Driving a Rigorous Analysis and Implementation of Effective Teaching Practices by Middle School Math Teachers

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Driving a Rigorous Analysis and Implementation of Effective Teaching Practices by

Middle School Math Teachers

Submitted by

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In fulfillment of the requirements

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Chair: Dr. Robert J. Starratt

Reader: Dr. Judith Rogers

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Abstract

Driving a Rigorous Analysis and Implementation of Effective Teaching Practices by Middle School Math Teachers

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Boston College Lynch School of Education

Dissertation Chair: Robert Starratt

Often educational researchers believe that the way to get teacher groups to improve their own teaching is to have them work in groups, share common assessments, look at the results, and choose the approach of the teacher who achieved the most success. Teachers, however, often resist this approach to identifying a “best practice” because it creates a competitive climate in which one teacher will be identified as the best. Conversations about teaching, when they do occur, thus often remain superficial. Teachers most often say to each other that they respect each other’s approach; when they do disagree, they focus briefly on ideological differences and then move on to another topic before identifying the specific instructional techniques that work. This dynamic persists in all schools, but particularly in high performing schools in which most students are succeeding, teachers choose to avoid these difficult conversations and thus avoid close examination of their practices.

This study examines a leadership project that strove to draw teachers into fruitful conversations about best practice by diminishing competitiveness within the group. Rather than asking them to compare student performance on common assessments, and identify the teacher whose students did the best, the Principal/Researcher focused teachers on the goal of establishing a common approach to teaching certain math topics. In order to find this common approach, teachers had to examine their practices very closely, adopting some new ones but keeping the
ones that worked. Rather than the work of one teacher, the “best practice” that the group members chose was a synthesis of strong teaching methods from all members of the group.
Acknowledgements

I am grateful to the help and support of my Boston College professors, Dr. Blumer, Dr. Consalvo, Dr. Pullin, Dr. Starratt, and Dr. Twomey. I am particularly grateful to Dr. Starratt, my dissertation chairman, for his thoughtful critique and encouragement. Dr. Judy Rogers was a indispensable mentor, tirelessly advising, editing, and cheering me on.
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Background of Participant

The Math Department at CMS

Teaching Struggling Math Students
Chapter I: Overview of the Study

Historically, school districts have relied on the use of standardized test scores to identify areas in which teachers can improve their instruction. This method of identification, however, may be ineffective in a high-achieving school system where the students’ home-life provides substantial support to the overall academic experience. This support from home may be the primary reason that a majority of students pass these tests. Regardless of the reasons, only a small percentage of students in these environments do not receive passing scores.

Teachers in high-achieving suburban schools not only lack a state, but also a community, mandate to develop pedagogies that consistently address the needs of struggling students in the classroom. Many of these teachers develop close relationships with parents, mostly with those of successful students, and, as a result, gain reputations in the community as strong teachers. They tend to believe, and are supported by parent opinions, that their instructional strategies work well because they are focused on engaging the strongest students. (Useem, 1992) In the spirit of fabled private academies, popular teachers in high-performing schools often develop a sense of strong individual reputations for excellence in the classroom. They may view the typical process of collaborating with colleagues to develop a set of best practices for struggling students as one that inhibits their creativity and effectiveness. (Kelleher, Leverett, 2006) In secondary schools that have the resources to departmentalize, furthermore, most teachers focus their collaborative conversations departmentally, and on questions of content coverage. As a result, they have infrequent discussions of pedagogy. (Calabrese and Bowser, 1988) Because they are reluctant to
collaborate, and collaborate in less substantive ways, many teachers in high-performing schools have less collegial support as they face the daunting task of differentiating their teaching strategies for weak as well as strong students.

Without a clear state or local mandate to modify instruction to serve these struggling students, and because of faculty resistance to collaborating and developing best practices, administrators often focus instead on providing support for these students from resources outside the classroom. This might be supplementary support services, such as pull-out classes, after-school programming, tutoring, and access to interactive computer software. Some struggling students may have as many as three or four staff members teaching them the same subject during the day. Receiving remediation at several points throughout the day from several different adults can fragment the learning experience for these struggling students and deepen their challenges.

The fragmented learning experience of the struggling students is perhaps most dramatic in their math classes. Over the last twenty-five years, United States students have performed on average relatively poorly on standardized math tests, causing math instruction to become a mainstream political issue. Politicians pit academics against each other. Profound disagreements in mathematics instruction have emerged, creating a false choice for school districts between teaching math topics as a set of procedures that require clear explanation and practice (“explicit instruction”) or guiding students to an understanding of the conceptual basis for those procedures (“guided instruction”). (Kroesburgen and Van Luit, 2005)
Site of the Study

All of the participants in this study teach at Central Valley Middle School (a pseudonym). Central Valley has a proud tradition of innovation and high performance. It is a school that serves approximately six hundred students and has a faculty of about seventy-five teachers. Central Valley is located in an affluent New England suburb near a major urban center with population of about 600,000. The median household income is about $110,000. Six percent of the student body is transported from a major urban center as part of a voluntary desegregation plan. These bused students are all non-white students. The students that live in the town of Central Valley itself are over 90% white. The middle school scored in the top forty on the 2007 state math test and in the top ten on the 2007 state science and English/language arts tests.

The district expectations for mandated state tests are that the Central Valley School score in the top twenty in every subject area. While its math cumulative scores are not in the top twenty, of greater concern has been the performance of certain subgroups on the Math state testing. The state cited the school for not making sufficient progress among Special Education students in math in 2003 and 2005. (In 2004, the school barely avoided a state citation.) Furthermore, in 2006, the sixth grade cohort’s scores were lower than they had been on the fifth grade test the year before. In 2006, the district’s leadership asked the middle school principal to focus attention on those students who did not achieve proficiency on the math tests.

Prior to the Leadership Project described below, in an attempt to increase the success of struggling math students the school had tried a couple of different teaching models. From 2004-2006, in sixth grade, all math classes were heterogeneous. However, students who were
particularly weak in math, according to their fifth grade teachers and their state test scores, were placed with stronger math students in a co-taught math class. In these classrooms, a regular educator and a special educator taught together with the intention that they would separate into two distinct groups and focus on teaching similar skills but at different levels, paces, and using different methods. The hope was that those two groups could come together at the end of class to discuss the major themes and procedures that the students had learned, even as the individual groups demonstrated the skills at a different level. The goal of the class was to incorporate fluidity, so crucial at the middle school age, in the leveling so that students who had a strong understanding of some topics but needed attention during another unit could move from group to group.

When the school did not meet the state demands for progress on the state testing in the Special Education sub-group in 2006, Central Valley decided to add more direct instruction and eliminate the co-teaching model. Previously, “Learning Center” at the school was time that was devoted mostly to supporting the regular curriculum. Prior to the 2006-2007 school year, Central Valley created a set-aside math class, to be taught by a special education teacher, for those students with significant math goals on their Individual Education Programs (IEPs) or regular education students who struggled in math. These classes, which had fewer than seven students each, met two to three times a week. The math department chair developed a curriculum for the classes which she called Focus Math. Focus Math provided students with more opportunities to learn the conceptual ideas behind various math units, particularly the basics of number theory.

In 2006-2007, the Focused Math (FM) class had mixed results. Although the special education teachers spent three days over the summer of 2006 participating in training led by
the math department chair, they did not follow the instructional model the department chair created that focused on using manipulatives. Instead, two out of the three special education teachers focused their teaching on practicing “math facts.” Their teaching ranged from providing pneumonic reminders of certain mathematical procedures to practicing mathematical procedures repeatedly. While the regular education math teachers reported that students were often more confident when they had previewed the procedures of a particular unit in their FM class, these students still struggled to apply their knowledge on quizzes and tests.

Focus of the Study

The Project

In response to the uneven results of prior attempts to improve the pedagogies that teachers used for struggling students, the Leadership Project attempted to diminish the difference in teaching pedagogies of the math teachers in sixth and seventh grade at Central Valley Middle School. The Principal/Researcher believed that encouraging teachers to develop and implement common approaches would create grade-level groups that worked more rigorously to determine best practices for struggling math students. Each grade-level group would become accustomed to examining their teaching lessons more minutely. They would discuss, for example, when they would introduce conceptual explanations for algorithms and when students would only learn how to use an algorithm. Teachers would use the meeting time to reconcile the two models of math instruction that have historically been at odds. Ultimately the goal of the project was to create a teacher group that engaged in a more vigorous search for best practice and then adopted that practice.
The Principal/Researcher structured the work of these grade-level groups in an attempt to cause them to decrease the differences in their teaching styles. The Principal/Researcher, acting as leader of the project, attempted to establish three collaborative groups: a group of regular education sixth grade teachers, a group of regular education seventh grade teachers, and a group of special education teachers with one math teacher. (In the fall of 2007, the Principal/Researcher decided not to study the group of special education teachers and regular education teachers because its membership changed significantly just prior to the start of the school year.) The teachers at each grade level met once each week to plan the following week’s teaching. The Principal-Researcher participated in these meetings.

During the grade-level meetings, the Principal/Researcher focused the discussion on how the teachers taught individual math topics. Teachers discussed, in particular, the questions that they asked the students. The Principal/Researcher prompted them to explore how their questions differed from their colleagues’. He then asked them what impact their questioning patterns had on the students who struggled in the class. As the year progressed, teachers wrote about and discussed their own teaching, observed each other teach, and in the process, tracked the effectiveness of each other’s approaches. The Principal/Researcher believed that teachers would be more motivated and feel more comfortable comparing each other’s approaches carefully if ultimately the project’s goal was collaborative. The Principal/Researcher, therefore, strongly encouraged teachers to agree on a common approach to each topic at their weekly meetings.
The Study

The Principal/Researcher studied the effectiveness of the collaborative project in decreasing the differences in the teachers’ methods of teaching, following a monthly cycle that provided data about the impact of various interventions. At least once each month, the Principal/Researcher observed each member of the group teach a topic that they had determined would be difficult for their students. After each observation, the researcher met with the teacher, using a transcript of the first fifteen minutes of class to help them examine the minute details of the lesson. During this post-observation conference, they discussed moments when they both agreed the students were learning. The Principal/Researcher hoped that studying a transcript of the audio-taped class would train the teacher how to analyze precisely the effectiveness of his or her teaching. He also hoped that identifying the strategies that worked would embolden staff members to share their techniques and willingly compare those techniques to their colleagues’ at their subsequent grade-level meetings. The Principal/Researcher participated in the grade level meetings once each week noting the dynamics of the discussion and how often the teacher groups ultimately agreed. As part of this monthly cycle, the researcher asked teachers to write in a journal how their views of their own and their colleagues’ teaching was evolving as they participated in this teacher group throughout the year. Finally, the teachers observed each other teach, and discussed those observations twice throughout the year.
Table 1: The Study’s Monthly Cycle

<table>
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<th>Part of the Month</th>
<th>Teachers</th>
<th>Principal/Researcher Interventions</th>
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<tr>
<td>First Week of the month</td>
<td>Taught about a topic that was challenging for certain students.</td>
<td>Observed and audio-taped class</td>
</tr>
<tr>
<td>1-2 days later</td>
<td>Researcher met with the teacher and asked the following questions:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Where are students learning?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. How do you know?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. What did you do that enabled them to learn?</td>
<td></td>
</tr>
<tr>
<td>2nd-3rd week of the month</td>
<td>Researcher met with the grade-level group of teachers</td>
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<td></td>
<td>and discussed effective teaching from the previous week, and strategies for addressing challenging material in the coming week. Then he asked teachers to teach a topic in the same way as their colleagues would teach it or explain why they would teach it differently.</td>
<td></td>
</tr>
<tr>
<td>3rd-4th week of the month</td>
<td>Teachers described their reactions to the observation, post-observation, and grade-level meetings from that month in their journals.</td>
<td>The Principal/Researcher reminded the teachers to complete their journals</td>
</tr>
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The study asked teachers what impact the various aspects of the collaborative had upon efforts to build a common set of pedagogies for a given topic. The Principal/Researcher then observed and analyzed how similar the teaching styles of the members of the group became as a result of the interventions. Another aspect of the study documented the informal roles that teachers adopted within the grade-level group in order to change student outcomes. For example, each grade-level needed the energy and wherewithal to keep track of any minute changes in curriculum in order to predict its impact on curriculum due to be implemented at a later time. Each group also needed the skepticism to press the teachers to deepen their conversation when a strategy did not work. The teachers
also needed to ask each other whether the lack of success should have been blamed on the strategy they used in the previous lesson or the strategy they used five lessons before or both. The study also analyzed the impact that more formal relationships had on the momentum of the teacher group. What role did the administrator play in discussing the group’s work? How could group members see necessary professional development as an additional tool rather than a threat to their sense of competence?

Research Questions

This qualitative case study examined the impact that various interventions had upon a teachers’ planning group and on the development of a common approach to teaching mathematics. The role of the principal in the shaping of this common approach was a particular focus of this study. The specific research questions were as follows:

1. What impact did the various aspects of the collaborative have upon efforts to build a common set of pedagogies for teaching math to struggling students?
2. How similar did the teachers’ questioning patterns become by the end of the year?
3. What challenges did the Principal face in implementing the collaborative structure?

Theoretical Rationale

The project is grounded in the belief that after decades of profound disagreement, a history detailed in the upcoming Chapter Two, a consensus is gradually emerging that teaching a blend both of conceptually-rich problems through guided instruction and of a more straightforward procedural nature through explicit instruction is the approach that is most effective with struggling students. The Principal/Researcher tackled the challenges of integrating these two pedagogies at the school building level. He grounded the project in the theories of teacher collaboration and adult learning that imply that teachers become more
effective at reaching struggling students when they not only share, but also develop the group’s best practices based on performance data. First, however, the administration attempted to provide a non-threatening environment in which teachers pooled their efforts to develop lessons and feel comfortable critiquing each other’s performance. The literature supported the idea that struggling math students needed teachers to agree on and implement a set of best practices because it would reduce the fragmentation of their experiences. The research also stated that mathematics is a subject area that has proven particularly resistant to cohesive teaching approaches, resulting in wider achievement gaps (Lubienski, 2002) and negative attitudes towards mathematics study. (Zevenbergen, 2005).

The Principal/Researcher anticipated that the teachers would initially see their practices as very similar to their colleagues’ in the study, disputing any fragmentation (Kelleher, Leverett, 2006). He also anticipated that the teachers would speak positively about their previous collaborations with colleagues. Before the study, the school had department and grade-level “house” structures in place for more than fifteen years and, as a result, the teachers had grown accustomed to a certain set of norms at teacher meetings. As the project proceeded, the researcher anticipated that emphasizing the importance of small differences in lesson delivery, and encouraging colleagues to discuss those differences carefully, would cause discomfort among colleagues. Eventually, the researcher believed that the teachers would become more comfortable discussing conflicting approaches, and that this discussion of difference would lead to a more efficient recognition of and agreement about best practices. The math teachers in the study would become more open to more diverse approaches to teaching. The researcher applied the work of de Lima and (2001) and Koelhner-Clark and Borko (2004) in the management of this necessary conflict.
The Principal/Researcher also believed that peer observation would have the greatest impact on the effectiveness of the group’s subsequent discussions of best practices. Torrance (2001) showed the impact that colleagues can have on teaching when teachers observed those teachers whom they meet with regularly outside of class.

The Principal/Researcher anticipated that he would fulfill the requirements of his dual role by asking probing questions when the group met and providing one-on-one support outside of the group meetings. Because the teachers were not eager to disagree with each other in the group, he took time during individual post-observation conferences to prepare members to disagree with each other. By ensuring that disagreements actually took place at group meetings and encouraging teachers to resolve those disagreements, the Principal/Researcher hoped to lead the groups gently.

**Significance of the Study**

Throughout the last century, mathematics educators were pulled between two different approaches to mathematics instruction, guided instruction that teaches students to understand the concepts behind the problems and explicit instruction that simply teaches students the procedures they need to solve math problems. Mainstream textbook companies developed curricula that mostly followed one approach or the other. Teachers received little curriculum guidance that integrated both approaches.

Because the schooling they had received prior to teaching math had not integrated the two approaches, mathematics teachers at Central Valley Middle School were often hesitant to debate the best approach. Their discussions often emphasized what parts of the textbook their students would cover and not what kind of approaches helped struggling students learn. As a result, these groups of teachers did not engage in systematic revision of their
curriculum, a process that would have enabled them to find an appropriate mix of both explicit and guided approaches.

By selecting for discussion specific concepts that are particularly challenging for students who struggle to learn mathematics, the researcher wanted to encourage the teachers in the group to state the differences in their approaches. By emphasizing the differences in their instruction, and the value of aspects of each of their approaches, the researcher believed that he could motivate teachers to agree more efficiently on a particular approach to teaching a certain concept.

While the discussion of conflicting approaches is a staple of various intensive peer observation and lesson study protocols, it is not typically the approach of generic grade-level planning groups. The researcher wanted the study to embolden teachers and to provide a pathway for teacher collaborations in which precise conversations led efficiently to a consensus about the proper mix of explicit and guided approaches.

Research Design

Qualitative Study

During this study, the Principal/Researcher, completed a qualitative, evaluative case study. The researcher participated in and evaluated an intensive professional development and curriculum development project. While the project was intended to improve ultimately the achievement of struggling students, the study focused on the description and analysis of the human relationships that evolved during the length of the study and the ensuing impact on classroom teaching. A qualitative study was appropriate because the researcher essentially studied the evolution of the sixth and seventh grade teachers’ groups as “holistic” (Miles and Huberman, p.6) entities distinct from other professional groups in place in the
school. The Principal/Researcher was a participant in the study as the project leader, as well, so he could gather perspectives “from the inside” (Miles and Huberman, p. 6) of the collaboration, witnessing the subtle impacts that the interventions had on the teachers. The researcher observed teacher meetings, observed his subjects teach classes, met with each of the teachers after they taught and collected journal responses from the teachers in the group.

*Type of Case Study*

The study was also one that was limited, or “bounded,” (Merriam, p. 19) by the Central Valley Middle School sixth and seventh grade math teachers in the years 2007 and 2008 therefore. It was appropriate to view each grade level as a separate, but related case study. The researcher answered the research questions by drawing conclusions from comparisons of what occurred across cases. (Merriam, p.40) It was an evaluative case study (Merriam, p. 39), furthermore, because it required a description of the process of sixth and seventh grade teachers working towards a goal and an evaluation of the impact of that work on the teachers’ practices.

*Limitations of the Study*

There were over five significant limitations to the study. The fact that the study would be completed at a single school site would limit the generalizability of the findings. The school was funded generously by the town, in addition, and thus had access to other forms of professional development that might also have impacted changes in teaching strategies. Most teachers had already taken some pedagogy classes together. The math teachers, for example, had taken two on-line courses sponsored through the Annenberg Foundation over the past four years.
The researcher also had a bias because he was the principal of the school, and was held accountable for the performance of the students. He wanted the project to succeed and the staff to work together to lessen the differences in their teaching strategies. This desire for success biased his involvement in the teacher groups. He addressed this bias by not expressing disappointment when the staff did not develop a consensus approach to teaching a particular topic. When one teacher, for example, wanted to complete a seventh grade math project in a new way and one did not, the researcher did not object openly to their divergent approaches.

The researcher’s position as the participants’ supervisor probably encouraged them to participate in the study in ways that they would not have normally in order to please him. To combat this threat to internal validity, the researcher assured staff that they could remove themselves from the study at any time. The researcher, in addition, addressed the bias through triangulation of the data.

Time affected the internal validity of the study because the changes were measured only over eight months. The study created a somewhat artificial urgency for achieving results. In addition, instrumentation was a threat to internal validity because the researcher, with all of his bias, is the person that used the instruments to collect and interpret the data.

*Definition of Terms*

The following terms and acronyms are important for understanding this study.

1. **NCTM**: National Council for the Teachers of Mathematics. This organization of math educators was founded in 1920.
2. **TIMMS Study:** The Trends in International Mathematics and Science Study discussed below was conducted in 1999 and measured and compared the performance of approximately forty countries in math and science. The TIMMS Study is conducted every four years.

*Overview of the Study*

Chapter One has introduced the reader to a problem at Central Valley Middle School, a project meant to address the problem, and how that project will be studied. Chapter Two will examine the research on mathematics instruction, adult learning, teacher collaboration, and leadership that will inform the findings of the study. Chapter Three will describe the design of the research, Chapter Four will discuss the findings and Chapter Five will analyze the findings and discuss the implications for future work in leadership and teacher collaboration.
Chapter 2: Review of Related Literature

The following literature review will examine the causes and the impact of the profound and unresolved disagreement about how mathematics should be taught in the United States. The literature will show that American policymakers, academics, and education schools have never fully reconciled nor integrated the two major schools of thought about how children learn, the behaviorist tradition and the constructivist. Educational leaders have presented a confusing mosaic of “best practices” to aspiring and veteran math educators. The lack of integration of an overriding vision for these best practices has had its greatest impact in the teaching of mathematics at the elementary and middle school levels.

This literature review will also examine the prevailing beliefs about how schools can engage its teachers in careful deliberation about their practice so that through collaboration they can develop a coherent curricula and better meet the needs of their struggling math students. In particular, the review will examine the impact that Professional Learning Communities (PLCs) can have on this collaborative environment. Finally, the review will describe the role that principals and central office leaders should play in effective teacher collaborations.

*The Problem with Mathematics Instruction in the United States*

The United States has yet to define clearly what mathematics skills it thinks students should have. Particularly unhelpful for its students, American schools have never developed a broadly accepted definition of what students should understand about number theory and how they should be able to apply that understanding to the four basic mathematical operations. As a result, every year, teachers confuse their students by making unclear
statements about basic mathematical operations. Liping Ma (1999) showed how the great majority of teachers that she studied from the United States used misleading and discredited metaphors for mathematical operations like “borrowing” for subtracting multi-digit numbers. (p. 22) Ma also found that math teachers in the United States consistently explained only how to complete a problem rather than why that approach made sense mathematically.

A fragmented mathematics experience further exacerbates the confusion for struggling students. For example, special education teachers most often use explicit instruction, instruction in which, in its simplest form, teaches students a set of steps to solving a problem. The majority of regular education teachers, meanwhile, follow guided instruction principles, allowing students to discover the reasons why a procedure works. (Hudson, Miller, Butler, 2006) Fragmentation is even worse in math instruction at high-performing suburban schools where the teachers enjoy a “culture of autonomy” (Kelleher, Leverett, 2006, p. 94) and the central office is typically not strong enough to promote curriculum or pedagogical alignment across the teaching faculty. (Kelleher, Leverett, 2006)

While one-time struggling readers often become strong readers by the time they go to college, the early experiences of struggling math students often have a permanent effect, causing them to internalize a “habitus” (Zevenbergen, 2005, p.613), or a self-image as a weak mathematics student. While mathematics scores on the National Assessment of Educational Progress (NAEP) since 1990 have increased, the achievement gap between students of color and white students and between low-income and middle-income students, has widened. (Lubienski, 2002) Lubienski states that students from low socio-econmic status and students of color are more likely to be exposed exclusively to weak explicit instruction methods that emphasize “fact memorization” and “multiple-choice
assessments,” (Lubienski, 2002, p.283) two practices that she believes contribute to the achievement gap. Furthermore, even when they are taught with guided instruction approaches, their cultural backgrounds often limit the gains they make. Lubienski showed that guided instruction approaches that require teachers to allow students to develop alternative approaches, require elaborate in-class discussions about the material. Guided instruction often delays the introduction of a clear set of procedures, contradicting the strict authority structure that vulnerable students often have at home. (Lubienski, 2000)

A History of Math Cognition in the Twentieth Century and Its Interpretation by Educators

John Dewey’s Progressive Movement is often misunderstood because Dewey was primarily a philosopher, not a cognitive psychologist. His ideas came from observing students respond in a school environment to different teaching approaches. His philosophy articulated a vision for what kind of climate children need in their school to progress. Dewey expressed concern that most teachers taught students as though they were evolving “savages” in need of their teacher’s firm hand and enlightening information. (Dewey, 1916) Dewey believed that teachers focused too often on disseminating the same information that those teachers had been taught when they were students in school. Learning, according to Dewey, took place when students incorporated information from their own experiences, “reconstructing” (Dewey, 1916, p.59) it so that it could be applied in the future. Individual students applied content in a myriad of ways, and education took place when that learning was applied. Teachers were expected to develop a wide variety of teaching methods to reach students on an individual basis. Dewey believed that students brought insights and skills to the classroom that formed the basis for their continued intellectual growth. Contrary to the beliefs of many of his followers such as William Kilpatrick (Klein in Royer, 2003), Dewey
did not advocate that lessons be devoid of structure. Dewey believed that specific content taught by adults in a specific sequence was necessary to fuel that continued growth. Students could not simply discover the skills they would need to think deeply. Dewey (1938) writes:

> Because the kind of advance planning heretofore engaged in has been so routine as to leave little room for the free play of individual thinking or for contributions due to distinctive individual experience, it does not follow that all planning must be rejected. On the contrary, there is incumbent upon the educator the duty of instituting a much more intelligent, and consequently more difficult kind of planning. He must survey the capacities and needs of the particular set of individuals with whom he is dealing and must at the same time arrange the conditions which provide the subject-matter or content for experiences that satisfy these needs and develop these capacities. (p. 58)

While Dewey believed that teachers should not explicitly just tell students how to solve problems, he thought that teachers needed to provide students with content, ordered in a particular sequence, in order for them to develop skills.

*The Practitioners’ Interpretation of Dewey*

Unfortunately, schools of education seized upon Dewey’s insight that children had a unique understanding of the world and advocated more limited adult guidance in the classroom. The unfortunate result was that education schools de-emphasized the need for teachers to have a rigorous content background. (Klein in Royer, 2003) Leading progressive educational scholars, such as William Kilpatrick at Columbia Teachers’ College, in the first half of the twentieth century, encouraged educators to write math curricula that incorporated students’ experiences. Progressive teachers accomplished these goals through “versions of
the theories Kilpatrick used to create his ideal progressive school in the 1920s—multiage groupings, where each child can go at his or her own pace,… teachers as coaches rather than sages, projects instead of textbooks.“ (Loveless, 2001, p.15) Because teachers did not provide enough direction for students, they covered fewer mathematical topics. Many mathematicians and educational policymakers uncomfortable with the Progressive movement expressed alarm about what they saw as a lack of rigor in math instruction. They quoted statistics that showed significant declines between 1930 and 1950 in the percentages of students taking higher-level math courses in high school. (Klein in Royer, 2003) Many anti-Progressives believed much of the problem was the paucity of education scholars with strong math backgrounds. Progressives largely ignored these criticisms, believing that their opponents who were mathematicians, most of whom had never taught below the college level, wanted to return to the traditional methods of memorization and recitation. (Klein in Royer, 2003) By the 1950s, math policymakers had aligned themselves on one side of this chasm or another. When Cold War politics entered the mathematics debate, the stage was set for the eventual Math Wars.

The launching of Sputnik and the fears aroused in the United States by the Cold War had a significant impact on math instruction. The United States, many believed, was losing the race to space because its students did not receive rigorous math instruction. Math instruction became a national security issue as the Defense Department infused millions of dollars into professional development programs that would raise the content knowledge of K-12 teachers. In the 1950s, government funding directed mathematics and education scholars to create a set of new instructional approaches that they called the “new math.” (Loveless, 2001) “New math” attempted to integrate a rigorous application of number manipulation with
abstract concepts like set theory and the use of non-base ten arithmetic bases. (Herrera, Owens, 2001) These curricula were startlingly “new” because previous math curricula had focused on practical, everyday uses for math. (Klein in Royer, 2003) “New math” combined a traditionalist approach in regards to content with a constructivist approach (Bruner’s “three stages of representation of mathematical ideas: enactive, iconic and symbolic,” Herrera and Owens, 2001, p.85) as a structure for pedagogy. While “new math” tried to integrate both schools of thought, the mathematicians did not scaffold nor explain their work, leaving teachers struggling to implement it, parents struggling to help their children, and leaving weaker math students behind.

After the “new math” of the 1960s, textbook publishers wrote curricula that went back to the basics of arithmetic, leaving behind the integration of set theory and algebra. These curricular changes incorporated behaviorist learning theory. (Pristine and Nelson, 2005) Behaviorists believed that knowledge was fixed and that if presented in the appropriate sequence, and if presented in an appropriately supported classroom, students would learn what the teachers had to teach. Explicit instruction, the most common outgrowth of behaviorism, required that teachers create lessons that began with a review of previously covered information and then presented new information. Students practiced applying that information individually on problem sets that they did at their seats. The teacher moved about the room answering their questions. Behaviorists believed that students should follow the well-trod pathway that their teacher provided them through his or her explanations. (Herrera and Owens, 2001) This was contrasted to Progressive educators who sought to provide opportunities for students to build their own connection to prior knowledge, and create their own pathway to the same endpoint.
Even as parents and mathematicians continued to express support for traditional approaches and frustration with Progressive approaches to teaching math, in the 1970s and 1980s the educational establishment developed new curricula that defied the behaviorist leanings of the public. (Klein in Royer, 2003) They developed in greater detail learning theories connected to Progressive ideas. Jean Piaget’s theories of child development supported the notion that students must re-create their own frameworks of thinking in order to develop new mathematics knowledge. (Van De Walle, p.22) What Bruner called discovery learning was the “linking process” that occurred “when previously unrelated items are suddenly seen as related in some way.” (Hiebert and Lefevre, 1986) Hiebert and Lefevre, making the bridge from cognitive psychology to mathematics instruction wrote, “We characterize this [connection] as an increase in conceptual knowledge [of mathematics.]” (Hiebert and Lefevre, 1986) Ultimately, educators who called themselves constructivists in education believed that students: 1) construct their own understandings of information; they are not given their teachers’ understanding 2) learn new information by constructing from the base of old understandings 3) learn by discussing their thinking with classmates and their teaching. (Prestine and Nelson, 2005)

Unfortunately, educational scholars applied Piaget’s constructivist concepts too loosely. Battista wrote:

Many [educators and laypersons] conceive of constructivism as a pedagogical paradigm entailing a type of non-rigorous, intellectual anarchy that lets students pursue whatever interests them and invent and use any mathematical methods they wish, whether these methods are correct or not. Others take constructivist to be synonymous with ‘Discovery’ learning from the ‘new math’ era, or even as a way of
teaching that focuses on using manipulatives or cooperative learning. (Loveless, 2001, p.55)

Battista agreed that constructivist principles should instruct the development of mathematics pedagogy. He cited highly skilled educators who could guide students effectively because they deeply understood their backgrounds and their learning strengths and needs. However, the typical teacher needed far more support than the broad conceptual explanations included in what were called “reform” textbooks.

*Educators’ Responses to a Nation At Risk*

In the 1980s, after the National Commission on Excellence in Education published *A Nation at Risk*, and stated clearly that American schools taught math ineffectively, education professors and educational practitioners sought to intensify their Progressive approaches. Educational leaders responded to the public’s demand for a more clearly defined mathematics program and to their own concerns about the limitations of the back-to-basics movement by developing and disseminating a set of learning standards called Curriculum and Evaluation Standards for School Mathematics. The National Council of Teachers of Math (NCTM) developed the Math Standards in 1989, which became the de facto national standards for the teaching of math. The Math Standards of 1989 expected that teachers would enable students to develop deep conceptual understanding of mathematics topics. They asked teachers to have students work in groups and to devise real-world problems for students to solve. By applying constructivism to actual instruction, practitioners fell into the trap that Battista described above. Real-world problems, while initially engaging, often took tremendous class time to explain and to complete. As a result, reform-based curricula, in order to cover the required topics, had to consolidate several concepts into single problems,
making them challenging to teach and taxing for the student. (Wilson, 2003) Curriculum packages such as those developed by the Technical Education Research Center (TERC), Connected Math, Everyday Math and Mathscapes offered very few one-step problems for practice. Typically they provided teachers with complex group activities that sought to engage even struggling students by allowing them to bypass aspects of the problem in which they lacked proficiency. (Loveless, 2001) Feldman (Royer, 2003) described the complicated set of interventions that a teacher implementing this reform curriculum had to provide in order to assign and discuss the solutions for a typical problem. Without Herculean effort, teachers could not adequately plan spontaneous responses to student answers that would gently guide them towards deeper understanding. The reform-based curricula also overwhelmed many struggling students, asking them to keep track of too many abstractions at the same time. (Royer, 2003)

In the 1990s, the “Math Wars” erupted, pitting math educational leaders, particularly the National Council of Teachers of Math (NCTM) against much of the public and many educators. The demands of the constructivist classroom alienated many teachers, while parents often struggled to follow the multi-step problems on their children’s homework. Inevitably, anti-reform backers spread mis-information about the NCTM Standards, telling parents that the reform curricula did not ask their children to know their times tables, and discouraged teachers from intervening as students veered off in confusing directions. In 2000, The Standards attempted to correct the lack of clarity in the 1989 standards. The 2000 standards were fewer in number, accompanied with more explanations, and examples of specific problems. (Herrera and Owens, 2001)
While the policymakers and math educators have argued about the balance of procedural and conceptual knowledge in developing an understanding of mathematics topics among students in the United States, it is clear that math education at the primary and secondary level faces a more basic problem. (Ma, 1999). In the late Nineties, after the Third International Mathematics and Science Study (TIMSS) in 1996 was published, it became clear that the 1989 NCTM standards had not been implemented effectively in classrooms. (Stigler and Hiebert, 1999) Other studies since have shown that US mathematics teachers have not implemented the 2000 standards. Stigler and Hiebert wrote, “The videos (of classes observed for the study) show little evidence that change is occurring… when teachers do change their practice, it is often in superficial ways.” (Stigler and Hiebert, 1999, p.12)

Stigler and Hiebert described uniformity in American math classrooms in which students practice math procedures but do not develop deep understandings. In Knowing and Teaching Elementary Mathematics, Liping Ma described how elementary and middle school teachers in the United States lack the understanding to articulate mathematics concepts clearly to their students. Teachers in the United States address confusions about how to solve problems by directing students quickly to the proper procedure.

Stigler and Hiebert showed that Japanese teachers, on the other hand, do not present solutions initially, allowing students to work in groups for longer periods of time, searching for the solution without teacher intervention. In addition, in American classrooms while “content is not totally absent… the level is less advanced and requires much less mathematical reasoning than in [Germany and Japan.]” (Stigler and Hiebert, 1999, p. 27) Stigler and Hiebert pointed to American lessons that cover far more topics more superficially as having a lack of “coherence.” (Stigler and Hiebert, 1999, p. 60) Finally, Stigler and
Hiebert showed that “96 percent of Japanese lessons contained explicit statements by the teacher connecting one part of the lesson with another, whereas only 40 percent of German and U.S. lessons contained such statements.” (Stigler and Hiebert, 1999, p.63) In other words, Japanese lessons were far more likely to tell a single, cohesive “story” than American lessons. This organizational coherence enabled Japanese students to progress through a significantly more rigorous curriculum than students in the United States encountered.

Stigler and Hiebert (1999) expressed concern not only about the lower level of rigor in the content which students in the United States study. They also expressed concern about the structure of the mathematics lessons. A combination of direct instruction from the teacher and discussion of the problem among the students over relatively short intervals gave Japanese students more opportunities to invent their own problems and to develop alternative solutions. While this approach echoed the oft-criticized “discovery” approach described earlier, it was not as extreme. Stigler and Hiebert (1999) described how teachers in Japan return a number of times to the chalkboard to discuss the connections that students have made, making explicit those connections that they have missed.

United States mathematics textbooks have attempted to provide a ready-made lesson structure for teachers to implement the NCTM standards. Sood (2007) detailed the increase in reform-based textbooks that emphasize problem-solving. She compared reform-based EveryDay Math (1989) with the more traditional products produced by Harcourt Brace, Scott-Foresman, and Houghton Mifflin. While there is much data that suggests that direct, explicit explanations are necessary, particularly for students who struggle in mathematics. Baker, Gersten and Lee (2002) showed that explicit instruction is particularly crucial in order to
allow students to hear a cohesive explanation first. Sood described how *Everyday Math* does not provide the teacher with significant explicit explanations.

The lack of coherence and depth in mathematics lessons in the United States has had a particular impact on students that struggle mathematically. Maccini and Gagnon (2002) surveyed special education and regular education math teachers’ views of the standards and discovered that special education teachers had far less familiarity with their state’s standards than regular education teachers. The math problems that the standards require teachers to teach, furthermore, were extremely challenging--and, in some cases, alienating for special education students. Jitendra, Sczesniak Griffin, and Deatline-Buchman (2007) explained that the “story” problems that require students to apply their knowledge, demand that students apply several different cognitive processes simultaneously. They advocated for a methodology that provided more guided instruction for the special education math student.

Several studies have raised concern about the effectiveness of reform-based curriculum because it creates too heavy a “conceptual load,” (Baxter, Woodward, Olson, 2001, p.544) requiring struggling students to navigate several conceptual hurdles simultaneously in order to solve one problem. Studies have raised concern about the fact that students who process slowly are less likely to contribute to the class discussion that is so critical in a constructivist classroom (Baxter, Woodward, Olson, p.544) These students became distracted during class discussions or misunderstood the answers of classmates. (Kroesbergen, Van Luit, and Maas, 2004). Studies have shown that explicit instruction, on the other hand, can aid in the development of automaticity, and thus decrease the cognitive load of students who struggle with their “number sense” development. (Gersten and Chard,
Studies have advocated a mix of explicit and reform-based instruction. (Allsopp, Lovin, Gree and Savage-Davis (2003).

Middle school is a particularly challenging age to mix guided and explicit instruction because middle school teachers have often resisted implementing constructivist approaches to learning. They are more focused on maintaining order, covering certain amounts of material and avoiding getting caught up in the confusion that can come from reform models. In order to move beyond reform-oriented teaching “as a slogan” (Silver, Charlambous, Strawhun, Stylianides, 2006, p.1), Silver, et al, encouraged teachers to focus on discussing with their colleagues the activities that they use with students in a particular lesson. In Silver’s research, teachers needed thorough discussions with colleagues and time to write in their reflection journals in order to apply alternative approaches effectively to struggling math students.

Hiebert (1991) argued that educational researchers have created a false dichotomy between teaching mathematical procedures and teaching concepts to struggling students. The fact that struggling students make progress unevenly has resulted in an over-simplification of the learning process with weaker students forced to memorize number facts. Hiebert gave the example of using manipulatives when discussing fractions. Manipulatives cannot easily show both the “discrete” and “continuous” nature of fractions and might cause a “partial understanding of decimals.” (Hiebert, 1991, p.323) At the same time, even these partial understandings may help struggling students develop more complete understandings later so should not be dismissed. Lee and Herner-Patnode (2007) made it clear that a mix of instructional methods, that include explicit and guided techniques, are critical for struggling middle school students. They referred to the use of explicit teaching methods in the teaching
of reading: “The direct teaching of vocabulary terms can have a powerful impact on reading comprehension.” (Lee and Herner-Patnode, 3007, p.125)

Ultimately, American elementary math teachers do not need higher-level courses to teach effectively. They also do not need piece-meal reform-based lessons. Liping Ma characterizes the main obstacle to effective math instruction as American teachers’ lack of “Profound Understanding of Fundamental Mathematics.” (1999, p.118) Ma contrasts American teachers with teachers from China. The Chinese teachers she studied had not taken nearly as many high-level math classes as their American counterparts. Yet, in her study Ma showed how comfortable most teachers were in guiding rigorous discussions of math concepts among their students, implementing the kinds of effective lessons described in Stigler and Hiebert. Stigler and Hiebert showed how in China teachers learned from their colleagues, carefully developing model lessons that guide students towards conceptual understanding and procedural agility. Creating a collegial and rigorous environment in which teachers can learn from each other’s experience, evaluate precisely how students learn, and create lessons that are staples of the curriculum is the way that Chinese teachers improve their practice. These collaborations provide hope for American schools.

*Adult Learning*

Ma (1999) calls for U.S. teachers to develop a Profound Understanding of Fundamental Mathematics in order to improve mathematics instruction, particularly for students who struggle. If schools and districts are going to develop these skills in their teachers, they must develop a deep understanding of how adults learn. Change in classroom teaching can only occur if teachers have the motivation, skills, the time and the training to collaborate. In the 1990s, school reform most often involved school restructuring. Schools
incorporated classes into longer blocks in their daily schedules for more in-depth class activities and discussions, broke teachers up into teams, and broke schools up into small learning communities. Elmore (2004), Darling-Hammond (2005) and Fullan (2001) all have shown the limitations of these structural changes on the actual learning experience of students in the classroom. Harris explains that “changing structures is not synonymous with changing beliefs.” (Harris, 2003)

Re-structuring was limited in its effectiveness in reforming education because it did not address the beliefs or the motivation of how teachers learn new methods and change their practice. Reform-based teaching, which includes guided instruction of math, requires teachers to learn new approaches in the classroom. Adults, while constructing their learning like children, learn somewhat differently. Knowles (1979) emphasized that adults need to know the reasons for learning new information and concepts. Adults also want to apply their knowledge quickly. Finally, adults are motivated by internal pressure more than children who have their parents and teachers to please. Aderinto (2005/2006) showed that adults must choose to learn and have the opportunity to direct the learning themselves. He wrote that adults “learn significantly only those things which they perceive as being involved in the enhancement and structure of self.” (Aderinto 2005/2006, p.140.)

Little (1993) explained that the nature of reform-based methodology means that teachers cannot learn how to improve their practice unless they work in groups with decision-making authority. Preparing students to complete tasks that require greater integration of concepts and authentic assessments cannot rely on textbooks. Furthermore, teachers have to reform their teaching quickly under the pressure of state-mandated testing, using assessments to inform instruction. Teachers are also expected to exhibit greater content knowledge and
are tested on this content knowledge in order to retain their certification. If teachers are increasingly held accountable for their students’ performance, they need the support and input of a group of colleagues, also qualified, in order to make classroom adaptations to improve that performance. (Harris, 2003) While the obstacles are intimidating, strategizing to improve student learning provides tremendous motivation for teachers. Therefore, their professional development must be intimately connected to the work that they do in their classrooms.

A traditional approach to engaging teachers in learning is hiring outside professionals to train teachers in particular teacher methodologies. Outside professional development has become more sophisticated, providing opportunities for practice and follow-up reflection. Teachers feel that their training must be connected to their practice. Kimmel (1999) described a comprehensive professional development package that combined summer study with a summer practicum. During the summer, teachers worked closely with their peers and more experienced teachers to identify effective practices. They applied these practices immediately to small groups of students and re-evaluated their effectiveness soon afterwards. While Kimmel found that teachers learned during the summer, a longer-term impact on their teaching depended on teachers’ ability to communicate their successes and struggles throughout the year in some sort of standardized fashion.

Many professional development programs understand the importance of the outside trainer’s ongoing, supportive relationship with the teachers that are implementing changes. Riley and Roach (2006) developed a process for developing this trainer-teacher relationship that models the teacher-student relationship closely. They began by focusing on the current strengths of the teacher, but not by making any value judgments. The professional developer
emphasized the impact that the teacher’s actions had on the student. The teacher determined whether that impact was what she or he wanted. The trainer would often focus his or her comments in the particular areas where the teacher needed to grow. Eventually, the trainer generalized the effective teacher behaviors by giving them labels. Finally, the trainer provided the teacher with research that supported the choice of particular labels for the effective teacher strategies. Subsequently, teachers gained confidence by applying labels to their effective actions and knowing that research supported their efforts.

One crucial key to the success of outside professional development is the role that it plays in encouraging teachers to develop sustained work with a group of colleagues in order to develop their skills in the future. Franke, Carpenter, Fennema, Ansell and Behrend (1998) call this “self-sustaining generative change.” (p.67) In a reform-based mathematics classroom, the teacher must respond to student ideas that have never emerged in the classroom before. In order to sort through the wide variety of successes and struggles they need a team of colleagues that knows the students and what has worked in the past. Franke, Carpenter, Fennema, Ansell and Behrend (1998) discuss training teachers in “practical inquiry” (p.79) of each other’s practice to get them to be capable of self-sustaining, generative change.

No matter how effective a professional development program is at meeting the needs of teachers, however, all programs originating outside the school have significant limitations. These limitations can only be overcome if teachers play a strong role in selecting the outside professional developer. Fullan’s (2001) categories of obstacles for change are helpful in showing how outside professional developers increase the likelihood that change will stall. First of all, it is unlikely that teachers will accurately see the need for the outsider’s support
unless they have identified that need and invited the provider. It is also unlikely that teachers will use the strategies taught to them by the outsider unless they have an established group of peers with whom to discuss that implementation.

Collaboration

Working in groups with colleagues, is not only crucial in fostering adult learning, it is also critical in getting teachers to feel effective after they implement new strategies. Michael Fullan (2001) described the problems associated with teachers not having regular, systematic and predictable access to the thoughts and feelings of their colleagues. Fullan summarized the uncertainty that teachers feel about whether they are impacting a student’s learning, and whether they are improving as a professional. The only solution to address these doubts is to make the teacher collaborative group the center of the professional development experience for faculty. Over the last ten years, outside professional development has taken on a complementary role as teacher collaborations have become the central mechanism for improving teacher skills.

At first glance, one might assume that teachers would be unlikely to embrace collaboration as the basis for their continued professional development because of the culture of schools. In “The Persistence of Privacy” in 1990, Judith Warren Little wrote about how collaborations, even if teachers are supportive and committed, often did not result in change in teachers’ classroom methods. She wrote, “Closely bound groups are instruments both for promoting change and for conserving the present.” (Little, 1990, p.510) Little described why teachers initially resist true collaboration, what she called “joint work.” (Little, 1990, p.512) She explained that joint work is more than just collaboration, it is “collective action,” (p.512) teacher efforts stemming from a common belief in how children learn. Little explained that
teachers are not inherently opposed to sharing their methodologies, rather they simply do not take those methodologies seriously enough to see their potential. Teachers see their knowledge as simply practical and mechanical, useful for planning the next day’s lesson and marching through a particular curriculum. Ultimately, teachers require not only Ma’s (1999) “profound understanding,” but they must also instill a confident mathematical attitude (Marshall, 2006) in their students. Teachers must take initiative based on their own convictions about how math is taught effectively in their classrooms. In order to develop this self-confident and responsible attitude, teachers must engage each other with hard questions about their practices and subsequently make changes in their teaching when appropriate.

The literature on teacher collaboration argues that there are stages of learning and acting that teachers must follow if they are going to institute significant change in their classrooms. First of all, they must develop a shared vision for what kind of learning they want their students to achieve. After they have developed a shared vision, teachers need a method of inquiry that spurs the development of assessments that provide accurate data for student learning. (DuFour, Eaker, 1998) They must then have a vehicle to implement changes and finally reflect upon those changes. (Fullan, 1993) Ultimately, this cycle continues as a school uses its teaching community to build capacity. (Stoll, 2006)

Professional learning communities (PLCs) are groups that many educational researchers believe can provide teachers with a structure that will support the adult learning cycle described above. Dewey (1910) spoke about the importance of teachers continually reflecting about their practice. He was concerned that even the best teacher could lose sight of his impact on students and become ineffective. He wrote, “The operation of the teacher’s own mental habit, unless carefully watched and guided, can make the child a student of the
teacher’s peculiarities rather than of the subjects that he is supposed to study.” (Dewey, 1910, p.49) He wished for his teachers to look outside themselves and consider their teaching objectively by discussing it with their colleagues.

In the 1980s and 1990s, as researchers looked to improve student achievement, and looked back on disappointments from previous reform efforts, Judith Warren Little argued that sharing and experimentation among teachers was key to a school’s success. (Little, 1982) Little identified examples of how teachers at effective schools discussed critical teaching strategies as opposed to talking more superficially about their teaching. Little identified four critical practices for improving school performance through particular types of teacher collaboration: clear and precise discussions of classroom teaching, participation in observation and discussion from all members, shared development of curriculum, and shared responsibility for making instructional improvements. In 1982, Little did not believe that these collaborations needed to take place within certain structures. They could take place in meetings, classrooms, or even the teachers’ lounge. What was critical was that it was part of the daily pattern of the school’s day. In 1982, Little, while not emphasizing one particular structure, made it clear that the entire faculty had to be engaged in this culture of collaboration. Little remarked on how successful schools could have heartfelt, rigorous discussions of practice without teachers taking offense or feeling threatened. Little encouraged schools to hire and evaluate teachers based on their willingness to collaborate.

As the Nineties progressed, and the standards based movement became established, schools felt greater urgency to make professional development more productive and efficient (Little, 1993). Hargreaves and Dawe (1990) connected the lack of effectiveness of previous instructional reforms with teacher isolation. Researchers emphasized a more structured
approach to teacher collaboration, one that distanced itself from outside professional development. Teachers needed less time with university-based courses and more time with “more school-centred (sic) forms of professional development which recognize, bring together, and build upon the skills, experience, and insights that teachers already have.” (Hargreaves and Dawe (1990, p. 229)

Hargreaves and Dawe believed that, ultimately, outsiders could not possibly understand teachers’ experiences with enough specificity. Inevitably, teachers would become distrustful and dependent because the outside professional developer worked for the administration and was not a colleague. Hargreaves and Dawe believed that the reciprocal relationship between two colleagues, on the other hand, enabled teachers to feel supported and the collegiality not to be “contrived.” (Hargreaves and Dawe (1990, p. 238)

In the late 1990s, educational researchers examined the possible benefits of systematizing the development of collegial networks. Dufour and Eaker (1998) showed how a school could ask teachers to take responsibility for different types of school challenges. Teachers could serve on multiple teams: one team, for example, could discuss the work of the students that they shared while another team could review teacher-submitted grant proposals. After certain periods of time, the faculty as a whole would review the progress of the collaborative groups.

Researchers agreed, however that the main purpose of professional learning communities should be to improve schools in the area most resistant to change, classroom teaching. (Elmore, Peterson, and McCarthey, 1996) Dufour and Eaker explained that professional learning communities would induce a calm sense of purpose in teachers, a “culture of continuous improvement” (DuFour and Eaker, 1998, p.55) in which an entire
faculty took responsibility for investigating its practices rigorously. Only in a deeply supportive and professional group, one which meets regularly and discusses issues carefully would teachers fully take ownership for the learning of all of their students. Dufour and Eaker quoted Newman and Wehlage to show that the ability of teachers to accept and fulfill this responsibility was what characterized “the most successful schools.” (DuFour and Eaker, 1998, p.62)

Peter Senge’s *The Fifth Discipline* influenced thinking about teacher collaboration because it described the necessary ingredients for creating the “learning organization” (2006), an organization in which workers are committed to the vision. Senge emphasized that commitment is a choice that all workers—in this case, teachers—should and would make individually. The reason that they would choose to support the school’s shared vision is because their very existence as a teacher is tied up with the fulfillment of that vision. Ultimately, they believed that the school’s mission was worth their total personal dedication.

Senge added, however, that the methods that an organization followed to achieve that mission were also critical to gaining the employees’ commitment. This was particularly true in the teaching profession in which practitioners had longed to integrate the standards-based movement of the 1990s with Dewey’s humane mind-set. Senge discussed the importance of employees acting in a way that is “consistent with [the] mission.” (Senge, 2006, p.208) Senge called for a “positive vision” as opposed to a “what do we want to avoid?” (p.209) negative vision. Senge’s vision of a “learning organization” parallels Dewey’s vision of teaching’s impact on teachers as learners, an impact that could easily inspire collaboration:

While it is easy to ignore in our contact with [children] the effect of our acts upon their disposition, or to subordinate that educative effect to some external and tangible
result, it is not as easy as in dealing with adults. The need of training is too evident; the pressure to accomplish a change in their attitude and habits is too urgent to leave these consequences wholly out of account... What nutrition and reproduction are to physiological life, education is to social life. (Dewey, 1916, p.13)

Many researchers believe that professional learning communities (PLCs) provide the basis for a well-structured group, with a mandate for collaboration and growth, that teachers need in order to grow. Koellner-Clark and Borko (Koellner-Clark and Borko, 2004) showed how teachers found their voice in a collaborative manner simply by showing their colleagues and themselves that they could complete a particular math problem. Once they showed that they could answer the question, they were comfortable debating other approaches to solving the equation. Furthermore, teachers are often more eager to ask for outside professional development when they act as a group. Not only is it less threatening to ask for help as a group, teachers need the group to discuss what they learned after they used the new strategy in their classrooms.

De Lima (2001) acknowledged how easily collaborations can become superficial. He quoted Barbour in explaining how teachers develop “tacit agreements” (de Lima, 2001, p. 100) to avoid having deep conversations. De Lima raised concern that leaders implementing professional learning communities can hinder their efforts by mandating that all teachers adopt a particular vision or all develop close relationships of “affection” with each other. (de Lima, 2001, p.103) What is critical is that teachers share “a deep commitment to students’ learning, development and well being. Strong personal bonds are by no means essential.” (de Lima, p.103) In fact, friendships can often interfere with the creation of strong professional learning communities because the friendship’s social dynamics can inhibit friends from
taking risks and performing differently as a teacher. De Lima wrote, “‘real’ collegiality is conceptually independent from emotional and affective attachments among teachers.” (de Lima, 2001, p. 109)

De Lima not only encouraged teachers to choose their groups based on their professional and pedagogical interests, he believed collaborations that are not based on deeply emotional ties can also take advantage of “conflict.” (de Lima, 2001, p. 111) Groups need to establish a norm for handling disagreement because it plays a crucial role in the success of the learning community. If groups cannot resolve conflicts, its members will look outside their circle for help and will resist resolving issues within the group. De Lima commented that the “critical friends” groups do not contradict his opinion that collaborations are less about deep emotion and more about cognitive exchanges. He explained that the effective critical friend is someone who ultimately is not an evaluator but will provide an objective evaluation to help the teacher or teachers involved succeed. De Lima liked better the term “friendly critic” (de Lima, 2001, p. 119) because it implies someone respectful of the school’s and the teacher’s work but not afraid to provide specific suggestions for how the teacher can improve. Snow-Gerono (2005) emphasized that those types of critics are more likely to exist on a professional learning community because of the shared sense of purpose and the long-term nature of its work. Teachers are more likely to ask the tough question when supported by their learning community and are more likely to become more expert in a certain field of inquiry with the support of a group pushing its members’ knowledge forward.

While attending to the social dynamics of teams is crucial to the success of professional learning communities (PLCs), ultimately PLC supporters emphasize the model’s results-orientation. The work of the PLC begins with investigating the school, district and
state standards and outcomes. ( Reeves in DuFour, Eaker and Dufour, 2005) showed how the learning community’s next step is to make sense of the myriad, and often overwhelming, numbers of standards, to create what he called “power standards.” (DuFour, Eaker and Dufour, 2005, p.50) While synthesizing standards into a small number of particularly important standards is perhaps beyond the scope of a single PLC within a department or within a grade level, Reeves stated that PLCs must prioritize teaching material and revise sequencing in order to have an impact on classroom instruction.

The next crucial step in the inquiry of the PLC is to identify how students individually and in disaggregated groups are faring in relation to achieving the school’s stated outcomes. Stiggins (In Dufour and Eaker, p. 1005) described these formative assessments as assessments “for learning.” (p. 76). In order to make these assessments useful, teachers must incorporate the outcomes and their knowledge of the students into the development of new curricula. Without doubt, the group can provide more information, experience, and research to the individual teacher than that teacher would find on his or her own.

Given that formative assessments provide us with the most useful information about how students are doing, teachers must receive feedback from colleagues who know those assessments deeply. Torrance (2001) illustrated how a group of British teachers, inexperienced in using formative assessments, studied how to develop them, and in the process improved their teaching. The teachers first developed what Torrance called “pedagogical self-awareness” (Torrance, 2001, p.14) through videotapes, capturing moments in their teaching when their use of informal formative assessments was ineffective. They discussed these formative assessments and the quality of information they provided about the
students’ learning. They categorized the types of information and then revised them so that they could provide higher quality feedback on the quality of the instruction. Their collaborative’s discussion was not only focused on what students’ knew but on the continuing revision of formative assessments. Teachers that are so deeply involved in revising a particular part of their teaching cannot rely on the occasional visits of an administrator for feedback. They need a peer, who has been involved in the work, to stop in and observe them.

Torrance’s (2001) description of the analytic framework for grouping different types of formative assessments raises the question of what generic tools should be used to improve the discussion of the group and “create a stance towards practice and its ‘improvement.’” (Little, 2002) Behavioral norms and protocols, first of all, are necessary for a group to function effectively. Little (Little, 2002) showed how one collaborative group argued amongst themselves about whether or not to discuss a particularly contentious topic and never achieved consensus. Group norms prevented this discussion from derailing the group’s momentum. Grossman, Wineburg and Woolworth (2001) examined other crucial aspects of effective collaborative efforts among teachers. They built in to their study groups a conflict between the participants’ desire to develop their own content knowledge and their desire to improve their pedagogy. They discovered the importance of enabling different leaders to take the lead in discussion, depending on their expertise. It was also crucial that all of the members of the group felt comfortable expressing themselves without fear of embarrassment. Finally, they found that a focusing question posed by the leader of the discussion, encouraged teachers to build on each other’s work.
While the consensus among educational researchers is that intense, regular, focused collaboration is what can drive achievement gains, this type of collaboration is not widely achieved throughout the country. (Schmoker in DuFour, Eaker and Dufour, 2005) Institutionalization of professional learning communities has occurred rarely. In Common Ground (Eaker and Dufour, 2005), Barbara Eason-Watkins described the implementation she led in the Chicago Public Schools as Chief Education Officer. In her first year of work, the district developed a shared vision of outcomes that they hoped to achieve for their students. Then she divided up the district into “Areas” that had about forty schools each, and provided curriculum advice and training for teams of people to complete their own action research.

Lesson study is a specific approach that professional learning communities can use that has received significant support over the last several years. The Teaching Gap (Stigler and Hiebert, 1999) made the case that lesson study was a superior method, and was the reason for Japan’s success relative to the United States on the Third International Mathematics and Science Study. By 2003, lesson study emerged in over 300 schools across the United States. (Fernandez, 2005). During lesson study, a group of teachers plan a single lesson for several hours. Then the group observes one teacher lead the lesson, taking detailed notes of student reactions to the teaching. The group then de-briefs, broadening the discussion to examine larger beliefs about how children learn, and to revise the lesson. (Lewis, Perry, and Murata, 2006)

The nature of lesson study work offers teachers a unique opportunity to develop the skills necessary to implement a reformed-based curriculum. (Fernandez, 2005) It gives them time to thoroughly investigate one topic, anticipate struggles students will have and questions that they will ask. By thinking through all aspects of the topic, teachers can gain “Profound
Understanding of Fundamental Mathematics” (Ma, 1999). The lesson study model, with its repetitive nature, gives teachers particularly good opportunities to practice their spontaneous responses to students’ reasoning, a crucial aspect of guided instruction. Fernandez acknowledged the limitations that teachers’ own knowledge places on their discussion; however, she also showed how the constant push to clarify ideas that lesson study mandates, enables teachers to clarify their misunderstandings. In addition, it makes clear to those teachers the areas in which they need to develop a better understanding. Teachers in the United States will need time to develop the skills necessary to lead effective lesson study groups. Lewis, Perry, and Murata (2006) point to studies that show that American teachers do not yet have the discipline to observe, take notes and discuss in the ways demanded in lesson study.

*Leadership*

As described above, the large majority of educational researchers are convinced that school improvement will occur when teachers develop a coherent approach to teaching based on highly structured lessons that provide students with time and opportunity to explore challenging ideas in a carefully sequenced manner. Whether through a specific pedagogical and curriculum revision process like lesson study or through a less structured “critical friends” group, researchers believe that egalitarian settings, like professional learning communities, are the most rigorous environments for the intimate critiques required to improve instruction significantly. In this environment, the school leader plays a subtle role. He or she helps the teacher reconcile Dewey’s vision for the ideal nurturing school with the ambitious requirement that all children attain proficiency in 2014 under No Child Left Behind. (NCLB) No longer can the effective leader simply say, “Follow me.” (Sergiovanni,
Teachers respond to principals because they believe that that administrator will help them reach the needs of their students more completely, not because they have nominal power. Sergiovanni carried the demand for a subtle approach from school leaders further when he wrote: “Emphasizing drastic restructuring of present organizational patterns as the means to bring out significant improvements is usually neither practical nor necessary.” (Sergiovanni, 2001, p.4) Principals and superintendents should think less about building smaller schools or changing schedules and more about supporting a variety of teacher collaboration structures. Sergiovanni also described the network of “reciprocal relationships” that the effective leader creates in a school. “These relationships enable informal communities of practice to bubble up and institutionalized collaborative cultures to trickle down.” (Sergiovanni, 2004, p.18) This give-and-take enables a school to institutionalize and systemize change. In a school where teachers have traditionally had large amounts of independence, striking this balance is particularly necessary for instructional change to take place.

Current theories of educational leadership pull significantly from leadership and organizational research done for business. W. Edwards Deming, the “pioneer” (Senge, 2006, p.xii) of the total quality management revolution, identified over fifty years ago how a company’s fortunes depended on the workers’ ability to take initiative to improve quality. It is also critical, Deming wrote, that workers’ know that their improvement responsibilities are never complete. While perfection will not be achieved, a company can get closer and closer to a mistake-free, maintenance-free product. (Walton, 1986, p.26) Deming explained that the leader must convey the vision that the company must produce high quality products and that the workers must take pride in that quality. The emphasis was on the team, not the
individual. Deming, for example, felt that merit systems for individual pay were destructive to the ability of the company to develop best practices.

Deming had a huge impact on Peter Senge and the leadership principles that he expressed in *The Fifth Discipline*. (Senge, 2006) Senge elaborated on Deming’s point that workers must be members of a team in order to have the intellectual wherewithal to employ systems thinking. Like Elmore (2005), Senge explained that external measures cannot drive improvement. The workers at a company, like teachers at a school, must believe that it is their responsibility to improve the company.

The leader should first remind teachers of the transformative nature of their daily work by developing with them, and communicating to them, a sense of their mission. Heifetz (1994) discussed the limitations of the merely “effective” (Heifetz, 1994, p.22) leader. A leader must have the experience and insight to see beyond the short-term wins of a successful sale or a high test score. All stakeholders in an experience must leave work each day with some sense that they had an impact and are valued. The leader must provide an “adaptive” (Heifetz, 1994, p.22) approach, including opposing values under the umbrella of one vision. For example, the school superintendent should not feel effective simply for unanimously winning the school committee vote to allow frank discussion about sexual reproduction in an eighth grade health class. The superintendent must also use this moment to get the entire community to face the “tough realities,” (Heifetz, 1994, p.24) that divisions exist within the community and that everyone must understand the concerns of the opponents of the new sexual education curriculum. The superintendent must work with the community to clarify why the schools should play a role in teaching about sexuality and what impact the community should see as a result of the schools playing this role.
Starratt (2004) developed a reflection process that integrates a leader’s mindset ("responsibility"), actions ("authentic"), into a state of being ("presence") that enables a leader to guide the school staff towards building a moral and ethical school. Crucial to this moral and ethical school is the connection that teachers should feel towards each other, a key to creating effective professional learning communities. Starratt explained that the ethical leader can convince teachers to take responsibility for improving the school as a whole by making them aware of the larger structural reasons for their ineffectiveness. If all teachers understand the complex and imposing obstacles that the bureaucracy and the community impose on a school, they will want to work together.

Starratt also stated how the leader at a high-performing public school, such as the one in the study below, can use “authentic learning” (Starratt, 2004, p. 130) to engage the faculty in improving their instruction. Because authentic learning asks more of students than “purely physical and technical engagement” (Starratt, 2004, p. 130), and requires work outside of one narrow discipline, teachers have to work together. The principal can model for teachers how to listen to the students’ thirst for authentic experiences, making public his realization that he must improve his work in order to engage the students authentically.

Once the leader develops Starratt’s “authentic” learning environment, that leader can implement what Sergiovanni calls an atmosphere of “professionalism.” (Sergiovanni, 1992, p.67) Sergiovanni wrote:

When [professionalization] happens, superintendents and principals can spend less time trying to figure out how to push and pull teachers toward goals and more time dealing with the broad issues of teaching and learning, on the one hand, and ensuring
financial, moral, political, and managerial support for the school, on the other.

(Sergiovanni, 1992, p.67)

The vision, and the ideas to fulfill that vision, drive the organization and are placed at the top of the hierarchy; the principal and the superintendent are servants of that vision. The entire staff, including the superintendent and principal, engage in “followership,” (Sergiovanni, 1992, p. 71) managing their own work to help the organization attain its goals.

While the ethical demands on them are intense, educational leaders today have a unique opportunity. All educational leaders acknowledge that NCLB’s demand for universal proficiency by 2014 is unrealistic, and, as a result, unhelpful. However, what state testing has clearly shown is that large percentages of our children, particularly in urban areas, are not receiving an adequate education. Reform efforts of the past have failed to fundamentally change the classroom instruction that students receive in most schools. (Elmore, 2005)

Elmore is not convinced that state and federal accountability measures accurately reflect a school’s quality. However, because these external measures exist and often feel overwhelming to individual teachers, the principal can use them to heighten the staff’s interest in collaboration and in taking initiatives to help the school. That increased motivation from staff often provides the energy for a small amount of immediate improvement. Soon, however, that improvement stalls, and the effective leader will need to push for more. (Fullan, 2005)

Fullan believes that in order to achieve long-term and significant improvement, schools must focus on building its own self-regulating “capacity” for improvement (Fullan, 2005, p. 176) rather than depend upon external accountability measures to energize improvements in instruction. Fullan (2005) showed how leaders at the national, state and
district level can provide funding to struggling schools to encourage them to train teachers in new instructional practices and in leadership roles. The principal should build on this support by reminding faculty of their potential and keeping the focus on improvement in the long-term.

While it is clear that teachers must take leadership roles in order to create a climate of internal accountability and in order to build capacity, the process that a successful principal or superintendent takes to create such a school is less clear. One promising model is that of distributed leadership. (Loder, 2005, Spillane, 2004, Elmore, 2005) Distributed leadership describes how the impact and nature of leadership is not embodied in the formal leader but is spread throughout the leader and the followers, and is shaped by the “situation.” (Spillane, 2004, p. 9) The principal, first of all, must communicate the vision of how distributed leadership clearly ties the work of the staff together. He or she must explain how a specific classroom teacher’s analysis of data is, for example, connected to the work that the assistant principal and a guidance counselor do to set goals for individual students. The principal must also know his staff well enough to take advantage of specific expertise that they have or specific relationships that they have with the students. By distributing the leadership throughout the staff, the principal makes it possible for all staff to be leaders. Just as importantly, staff will see themselves as impacting the group, making important curriculum decisions. As a group, they also pool their expertise, strengthening the rigor of the discussion.

In *A New Agenda for Research in Educational Leadership* (Firestone and Riehl, 2005), Prestine and Nelson described a typical pitfall of principals’ efforts to create a distributed leadership framework for leading school change. In attempting to systematize the
work of teacher collaborations and to create predictable change, principals often embed structures that do not allow teachers to deeply investigate what works and what doesn’t at the classroom level. The principal might, for example, ask groups to make decisions within an artificial time-line that can cut short the teachers’ experimentation with their teaching methods.

Principals must participate in the efforts to improve teaching strategies at their school. Principals must also understand how change fits into the organization’s “First Principles,” (Firestone and Riehl, 2005, p. 54) the governing force of change that will lead the school to its vision. Not only does the principal need to understand and use the First Principles, he or she must teach it to the staff so that teachers can use it in their work. All staff must internalize the First Principles or they will become bogged down in overly “concrete,” (p. 54) dialogue involving logistical or management issues, rather than discussions with other teachers.

Prestine and Nelson (Firestone and Riehl, 2005) emphasized that principals need to have strong subject area knowledge in a variety of areas in order to participate in teacher collaborations. Prestine and Nelson do not make it clear how principals should obtain such broad subject area knowledge but do say that administrator training programs have a responsibility to emphasize the development of teaching and learning skills. Realistically, they cannot be expert in all subject matters but they must be expert in the “similarities and differences in the nature of the curricula that are available in different fields.” (p.55) Pristine and Nelson said that principals need a strong understanding of constructivist principles.

Because distributive leadership requires a diverse set of models within the same school to incorporate a wide variety of teacher input and leadership, researchers have studied
several models. One is the Critical Friends Group (Holland and Phillips, 2003) that focuses on creating a community of teachers that reflect through conversation and peer observation and then adapt their teaching to meet specific student needs. Peer review is another strategy that requires coordination with other schools’ participating staff. (Holland and Phillips, 2003) Peer review often incorporates outside trainers who use protocols to lead their discussions with staff and provide evaluators from other schools. The peer reviewers evaluate the school’s progress in meeting the goals established by the school.

Conclusion

Throughout the last one hundred years, math education has been the subject area that has most resisted coherence. It is true that progressives have fought with traditionalists, and constructivists with behaviorists in other subject areas. However, in math they have not achieved any widely recognized middle-ground that incorporates their range of ideologies. While teachers can not build this consensus alone, their intimate knowledge of the needs of the students give their teaching groups the best chance at resolving this conflict. School leaders must support their efforts by clarifying each school’s vision for the well-educated child and marshalling the school’s resources towards that goal.

Chapter Two reviewed the literature that has provided context for the study and will provide a framework for stating and analyzing the results of the study and discussing the implications of those results in Chapters Four and Five. In Chapter Three, that follows, the researcher details how he designed the study and why its design will yield answers to the research questions.
Chapter Three: Design of Research

The goal of the Leadership Project was to create a new dynamic in how teachers collaborate at Central Valley Middle School. They would look at their pedagogical decisions with great care, decide what teaching approaches worked best, and agree to use a common set of best practices. The observations, discussions and written analysis of practice provided opportunities for teachers to practice studying their teaching carefully and systematically, preparing them to accurately assess effective instructional strategies. The researcher completed a qualitative, evaluative case study to analyze the evolution of the teachers’ grade-level math groups. It is a qualitative case study because its focus is on studying the “process” and evolution of the teacher groups, not their final products. (Merriam, 1998, p.27) It is evaluative because it involves “description, evaluation and judgment” (Merriam, 1998, p.39) of how the teachers changed their approach to collaboration. This chapter describes specific history at Central Valley that led to the development of the Leadership Project, the research questions, the research methodology, the sample, the rationale for the sample, how the data will be analyzed, how the data will be presented, and limitations of the study.

Establishing a clear expectation and providing time for collaboration for a majority of the staff was the Principal/Researcher’s most recent effort to increase the rigor with which the teachers at Central Valley determined their teaching strategies. His previous efforts at Central Valley to create robust teacher collaborations greatly influenced the structure he developed for the Leadership Project. In particular, the Principal/Researcher hoped to navigate obstacles that in the past had limited the school’s ability to use other collaborative structures productively.
After serving for two years as Principal at Central Valley Middle School, and after providing teachers with extensive training in peer observation and the use of protocols for looking at student work during those two years, the Principal/Researcher wanted staff to implement the skills that they had learned in a manner that would improve their teaching systematically. In the early fall of 2005, the Principal/Researcher asked the English Department Chairperson to form a committee that would plan a school-wide writing initiative to be implemented in the fall of 2006. As a result, in the fall of 2005, the Department Chairperson formed Writing Across the Curriculum (WAC) and recruited thirteen other faculty members who met throughout the year, calling themselves “Writing Across the Curriculum Coaches.” During the year, they developed a manual for all staff to use in order to develop writing assignments in their subject areas. They trained staff in developing effective writing assignments throughout the spring of 2006. Teachers practiced assigning writing assignments, using a protocol and a scoring rubric. By March of 2006, the WAC Committee created and distributed to teaching staff a time-line for implementation of the Writing Across the Curriculum Initiative that described what staff had already done and what they would do in 2006-2007.

During the fall of 2006-2007, WAC’s implementation immediately encountered problems. Over the summer of 2006, the new WAC coordinator met with the Principal/Researcher to discuss how WAC would be implemented in the coming school year. They both agreed that they wanted staff to document the students’ progress, partly to ensure that the program was implemented with fidelity and partly to evaluate its success. At the first faculty meeting in 2006-2007, the new WAC coordinator for that school year reviewed
WAC’s work with the faculty in 2005-2006, discussing the training that staff had received the previous year. Then, over the next twenty minutes of the faculty meeting, she explained specifically what was expected of staff. She stated that students would complete a department-specific writing prompt in every subject at least once each year. The teacher who assigned the writing assignment would evaluate the students’ writing, using a generic rubric. The teacher would record the students’ scores on a spreadsheet that all of the teachers at the grade-level (called the “House teachers”) could access to monitor the students’ progress. Every trimester, in addition, students would evaluate their progress by reflecting on the writing in their portfolio.

Unfortunately, the teachers expressed frustration with the structure that the new WAC coordinator had provided for the coming year. Shortly after the faculty meeting, the previous coordinator distanced herself from the new structure, saying that WAC had strayed from the direction that the staff had agreed to in the spring of 2006. The WAC coordinator met with grade-level leaders, WAC members, and individual teachers to identify ways to regain the initiative’s momentum. Some teachers, in fact, embraced the initiative. The art teachers used the WAC initiative to make a poetry-writing assignment more engaging for students. The science department developed new standards for the data analysis section of their lab assignments. Most teachers, however, were resistant to assigning student work outside the confines of where they felt most comfortable, their content-area departments. In the math department, for example, the teachers talked repeatedly about how they felt uncomfortable about scoring the writing prompts. When the Principal/Researcher explained that the only technical aspect of student writing that they needed to address was whether students used complete sentences, they shifted their argument to questioning how it helped develop
students’ math skills. When the department chair countered this argument by showing data from the state tests that showed that their students particularly had struggled on multi-step problems, a weakness that reflective writing would help address, her math colleagues quickly objected. At this point, it became clear to the Principal that the whole spirit of the initiative, encouraging teachers to look outside their disciplines to improve their instruction, had lost steam.

At the end of 2006-2007, the Principal sensed that a change in focus was required for collaborative work to improve instruction. In the spring of 2007, the Principal/Researcher told the staff that they would transition to a different focus in the coming year’s collaborative work. He said that he wanted to provide opportunities for teachers to focus their discussions on pedagogical and content issues directly related to their subject areas. While the Principal felt that a consistent approach to writing would definitely help struggling students, he did not want the teachers’ frustrations to continue to distract them. He wanted teachers, above all, to question their approaches rigorously, and determine, what teaching strategies helped students, particularly struggling students, most. Whether the student work involved writing was not as important as it was for the teachers to work together in a collaborative manner.

In watching the teachers struggle with the interdisciplinary nature of the WAC initiative, the Principal/Researcher had discovered that the teachers had done their best collaborative work with colleagues who taught the same content. He had also learned that teachers seemed uncomfortable with any form of required documentation, whether it was a meeting discussion log, a student portfolio, or a spreadsheet that quantified student progress. Finally, more than one teacher openly questioned why they needed to discuss actual student work. They could just “talk” about their practice. Ultimately, the Principal/Researcher
believed that a large group of teachers at Central Valley was afraid to compare their work to that of their colleagues, possibly insecure that they would not measure up. The Principal/Researcher decided that he would incorporate what he had learned into a new initiative that would move gradually and would enable him to pilot an approach to collaboration that he thought teachers might find less threatening.

*Grade Level-Content Teams: Central Valley’s New Collaborative Intervention*

In the spring of 2007, The Principal/Researcher directed a school administrator to schedule a common planning period of forty-eight minutes for each member of the science, math, social studies and English departments that would allow them to meet weekly with their grade-level colleagues. The other teachers, outside of these disciplines, would have time every two weeks after school to meet during whole-department meetings, but did not necessarily have a set-aside time to meet during the week.

At the Central Valley Middle School’s first faculty meeting of 2007-2008, the Principal/Researcher stated that most teachers would have scheduled time each week, one period for forty-eight minutes, to meet with their colleagues who taught the same subject at the same grade level. He explained that providing time to work with grade level colleagues in the same content area was a response to requests from staff at the end of last year. The Principal/Researcher stated that he hoped that these meetings would enable the staff to develop teaching practices that most effectively met the needs of struggling students. The Principal/Researcher acknowledged that Foreign Language, art, music, health, and physical education teachers did not have that time built into their schedule every week and would likely need to find time on their own to collaborate.
In order to accomplish his goal of more in-depth collaboration, at the September 2007 faculty meeting, the Principal/Researcher explained that he hoped to create vibrant “Professional Learning Communities” (PLCs) in which teachers worked closely together to determine what strategies were effective and which ones weren’t. (Faculty Meeting Agenda, September, 2007) The Principal/Researcher told the teachers at Central Valley that they had vast experience working collaboratively; now, they had the chance to make their collaboration more timely and predictable. Ultimately, the Principal/Researcher wanted to foster the creation and growth of PLCs that would consistently answer DuFour, Eaker and DuFour’s four questions:

1. What is it we want all students to learn?
2. How will we know when each student has mastered the essential learning?
3. How will we respond when a student experiences initial difficulty in learning?
4. How will we deepen the learning for students who have already mastered essential knowledge and skill? (DuFour, Eaker and DuFour, 2005, p.15).

In order to avoid creating negative feelings like the ones that had stymied the previous school-wide writing program, the principal imposed no formal accountability measures during this first year. At the faculty meeting, he told the teachers that they needed to meet with their grade level counterpart once a week, but did not necessarily need to use the set-aside common planning time if that time was not convenient. He also told the teachers that they would establish their own structures for their meetings, and that they need not keep any written documentation from their meetings. He suggested that teachers use the protocols they had used in the past for looking at student work. He also encouraged the staff to further develop their peer observation skills by taking time to observe their grade-level counterpart.
The Principal/Researcher offered to provide coverage for any teacher’s classes so that each teacher could observe their grade-level colleagues at any time. (Faculty Meeting Agenda, September, 2007)

A drawback to the structure of the forty-eight-minute weekly meeting was that the school operates in two separate buildings, about seven-tenths of a mile apart. Teachers had to travel to each other’s buildings to meet. The Principal/Researcher anticipated inevitable obstacles: teachers would forget which teacher was hosting a particular meeting, or a needy student would delay one teacher’s departure. He expected that Central Valley’s unusual logistical challenges would limit the meetings to thirty to thirty-five minutes.

Creating a Model PLC within the Math Department

Ultimately, the Principal/Researcher felt that math teachers at his school could create a model PLC that would foster a deeper feeling of trust among the faculty towards the school’s new grade-level meeting initiative. Specifically, the Principal/Researcher believed that the members of the math department could adopt Little’s formula for “joint work” and “pursue a single course of action in concert or, alternatively, to decide on a set of basic priorities that in turn guide the independent choices of individual teachers.” (Little, 1990, p. 519) The Principal/Researcher believed that the math teachers at Central Valley were most prepared to strive toward “joint work” partly because he had seen their unity when nearly the entire department had rallied together to question the WAC initiative. While expressing a belief that they should not teach writing, they were eager to improve the effectiveness of their teaching of struggling students.

At the department meeting in November, 2006, the Principal/Researcher was further intrigued when the teachers expressed a deeper feeling of vulnerability concerning their
work. They felt that the community, including the students’ parents and their colleagues outside the department, had a somewhat negative opinion of how effective they were as teachers. One teacher at the November 2006 meeting explained her hesitance to focus on writing because of the threat that she felt from the community: she said, “the spotlight is always focused on [the math department]. We are always in trouble because the students don’t do as well on the [state] math [tests].” The Principal/Researcher noticed other teachers at the department meeting, many of them veteran teachers who were rated Highly Qualified by the No Child Left Behind regulations, subsequently nodding their heads, and agreeing that even their colleagues in other departments, whom they had known for years, might not fully respect their ability to teach math. The Principal/Researcher believed that their lack of complacency combined with their eagerness to improve their reputations made them good candidates for engaging in effective collaboration.

In fact, for years prior to 2007-2008, these same math teachers had met by grade level each week, providing a precedent for the new initiative. During these meetings, though, teachers discussed content coverage almost exclusively. They usually did not look at student work, and did not discuss teaching strategies in great depth. However, their regular meetings enabled them to develop a detailed set of outcomes for each unit. After developing a specific set of outcomes, in the fall of 2006, the math department developed baseline assessments for the beginning and end of the year at every grade level. The Principal/Researcher reasoned that the professionalism that their history of collaboration showed made them even more likely to embark on Little’s “single course of action” and engage in “joint action.”

In the fall of 2007, the Principal/Researcher explained to the entire math department that he would be studying and participating in the work of the sixth and seventh grade math
groups. To address concerns about how participation might impact their evaluations for that year, the Principal/Researcher explained that he had given evaluation responsibilities for the participants in the study to the Assistant Principal. The Principal/Researcher provided teachers with a different incentive: he explained that he wanted the math teachers to establish a set of best practices that would enable the children to succeed and for those teachers to receive recognition for their excellent work.

“Convergence” as a Tool for Improving Collaboration

The goal of the Leadership Project was to create a structure that would cause the sixth and seventh grade math teachers at each grade-level meeting to seek consensus on how to teach particular topics to struggling students. The Principal/Researcher hypothesized that the math teachers would value the urgency that their charge of arriving at a consensus “best-practice” would confer on their meetings, and would appreciate the respect the initiative showed for their teaching. At the same time, the math teachers’ professionalism would not allow them to accept a colleagues’ approach quickly. By explicitly emphasizing the importance of reaching consensus at the end of each meeting, the Principal/Researcher believed that in a relatively brief amount of time, he could cultivate rigorous discussions of practice at the math grade-level meetings. Learning from his experiences implementing the Writing Across the Curriculum initiative, the Principal/Researcher de-emphasized the importance of comparing student performance on common assessments.

Instead, he focused the math teachers on building consensus about best practices as the path to achieving a model professional learning community. In speaking to the math teachers, he called this consensus-building process building “convergence.” At each meeting of their grade-level group, teachers would have to integrate both explicit and guided
approaches to math instruction in order to create convergence. Throughout 2007-2008, the Principal/Researcher constantly prodded the groups to think about using a common approach, and if they did not, to explain their reasoning. By letting them know that they would determine their own teaching methods for the upcoming lesson through the group’s discussion, the principal hoped to raise the stakes of the meeting. He hoped to provoke a vibrant, urgent discussion, with the result that teachers would work more deliberately and efficiently to determine the best approach to teaching a particular lesson. Through his encouragement of convergence, he hoped to create a fully functional Professional Learning Community (PLC) in less than one school year, a fraction of the time that the majority of the research prescribes for establishing a PLC. (DuFour and Eaker, 1998)

The Experiences of the Members of the Sixth and Seventh Grade-Level Teams Prior to the Leadership Project

Though all of the individuals in the study had worked as colleagues in the larger math department for years, their teams were newly constituted in 2007-2008. In order to compare the impact of each grade-level’s collaborative, the reader must first understand the attitudes of the individual participants towards collaboration prior to the study.

Rhonda (All of the names of teachers in this study are pseudonyms.), a sixth grade math teacher, entered the collaborative, confident that she would enjoy her experience collaborating far more in 2007-2008 than she had in 2006-2007. In the spring of 2007, prior to the start of the study, she recounted disappointing experiences she had had with a colleague the previous year. She said, “By the end of the year, it was just ‘I’m just teaching this, this, this and this. I’m doing inequalities, I’m doing this, I’m doing that.’ “ (Rhonda, Pre-Leadership Project Interview, June 2007) However, prior to this experience Rhonda had
had very positive experiences with colleagues, experiences that affected her teaching significantly. With one colleague, with whom she team-taught struggling students a few years before, she stated:

    It was amazing for me to watch her be able to know before what the kids were really going to have trouble with …she was very clear in giving lots of scaffolding…I picked up that ability to…go through the material before and know… where are the problems? (Rhonda’s Pre-Leadership Project Interview, June, 2007)

In this particular team-teaching collaborative, Rhonda believed that she also had had a significant role to play, providing conceptual explanations, “this is why we do it,” to their struggling math students, helping them to hold on to the procedural knowledge that her colleague had explained so clearly. Rhonda also described another experience, satisfying in a different way, in which she felt like she had gotten a veteran math teacher “on board” by getting him to use a new piece of math software. She described this experience “as an extremely good experience for me.” (Rhonda’s Pre-Leadership Project Interview, June, 2007)

    Rhonda entered the project with a strong sense that effective collaboration was particularly critical for math teachers at Central Valley Middle School because the department had developed many of its own curriculum materials that mixed conceptual and procedural approaches. Rhonda felt, as a result, that the curriculum was “patchworky,” (Rhonda’s Pre-Leadership Project Interview, June, 2007) a mix of worksheets, manipulatives and textbooks with different approaches. She stated that there was great potential for “variability” (Rhonda’s Pre-Leadership Project Interview, June, 2007) in the way the curriculum was taught. She expressed concern about a grade-level group that could not say,
“This is what we do.” (Rhonda’s Pre-Leadership Project Interview, June, 2007) Ultimately, even though she believed that close collaboration was critical, Rhonda was skeptical about how much teachers could adopt similar approaches.

We can only be as united as people want to be…When I am working with [a certain math teacher] one-on-one, she and I are very, very open, give-and-take. If I say I really like this unit …she will fight me a little, and then she’ll agree …I don’t know if that’s what goes on [with other teachers]. (Rhonda’s Pre-Leadership Project Interview, June, 2007)

Mary, who had served as Department Chair for fourteen years, played a leadership role on all of the grade-level teams, and for this study was one of the members of the sixth grade study as well as one of the members of the seventh grade study. In discussing successful teacher groups, Mary described how the department had taken on-line classes together that caused them to have substantive conversations about a variety of teaching topics. In one class, they had had lengthy discussions about how manipulatives were a crucial part of nearly every mathematical demonstration. Mary, however, was skeptical about the ultimate impact of that, and other, professional development. For example, she did not believe that teachers used more manipulatives in their teaching as a result of the class discussed above.

In the spring of 2007, Mary also seemed somewhat concerned about the interpersonal dynamics among her colleagues. She was concerned that the seventh grade teachers would meet because they had to meet, but would not share their practices carefully. Nonetheless, she was eager to debate and improve various parts of the seventh grade curriculum. In particular, she mentioned a survey project assigned each fall as one that the seventh grade
teachers could improve by refining the question that was used with the students. (Mary’s Pre-Leadership Project Interview, June, 2007)

Diana would also be part of the seventh grade case study, having taught seventh grade math for a number of years. She had begun her teaching career at Central Valley as a special education teacher, switching to teaching mathematics after one year. In the spring of 2007, she focused her concerns on a lack of convergence that currently existed between special education and regular education math teachers. Special education teachers wanted the math curriculum to focus more on the acquisition of basic number skills, even in seventh and eighth grade. Diana stated: “Some of the special education teachers don’t believe in the conceptual approach [to teaching mathematics.]” (Diana’s Pre-Leadership Project Interview, June, 2007) When asked what the school should do to build consensus among all the math teachers, she said, “[Special education teachers] have to trust the professional in each area to know what’s best for kids.” (Diana’s Pre-Leadership Project Interview, June, 2007) When asked what should happen when special education and regular education teachers could not come to agreement, Diana said:

Obviously meeting time has to happen…It has to be stuck to…It has to be a give and take where the math teacher should say this is the concept we are going to present in the next week…here is the essential knowledge…here is what every kid has to come away with…now let’s have a conversation about the best way to approach it…It should be a conversation and a back-and-forth. (Diana’s Pre-Leadership Project Interview, June, 2007)

Here Diana states that she wants structures in place to resolve disagreements. She also wants regular education math teachers to determine what was taught and then consult the special
education teachers on how to teach it. Through her thoughts on how curriculum decisions should be made when math teachers and special education teachers are in conflict, Diana implies her confidence in the ability of the math teachers to easily agree on the best practices among themselves.

She described successful collaborations in the math department in the past as one in which the math department worked as a whole. She described effective collaboration during these meetings as follows:

[We] did it really well…I think we have really good discussions and even if we don’t all agree we come away feeling, “that was a really good discussion, we were able to get stuff out, we were able to express our views…we were able to see each other’s point of view.” So even if it doesn’t come out the way someone wanted, you felt like you had a sense of accomplishment that something happened. (Diana’s Pre-Leadership Project Interview, June, 2007)

Ultimately, when groups could not find common ground, Diana believed that the department chair could resolve any disputes. She said:

If Mary (the current math department chair) says we’re going to do this…then pretty much, we’re going to do this. It doesn’t mean that people aren’t going to stick their own individuality into it but for the most part…if Mary says we’re going to do this, then we’re going to do this….Mary is not only extremely knowledgeable about math but about teaching... I think she’s a phenomenal teacher…I learned by watching her…she does know what’s good for kids… mathematically. (Diana’s Pre-Leadership Project Interview, June, 2007)
Ultimately, Diana felt that Mary would be the decisive factor regarding math instruction. She felt that if you “gave people that small chance to get their fears out, get your goals and hopes out, and then, now let’s move on. Now we can get the work done.” (Diana’s Pre-Leadership Project Interview, June, 2007) Moving on, according to Diana, might mean that teachers do not come to consensus, but that the department chair decides.

Dan, finishing his eighth year of teaching and fifth year at Central Valley, said the study was “interesting and he was glad to participate in it.” (Dan Pre-Leadership Project Interview, June, 2007) Like Diana, prior to the study, he did not differentiate the professional development work that the math teachers did as a whole department from the work that he did at the grade level, citing past professional development that the entire department did together as useful. He stated that he looked forward to working closely with his colleagues. He remarked that in the past that he had worked particularly closely with the colleague that was in the grade level above him, ensuring that his students were ready for eighth grade.

Mary felt that it was particularly important to engage Dan in the collaborative because at times he was reticent to share. She stated that Dan was seen as a strong mathematician within the department and that she could engage him best when she asked him conceptual questions about how students learn mathematics. In these situations, he often showed that he could have the best insights of anyone in the department. The top students, in addition, enjoyed the connections he made between mathematics and sports.

The Principal/Researcher’s Interventions in the Math Grade-Level Groups

In order to create a professional learning community as quickly as possible, the Principal/Researcher applied several interventions to the group to encourage them to converge their teaching styles. The Principal/Researcher observed and had a post-conference
with each teacher in both math groups at least once each month for eight months. The Principal/Researcher audio-taped the observed class and typed out a transcript of the class that he shared within a couple of days of the observation. During this discussion, the Principal/Researcher emphasized what had succeeded during the math lesson, showing the teacher in the transcript where he saw effective teaching taking place. The Principal/Researcher discussed the sequencing and types of questions in the first fifteen minutes, and the use of manipulatives or visuals to demonstrate the concept. By using such specific data that highlighted effective teaching, the Principal/Researcher hoped to embolden teachers to share their strategies at an upcoming grade-level meeting while exciting them about the potential rewards of looking at minute pieces of individual lessons. The Principal/Researcher also encouraged the practice that the sixth grade group found particularly efficient: they e-mailed their presentations, complete with graphics, to each other throughout the week.

The Principal/Researcher felt that if each member of the grade-level group developed confidence in their individual approach, the resulting assertiveness during meetings would cause teachers to challenge each other, searching confidently for the best practice. The Principal/Researcher asked teachers to limit discussions of content by resolving questions of “coverage” over e-mail whenever possible. The Principal/Researcher would also have the teachers observe each other teach at least twice during the year, encouraging them to discuss which of them taught a particular skill to students more effectively. He also asked them to keep a journal, writing once a month about the decisions that the group made and how the group affected their teaching.
Initially, the Principal/Researcher intended to include a third group in this study, a special education group that would meet every two weeks to discuss their work with struggling math students. However, after two special education teachers left Central Valley in the spring of 2007, and two of the remaining teachers were new to teaching, he decided not to incorporate the third group into the study.

Methodology

The heart of the study was a description and analysis of the effectiveness of teacher groups in improving instruction. A qualitative study was appropriate because the researcher essentially studied the growth process that the sixth and seventh grade teacher groups underwent. He looked at each group as a “holistic” entity, independent worlds unto themselves. (Merriam, 1998, p.39) As a participant, the Principal/Researcher gathered perspectives from within the teacher group. (Miles and Huberman, 1994). The Principal/Researcher observed teacher meetings and observed the teachers teach classes. He also met with each of the teachers after they taught, and collected journal responses from the teachers in the group. Ultimately, after eight months of looking at their work and discussing that work with the other teachers in the group, the Principal/Researcher interviewed the teachers to determine how their experiences affected their relationships with their colleagues in the group. It was an evaluative case study because the researcher captured the social as well as intellectual dynamics that stimulated teachers to adopt similar teaching strategies. (Merriam, 1998). The study also documented which interventions changed attitudes and understandings most quickly among the participants. The hope was that the case study would provide a “history” of a learning process that could be evaluated and then implemented in the future with other teachers.
The study was limited or “bounded” (Merriam, 1998, p.19) by the Central Valley Middle School sixth and seventh grade math department in the years 2007 and 2008 and it was, therefore, appropriate to view each grade level as a separate, but connected case study. The researcher answered the research questions by doing a “cross-case analysis” (Merriam, 1998, p.40). Because each case had its own individual dynamics the analysis involved looking at those dynamics in order to analyze the impact of specific variables such as the participants’ attitudes towards collaboration and towards their colleagues. (Miles and Huberman, 1994)

Research Questions

This qualitative case study examined the impact that various interventions had upon teachers’ collaboration and on the development and use of a common approach to teaching mathematics. The role of the principal in the shaping of this common approach was a particular focus of this study. The specific research questions were as follows:
1. What impact did the various aspects of the collaborative have upon efforts to build a common set of pedagogies for teaching math to struggling students?
2. How similar did the teachers’ questioning patterns become by the end of the year?
3. What were the challenges that the Principal faced in implementing the collaborative structure?

Sample and Rationale for Sample

The Site of the Study

Central Valley Middle School (a pseudonym) had a proud tradition of high performance. All of the participants in this study taught at Central Valley Middle School, a school that served approximately six hundred students and had a faculty of about seventy-
five teachers. Central Valley was located in an affluent New England suburb about twenty-five minutes west of a major urban center with population of about 600,000. The median household income was $110,000 in 2008. Six percent of the student body was transported from the major urban center as part of a voluntary desegregation plan. These bused students were all non-white students. The students that lived in the town of Central Valley itself were 92% white. The town of Central Valley had been incorporated for over three hundred years. The middle school scored in the top forty in the 2007 state math exam and in the top ten in Science and English/Language Arts.

The researcher chose sixth and seventh grade math teachers to study because previous to the study those the school had been cited by the state for not making acceptable progress in math with special education students in those grades. The research questions that guided this study focused on what would happen to the practices of a group of teachers when a grade level teacher group met more intensively, added more structure to its discussions, observed each other, and wrote in a journal about their experiences. The goal was to discover what interventions most efficiently sparked rigorous conversations about specific aspects of the teachers’ practice and enabled them to identify a set of best practices that they could all use with their students.

The Subjects

For the purposes of this study, the researcher obtained consent to participate from a total of seven sixth and seventh grade math teachers in the spring of 2007. Unfortunately, by the fall of 2007, two teachers had left their positions and one teacher had switched grade levels. As a result, the Principal/Researcher was able to use four of the original seven as subjects, with one teacher serving as a subject of the sixth and seventh grade study. A
potential third case study, a collaboration between regular education and special education teachers, was not included in the study because two of its members left their positions just before school began in the fall of 2008. In order to increase the internal validity of the study, the researcher chose not to include in this study teachers who did not have tenure, and who might see participation as mandatory. The sample was an example of “criterion sampling” (Gay, Airasian, 2000, p.115) in which the participants were selected because they met a “set of criteria” (Gay, Airasian, 2000, p.115): they were all sixth or seventh grade math teachers with tenured status. The Principal/Researcher asked the participants to participate and no one refused. Of the eight teachers in the mathematics department, four participated in the study. All of the sixth and seventh grade math teachers, furthermore, were subjects except for those without tenured status.

At the time of the study, all four math teachers were considered competent teachers by several different standards. The four teachers were Highly Qualified under the guidelines of No Child Left Behind. All four teachers received “satisfactory” (out of two possible designations, “satisfactory” and “unsatisfactory”) on their latest summative evaluations. The participants in the study had between eight years and thirty years of teaching experience. They were between the ages of thirty-three and fifty-two years old. All teachers had earned their master’s degree in education. Three of the teachers were female and one was male. Three of them were white, of European-American background. One teacher was a native of Hawaii, and of Japanese descent.
Table 2

Study Participants Biographical Data

<table>
<thead>
<tr>
<th>Name (pseudonym)</th>
<th>Gender</th>
<th>Educational Background</th>
<th>Age (in June, 2008)</th>
<th>Teaching Experience (in June, 2008)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mary</td>
<td>female</td>
<td>M.Ed. (math)</td>
<td>53</td>
<td>30</td>
</tr>
<tr>
<td>Rhonda</td>
<td>female</td>
<td>M.Ed. (math)</td>
<td>38</td>
<td>14</td>
</tr>
<tr>
<td>Diana</td>
<td>female</td>
<td>M.Ed. (math)</td>
<td>40</td>
<td>12</td>
</tr>
<tr>
<td>Dan</td>
<td>male</td>
<td>M.Ed. (math)</td>
<td>34</td>
<td>8</td>
</tr>
</tbody>
</table>

Pilot Test

In the spring and early fall of 2007, the researcher piloted interview questions. First he discussed the questions with participants and colleagues. He determined the best questions for identifying the teachers’ views of effective pedagogy for struggling math students. He also refined his interview questions to ensure that he obtained as candid information as possible about the teachers’ experiences working with their colleagues.

As part of the pilot, in the spring of 2007, he observed and interviewed a teacher who would not be participating in the study. During September and October of 2007, he refined his observation instrument by observing the participants a few times each and meeting with them after each observation. After several revisions, the observation instrument required the researcher to document the questions that the teacher asked and the answers that students provided in the first fifteen minutes of class. The researcher found that teacher-participants responded better to the fifteen-minute transcript because it seemed less overwhelming than a transcript of the whole class. The researcher also assigned practice journal assignments to the participants, and distributed a revised prompt for their journal entries in November of 2007.
(Appendix A) The revised prompt focused on the teachers’ opinions of strategies they and their colleagues used to teach struggling learners effectively.

Data Gathering Procedures

Data was collected using the following methods, which enabled the Principal/Researcher to both triangulate his data and get the most accurate description of the participants’ experiences:

1) Interviews of teacher-participants
2) observations of participants’ classes
3) post-observation conferences between the individual teacher and the Principal/Researcher
4) observations of math team meetings
5) monthly journal entries from participants
6) the researcher’s leadership journal

Documents that informed the Principal/Researcher’s analysis of the data above include student assessments and teacher handouts. The researcher transcribed teacher conversations and student responses from audio-tape recordings. He stored these transcriptions on his computer.
Table 2: Time-Line of Interventions

<table>
<thead>
<tr>
<th>Date</th>
<th>Tool</th>
<th>Structure</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 2007</td>
<td>45-minute Pre-Leadership Project interview.</td>
<td>Semi-structured</td>
<td>one time</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>September 2007-October 2007</td>
<td>Pilot of each intervention</td>
<td>Experimented with different structures</td>
<td>Different number of trials depending on the intervention.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>November 2008-June 2008</td>
<td>Implementation of Interventions</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Classroom Observations</td>
<td>Observed entire class; audio-taped first fifteen minutes</td>
<td>monthly</td>
</tr>
<tr>
<td></td>
<td>Post-observation Conference</td>
<td>The Principal/Researcher and the teacher analyzed the transcript of the audio-tape</td>
<td>monthly</td>
</tr>
<tr>
<td></td>
<td>Observations of Math Group Meetings</td>
<td>The group planned the week and discussed whether they would diverge in their teaching approaches.</td>
<td>weekly</td>
</tr>
<tr>
<td></td>
<td>Participant Journal Prompts</td>
<td>1-page, answering questions: Participant identified his or her impact on colleagues</td>
<td>monthly</td>
</tr>
<tr>
<td></td>
<td>Principal/Researcher’s Journal</td>
<td>1-page: leadership issues issues</td>
<td>Weekly</td>
</tr>
<tr>
<td>June 2008</td>
<td>45-Minute Post-Leadership Project Interview</td>
<td>Semi-structured</td>
<td>one time</td>
</tr>
</tbody>
</table>
Pre- and Post-Leadership Project Interviews

As Merriam states, “Interviewing is necessary when we cannot observe behavior, feelings, or how people interpret the world around them.” (Merriam, 1998) During the study, the Principal/Researcher was particularly interested in determining what motivates teachers to develop common approaches to teaching the same content. The Principal/Researcher interviewed each of the four participants in the spring of 2007 (Appendix B) and at the end of the project in June of 2008 (Appendix C). The interviews consisted of “hypothetical,” “devil’s advocate,” and “ideal position” questions (Merriam, 1998) to give a variety of opportunities for teachers to comfortably express their opinions about themselves as a teacher and to describe their past experiences collaborating with colleagues. The interviews were “semi-structured” (Merriam, 1998) to ensure that there was a consistent base of questions and yet individualized enough to allow teachers to explore their particular experiences.

Observations

The Principal/Researcher used classroom observations as a tool in achieving the goal of the leadership project, creating a Professional Learning Community that could efficiently identify best practices. By observing teaching, he could witness whether or not teachers were actually using common approaches, and then ask them to explain their decision-making process. From November to June, the researcher observed the four teachers monthly. The observations usually took place a few days before the weekly grade level meeting. After tape-recording the class, the researcher transcribed and analyzed the questions that each teacher asked and the activities that they used during the first fifteen minutes of their class.
Post-Observation Conferences

During the Post-Observation Conference, the Principal/Researcher and the teacher analyzed the transcript of the lesson together. The Principal/Researcher asked the teacher to identify specific moments during the first fifteen minutes of class when he or she believed that students who typically struggled were learning. The Principal/Researcher and the teacher then discussed which methods the teacher used during these fruitful moments of class. Finally, the Principal/Researcher asked the teacher to share his or her success and the reasons for his or her success with his or her colleagues at the next group meeting.

Weekly Group Meetings

The grade-level math groups met weekly for thirty-five minutes. During these meetings, teachers took time to discuss the topics that the teachers would cover during the week and the sequencing of those topics. At least ten minutes of each weekly group meeting were devoted to discussing what topics would cause students to struggle. Each explained how he or she would meet their needs. When their styles diverged, the Principal/Researcher would ask them to agree on a common approach. If they could not agree, he would ask each teacher to explain why he or she could not agree.

Participant Journals

Another source of data was group members’ journals. The Principal/Researcher asked each member of the project to answer a particular prompt every month. The researcher asked them to write at least one page on a 5”x 8” journal book within seventy-two hours of a grade-level meeting. The questions that they answered each month were as follows:

“Identify teaching strategies that were effective this week. What were your colleagues’
reaction when you discussed them at your grade level meeting? Did anyone agree to adopt your strategy? Why do you think that they agreed? Or, why did they not agree?” (Appendix, p. iii) By asking these questions, the Principal/Researcher hoped to spark teachers to identify the moments during the meeting when teachers were able to adopt a consensus approach.

*Leadership Journal*

The Principal/Researcher used his journal, typed into his laptop computer, to document his impact on the work of the teacher group. He wrote about the actions that he took to accomplish the goals of the leadership project.

*Artifacts*

Because the goal of the leadership project was to identify structures that help teachers build consensus and implement a set of best practices, the Principal/Researcher used student assessments to make the discussion of effective teaching strategies more precise. The assessments ranged from projects to tests and quizzes that teachers gave at the end of each unit. During the group meetings, the teachers used the assessments to identify places where students were successful and areas where they struggled. After they agreed on whose teaching was effective, they determined whether they could agree on a common set of best practices for the entire group.

*Method of Data Analysis*

*Organization of the Data and Coding*

At the conclusion of the data collection, the researcher assembled the audiotapes from interviews, monthly observations, the ensuing post-observation conferences, and weekly grade level meetings. He also read the participants’ journals. In order to organize each
grade-level group into a manageable case study, the Principal/Researcher separated the data into separate folders for each participant and combined the folders into grade level groupings. Using the transcripts from the classroom observations, Principal/Researcher coded how each teacher structured their lessons by categorizing different aspects of their teaching. He shared these patterns with the teachers at their post-observation conferences when they discussed the transcript of the first fifteen minutes of class. In particular, he showed each teacher how often he or she asked questions that required one-word answers and how often the teacher asked for multi-word answers. The Principal/Researcher, in addition, used this coding of question types as a measure of how similar teachers’ methods became as the leadership project progressed.

The Principal/Researcher coded incidents in the participant journals when teachers identified strategies of their own that worked in order to identify events that caused teachers to develop a sense of efficacy. He also coded their reactions to the work of their colleagues, focusing particularly on incidents in which the question of diverging teaching styles emerged. These codes allowed the Principal/Researcher to determine how the research project had impacted the development of best practices for the entire math group.

The Principal/Researcher used codes to identify patterns in the transcripts of the grade-level meetings. The Principal/Researcher focused particularly on identifying the number of topics that the group covered, how they identified differences among their approaches for those topics, and how they resolved those differences. He used this data to determine whether the Principal/Researcher’s focus on developing consensus helped teachers efficiently develop a common set of best practices.
The Principal/Researcher coded the leadership journal entries by focusing on how he led the sixth and seventh grade math groups towards the goals of the Leadership Project. He analyzed how effective his intervention was in improving the work of the group.

_Formats for Reporting the Data_

The researcher used a combination of text and matrices to report the data that he collected over the eight months of the study. (Miles and Huberman, 1994) The text described changes in teacher approaches to collaboration, changes in their opinions of their colleagues, and changes in their views of their ability to reach consensus on best practices. The text also captured teachers’ opinions regarding the Principal/Researcher’s impact on the group. Matrices provided a more graphic representation of how frequently a particular grade-level group adopted a consensus approach to teaching a particular topic. Another matrix showed how the types of questions they asked in class changed over the course of the leadership project. A bar graph showed how roles shifted in each grade-level group throughout the course of the leadership project. (Miles and Huberman, 1994)

_Frameworks for Discussing the Findings_

The researcher begins the “Findings” section that follows by discussing findings for each research question, discussing one grade-level group at a time. In his discussion of each research question, he analyzes evidence from the relevant data sources, breaking down his findings further into sections for each participant. Ultimately, a narrative emerges that shows how the research project affected each participant and how it affected each grade-level group.

_Conclusion_

This study was designed to examine what happens to a teacher group when the leader of the group makes achieving consensus the highest priority and interventions are designed to
encourage teachers to adopt a common approach. Intervention efforts included regular observations, conferencing, collaborative meetings, journal writing and peer observations. Through these interventions, the Principal/Researcher determined how teaching styles became more similar, what made them become more or less similar, and how that development of commonality affected the functioning of the group. The Principal/Researcher hoped to prove that finding a common approach to teaching, the “converging” of teaching styles, was a powerful tool for getting teachers to work together effectively.
Chapter 4: Findings

Chapter Four presents the study’s findings for the three research questions. In addressing the first research question, the Principal/Researcher reports the impact that various interventions had upon the teachers’ work. He describes the impact of individual interventions on each participant as well as the impact of the Leadership Project as a whole. The Principal/Researcher also compares how each grade-level group functioned and compares that evaluation to how each member thought his or her group functioned. Subsequently, the Principal/Researcher presents the findings related to the second question, examining how much the teachers actually converged in their approaches to content and pedagogy. He discusses their amount of convergence in finer detail by looking at the types of questions each teacher asked. Finally, in addressing the third research question, he describes the challenges that he faced in providing leadership and support to the fledgling learning communities. He also describes his efforts to build the capacity within the groups for teachers to take on leadership roles in the future.

The Study’s Research Questions

The Principal/Researcher’s study enabled him to gain insight and answers to three research questions:

1. What impact did the various aspects of the collaborative have upon efforts to build a common set of pedagogies for teaching math to struggling students?
2. How similar did the teachers’ questioning patterns become by the end of the year?
3. What challenges did the Principal/Researcher face in implementing the collaborative structure?
The Findings for Question 1: What impact did the various aspects of the collaborative have upon efforts to build a common set of pedagogies for teaching math to struggling students?

In this section of Chapter Four, the Principal/Researcher will identify the impact that various aspects of the intervention had upon efforts to build a common set of pedagogies for teaching math to struggling students. He will examine the impact that peer observation and the weekly grade-level teacher meetings specifically had upon the development of common approaches to math instruction in each grade-level group. Subsequently, he will examine whether the participants think the Leadership Project caused their practices to converge. The Principal/Researcher looked at the teachers’ perception because he suspected that their view of the group’s efficacy would have a significant impact on the creation of an effective PLC in less than one school year.

The Impact of Peer Observations on the Sixth Grade Group (Question 1 continued)

Throughout the Leadership Project, Rhonda and Mary drew very specific insights from the approaches that their peers used. It is unlikely that they would have drawn those insights if they had not engaged in peer observations. After one peer observation, for example, Rhonda marveled at how Mary had led her struggling students to a deeper conceptual understanding of the division of fractions. After some prodding from the Principal/Researcher, at a grade-level meeting, Rhonda talked about how she had observed Mary ask a long series of specific questions that helped her students develop a new conceptual understanding. The Principal/Researcher next asked Rhonda to explain the differences between Mary’s and her approach, and why her approach had been different. At first, Rhonda explained the differences in the approaches as a necessary reaction to skill-level
differences of students at different tracks. In her statement, “Directed” refers to the lowest track, “Guided” the middle, and “Independent” the highest:

I think the only thing [that caused the different teaching approaches] is that we were looking at a Directed group, a Guided group, and an Independent Group which I think are inherently different. (Sixth Grade Meeting, March, 2008)

At this point, however, the Principal/Researcher asked for Rhonda to re-examine how Mary approached this lesson. He asked Rhonda to explain to him the sequencing of Mary’s questioning, and how she got her struggling math students to develop a conceptual understanding of the division of fractions. After explaining the sequence of questions, Rhonda began to see that Mary had had success that she might be able to transfer to her own teaching of more skilled students. When the Principal/Researcher asked her to explain why Mary’s conceptual explanation, using balloons and cookies, was extremely helpful, Rhonda began to see how a lengthier explanation and discussion might help all students:

It was very telling the way that they…grabbed onto that larger [concept.] [Mary] broke it down, broke it down, broke it down…broke it down…[she] held their hands, until they got there which I was like, “That’s awesome”… If I had done [what Mary had done], I think I would have gotten farther with even the Independent kids but for some I didn’t have to do that so they were able to go to it right away. There simply were kids who I should have been holding their hands. There is just such a range…When Mary … kept asking them every time which model is this like…they totally got it. They were carrying that balloon thing around for the rest of their lives. (March, 2008, 6th Grade Meeting)
In this instance, the combination of the peer observation and the de-brief at the ensuing grade-level discussion, in which the Principal/Researcher asked participants to describe the smallest differences in approach, helped focus the teachers on identifying how different approaches might improve their teaching. Mary then pushed the conversation further by discussing how she would inform the students’ Focused Math teacher about the success of her teaching methods. (Focus Math, “FM,” is the name of the supplementary math class that struggling students took in addition to their regular education math class.):

As I’m thinking ahead, I’m always going to go back to that balloon, cookie, balloon, cookie, and talking to [the FM teacher] and what she’s going to do in FM and I’m going to say to her, “Make them talk balloon/cookies, make them talk balloon/cookies,” because they’ve got those two models and I want them to see the difference. (March, 2008, 6th Grade Meeting)

By the end of the conversation, Rhonda stated that she “dropped the ball.” (March, 2008, 6th Grade Meeting) She then discussed how she might change her approach in the future to emphasize the conceptual issues just as Mary had. At this meeting, the push for consensus had required teachers to identify a best practice for introducing the division of fractions.

The Principal/Researcher found that the sixth grade group did not typically have conversations that produced a consensus best practice by the end of the meeting. In the other discussions of peer observations earlier in the fall, Rhonda, Mary and the other teacher did not identify a colleague’s practice as a “best practice.” They complimented each other on good teaching, but did not acknowledge that they could apply what they had seen to their own teaching. The main difference in these two sets of peer observations was that, in the fall, the Principal/Researcher did not play as forceful a role in the discussion of how
instruction had differed in their lessons. Without the Principal/Researcher driving the discussion of best practice, the teachers tended to back off when agreement did not come relatively quickly.

At the same time, peer observation seemed a critical part of building understanding among colleagues, enabling them to accept a colleague’s approach as a superior practice. In the following excerpt from her journal during the fall, Mary discussed her technique of “triggering” the students’ memory of a complex concept by reminding them of the activity that they did when studying the concept.

I refer to probs (sic) we’ve done before (hot dogs and juice, ferns, wheel, beads) b/c (sic) I find it triggers memory leading to recalling concepts, strategies, procedures … I had not taught the Bead Factory before, but I think it worked well. It allowed kids to get very concrete by making the products (something we hadn’t anticipated). I was also able to go back to the model for [Greatest Common Factor] and [Lowest Common Multiple]. (Mary’s Journal, October 2007)

After explaining her approach, Mary subsequently explained in her journal that her colleagues did not seem to understand why her approach worked. Mary stated: “[The other teachers in the group] couldn’t get my drift from the flipchart so they didn’t use it. Maybe if we had more time for me to explain it?” (Mary’s Journal, October, 2007) Mary suggested that she could have explained it better with more time. Perhaps, however, her colleagues could have understood her approach if they had watched her implement the activity and observed her students apply their newfound understanding.
The Impact of Teacher Meetings on the Sixth Grade Group (Question 1 continued)

For Rhonda, who had not taught the curriculum before, the grade-level meetings ensured that she approached the material with appropriate expectations for her sixth grade students. With the help of her colleagues she realized throughout the year what material the students found difficult. Rhonda also explained that e-mail was a necessary complement to the grade-level discussion, helping her colleagues to solidify the convergence that they had established at a grade-level meeting. She explained that the way “you structure a lesson” (Rhonda’s Final Interview, June, 2008) is expressed through the composition of the flipchart. (A “flipchart” is the name of a file in the school’s software package for classroom presentations.) Rhonda agreed that the sixth grade group’s meeting time was valuable in providing a clear overview of how to proceed with future lessons; the flipchart that was e-mailed among the teachers filled in the details of those lessons.

While the grade-level meetings helped shape Rhonda’s understanding of the needs of her sixth grade students, they did not change her overall approach for helping struggling students. In order to reach all of her students, Rhonda taught as clearly and concisely as possible so that “eighty percent” (Rhonda’s Final Interview, June 2008) of her students understood the material. For the twenty percent who struggled, Rhonda said that she met with them individually in the morning. As in years past, she relied on these extra-help sessions to “create a process for them to pick up the pieces… [the extra-help was] really a class unto itself.” (Rhonda’s Final Interview, June 2008) The grade-level meetings had helped Rhonda clarify for herself how she would approach the material initially with the students. While she valued their input, however, Rhonda did not believe that the discussions that she had had with her colleagues affected the numbers of students who needed this one-to
one attention. In the end, she used the same techniques as she had in the past, one-on-one tutoring, to reach students that struggled.

Mary depended even less on the grade-level meeting and more upon her own personal reflections to help her determine what worked and what didn’t about her instructional strategies. She stated:

I’m not one who generally journals…When I would make it a practice to pick three kids in a day and to write in a journal about those three kids and to keep it up, I always felt like I had a much better understanding of the kids and my impact on the teaching and learning experience than any of the other [interventions]. (Mary’s Final Interview, June, 2008)

Ultimately, the above field notes have suggested that teachers in the sixth grade had a significant impact on each other’s teaching, particularly when prompted by the Principal/Researcher. However, they did not believe that their instruction changed significantly throughout 2007-2008. They did not believe that they developed a systematic approach to comparing practice and selecting a best practice.

*The Sixth Grade Teachers’ Opinions of the Leadership Project (Question 1 continued)*

The sixth grade participants’ attitudes towards the Leadership Project reflected their hesitance in adopting a systematic approach to sharing and adopting best practices. (Note: None of the participants referred to the project as “The Leadership Project.” They called their meetings “Grade Level Meetings.” The author uses “Leadership Project” below in order to maintain consistency with earlier parts of this study.) While they enjoyed and appreciated their colleagues, they did not believe that the purpose of the grade-level meetings...
was to work together to adopt a common best practice. They did not believe that the Leadership Project influenced them more than if they had simply met weekly, without the Principal/Researcher present and without any of the other interventions. They did not realize that they had engaged in rigorous back-and-forth discussions as a result of the interventions, and that this dialogue improved their teaching.

Table 4: Teachers’ Opinions of the Leadership Project

<table>
<thead>
<tr>
<th>Teacher Name</th>
<th>Success of Leadership Project</th>
<th>Did the Leadership Project make your teaching styles converge?</th>
<th>What intervention had the greatest impact?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mary</td>
<td>5</td>
<td>yes</td>
<td>Journal Writing</td>
</tr>
<tr>
<td>Rhonda</td>
<td>4</td>
<td>yes</td>
<td>Meetings with the grade-level</td>
</tr>
</tbody>
</table>

Note about Table 4: The Principal/Researcher asked each teacher to rate the success of the collaborative from “0 to 5.” A rating of “0” meant that the collaborative was not effective at all while a rating of “5” meant that the collaborative was extremely effective. The third teacher in the grade-level group was a non-tenured teacher, and, as a result, the Principal/Researcher did not interview her for the study.

At the end of the study, Mary was extremely positive about her involvement in the math collaborative with Rhonda and the non-tenured teacher that was not part of the study. Mary stated that her rating of the grade-level group, based on a scale of five was “five…six” (Mary Interview, June 2008) Mary described the success of the sixth-grade teacher group in terms of how deeply they examined their teaching strategies together. She stated the following reasons why it was successful:
Because of the personalities of the people, because Rhonda was brand new to that position and needed someone to lead her through the way, because I hadn’t done it in awhile and I needed to figure out what I was doing as well, and it was just a group of people that work well together and they share … materials back and forth all of the time. It’s just the way [the members of the sixth grade group] work… We spent more time talking about why we teach something the way we teach it or how we were going to teach something. (Mary’s Final Interview, June 2008)

Mary described the two other members in the collaborative as follows:

They both know kids very well and always talk about the math in terms of what the kids are developmentally ready to handle and that is not necessarily a conversation that I have in seventh grade or eighth grade. (Mary’s Final Interview, 2008)

Mary felt that the sixth grade incorporated the “developmental” (Mary’s Final Interview, June, 2008) model, creating strategies that would help them be successful, rather than the “deficit” (Mary’s Final Interview, June, 2008) model in which teachers anticipated that certain students would not be able to solve certain problems.

Ultimately, Mary did not see the interventions introduced through the Leadership Project, designed to provide a structure that required teachers to determine a common set of best practices, as important to the success of the grade-level group in the future. When asked, for example, if she had taught struggling students in 2007-2008, the year of the Leadership Project, any differently from the way she had taught in the past, Mary said that her approach had not changed. Mary said that her feelings about the effectiveness of the collaborative were strictly related to the teachers involved and not to any structures imposed from the outside by the Principal/Researcher. To Mary, convergence occurred among the
sixth grade teachers because members of the group trusted each other enough to accept the approach of a colleague as a best practice and not feel inferior as a teacher for doing so. Mary explained that even when Rhonda did not readily agree with her approach to teaching a particular sixth grade concept, which was rare, Rhonda eventually “had it make sense for the kids and she was able to put something together in a flipchart and sort of use the manipulatives and bring them to the place that they needed to come to.” (Mary’s Final Interview, 2008) While Mary believed in the importance of building a consensus best practice, she did not seem to want a structure imposed to enforce that consensus.

Rhonda felt that her own lack of experience in teaching sixth grade limited the Leadership Project’s ability to create a structure for identifying and implementing best practices. She rated the sixth grade group a “four” (Rhonda’s Final Interview, June 2008) because she felt that she did not know enough about the curriculum to advocate for her own practices as ones that others should use. While she felt that the grade-level group would improve the following year because she now knew the curriculum better, she did not believe that the interventions of the Leadership Project had added significant value to their exchanges. The group had compared teaching strategies, but not because the Principal/Researcher was present or because of the various interventions of the Leadership Project. Rhonda stated that you can’t “make people share” (Rhonda’s Final Interview, June 2008) in a deep and thoughtful way.

When prodded, Rhonda brainstormed how more intensive structures might encourage reluctant collaborators. She said that the Principal/Researcher could require certain documentation from teachers that would hold each teacher-group accountable for doing rigorous work: Rhonda suggested a curriculum binder that gathered the group’s best
practices. At the same time, she expressed concern that this approach would simply annoy teachers because it was cumbersome. (Rhonda Final Interview, June 2008) While PLCs generally require tangible products as a result of the group’s work, and the discussions at the grade-level meetings did have a structure, Rhonda was not confident that the teachers would sustain these structures if they were implemented on a larger scale.

The Impact of Peer Observations on the Seventh Grade Group (Question 1 Continued)

Dan described the impact of peer observations in the following way:

Just seeing something done differently than I would think about doing it. Even having done now, the seventh grade curriculum three times, and next year for the fourth time, it’s still surprising to see, "Oh I never really thought about it in exactly those terms,“ and getting to sit in on some of Diana’s classes, it was nice to be able to see something done differently, and then try it and have it be successful or try it and have it not work, but either way still try it. I think that that was one of the benefits. (Dan’s Final Interview, June 2008)

Dan’s answers supported the researcher’s hypothesis. Dan had said that actually seeing teachers implement the strategies that they had discussed in their meetings enabled him to apply them to his own teaching. Not only did the peer observation help produce the sought-after convergence, Dan was able to identify the Leadership Project’s role in producing this convergence. Yet, when the researcher asked him to speak for his colleagues, and state whether his colleagues would respond similarly to peer observations as he had, and adopt the strategies that worked best, he hesitated. He stated: “I don’t think that any of us would say that we do something better than the other person, but just different in some cases.” (Dan’s Final Interview, June 2008) In this statement, Dan expressed concern that teachers would
become defensive if their work was compared. Of course, without this comparison, teachers cannot determine a “best practice.” Dan supports the view that teachers should be able to protect their individual approaches from comparison.

The other two teachers in the seventh grade collaborative did not name peer observation as an effective intervention, but seemed to benefit from it significantly. Mary felt her role as a peer observer was not significantly different than the role she played as department chair. While she did not state that it was very valuable, Diana was an eager participant in peer observation. In one peer observation, she saw how Mary had given a child too many instructions at once, causing him to get confused. After discussing Diana’s opinions with her, the Principal/Researcher encouraged her to share this insight at a grade-level meeting. At the next seventh grade math meeting, Diana explained to Mary how she would have taught it more clearly, Mary listened and agreed. (Seventh-Grade Meeting, February, 2008) In her journal, Diana showed how peer observation had not only provided a clear opportunity to deepen their group’s discussion of practice, but also boosted her confidence in the value of convergence. Diana stated:

> It was a bit amazing to me to see how in sync we are for this concept. Mary, Dan, and I teach this extremely similarly. We use the same steps and vocab (*sic*) (almost word for word, ex[ample] for ex[ample]). I am not sure why this concept more so than any other, but I suppose that is a good thing. (Diana’s Journal, February 2008)

Unfortunately, deeper tensions among the seventh grade group eventually overshadowed the energizing impact of the peer observations.
Diana described her role at the grade-level meetings as “disagreeable, antagonistic.” (Diana’s Final Interview, June, 2008) She went on to state:

I always tried to push things a little bit and I’m OK with that because I’m trying to be reflective and do what’s best for my kids and sometimes it worked out fine and sometimes it was met head-on…I did things slightly different, knowing my kids, and I wanted them to be a little more engaged and buy into it. I don’t think it was better or worse… just something I wanted to do differently for my own reasons... and that was fine…in some respects I feel badly for [Dan] because he had to sit through some of those meetings. On the other hand, I don’t know if he necessarily disagreed with me or didn’t disagree with me. He just kind of sat back and let me take on that role. (Diana’s Final Interview, June, 2008)

At their grade-level meetings, when she disagreed, Diana felt that she was “disagreeable” and “met head-on.” She did not feel that disagreement was simply part of a rational process for discussion that consistently took place at the grade-level meetings. As the year progressed, when she diverged from the others, Diana did not justify her approach in detail to her colleagues. Rather she stated, without waiting for a response, that her approach was better for her students because they needed to become engaged in their learning. Diana saw the grade-level meetings as helpful to her in a larger professional sense, but not as a means to work with colleagues to find a best practice. She stated:

The three of us don’t always see eye-to-eye but we all make valid points and valid reasons and I can sit back and say “Huh. I didn’t think of it that way.” Or, “I never approached it from that angle;” or “maybe that will work;” or “gee, that didn’t work.”
It kind of helps me reflect on myself and helps me keep myself in check better.

(Diana’s Final Interview, June, 2008)
While Diana described above the seventh grade group’s discussions as fruitful, she seems to have accepted the belief that diverging from a common best practice was appropriate. Practically speaking, furthermore, she expresses doubts about the likelihood that the group can agree on a best practice. No longer does she express confidence, as she did in June of 2007, that the department chair can, if necessary, mandate a common approach.

Mary also stated that the somewhat tense atmosphere at the seventh grade meetings reflected a lower quality of sharing than at the sixth grade meetings. After the Leadership Project ended, Mary expressed frustration about the actual conversations that took place in the collaborative. She stated that, during the meetings, members of the group were able to “[keep] one another informed about where they were [in the curriculum] but they wouldn’t necessarily collaborate. It was more [about logistics].” (Mary’s Final Interview, June, 2008) The grade-level meetings did not create a dynamic in which Mary felt capable of engaging Diana in frequent, rigorous discussions.
The Seventh Grade Teachers’ Opinions of the Leadership Project (Question 1 continued)

Table 5

The Seventh Grade Collaborative: Overall Views of the Teachers, June 2008

<table>
<thead>
<tr>
<th>Teacher Name</th>
<th>Success of Collaborative</th>
<th>Did the Collaborative make your teaching styles converge?</th>
<th>What intervention had the greatest impact?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dan</td>
<td>4</td>
<td>Yes</td>
<td>Peer observation</td>
</tr>
<tr>
<td>Diana</td>
<td>4</td>
<td>No</td>
<td>Discussions with the principal</td>
</tr>
<tr>
<td>Mary</td>
<td>3</td>
<td>No</td>
<td>Journaling</td>
</tr>
</tbody>
</table>

Note about Table 5: The Principal/Researcher asked each teacher to rate the success of the collaborative from “0 to 5.” A rating of “0” meant that the collaborative was not effective at all while a rating of “5” meant that the collaborative was extremely effective.

In his interview at the conclusion of the Leadership Project, Dan rated the collaboration a “four” and stated the following:

It made me see things what I hadn’t seen before and in some cases I wasn’t completely comfortable with because it didn’t fit my teaching style so that would be the only negative. But that’s just learning [about] engaging the kids I want to reach successfully…” (Dan’s Final Interview, June 2008)

In this statement, Dan expressed his belief that the leadership project forced him to think rigorously about his teaching. At the same time, the seventh grade group did not alter his view that he had certain strengths and weaknesses as a teacher that he could not change. Certain teaching styles simply did not “fit” him.
In response to the same question about the overall success of the seventh grade group, Diana also rated it a four out of five. She only could offer a vague sense of its impact. She felt this particular collaborative was similar to others in which she had participated in the past. She benefited from sharing her work and her insights with colleagues because it forced her to think carefully about her own practice. At the same time, she emphasized that the collaborative did not make her adopt the techniques of her colleagues.

Diana stated:

I think for the most part it’s always really, really helpful to kind of plan together, to bounce ideas, to talk things out and we don’t always agree and that’s OK. It’s OK to disagree and it’s OK to do things slightly differently. (Diana’s Final Interview, June 2008)

She saw her colleagues as listeners whose thoughts would cause her to refine her thinking. She did not, however, think that they were coaches that would cause her to converge her approaches with theirs.

The third member of the seventh grade group, Mary (also a member of the sixth grade collaborative), shared her disappointment of the seventh grade collaborative:

I don’t think either one of them generally pushed the conversation. [They would keep] one another informed of where they were but they wouldn’t necessarily collaborate on that. (Mary’s Final Interview, June, 2008)

Mary had hoped to learn more from her colleagues, particularly Diana. Mary had hoped, for example, that the remedial class that Diana taught to the neediest seventh grade students, called Focus Math (FM), would inform the seventh grade group’s conversations. During our year-end interview, as stated earlier, Mary felt that Diana didn’t “embrace [Focus
When I responded that Diana had told me that FM had been very helpful for her, Mary said that Diana had not followed “the plan” that they had developed over the summer. (Mary’s Final interview, June 2008) The meetings had not provided enough impetus for Mary and Diana to discuss FM, and its potential impact.

The members of the seventh grade group, while giving relatively positive scores to the grade-level group’s work, ultimately acknowledged that only rarely did they ever identify or implement one joint, “best” practice. In a discussion of one successful convergence of teaching styles, Dan said that he realized that the way that Diana and Mary had taught how to subtract integers was a superior method. He had adopted their method. (Dan’s Final Interview, June, 2008) This was the only occasion that a teacher in the seventh grade group acknowledged changing his or her approach because he or she determined that a colleague had a better practice. Diana, in fact, did not believe the Leadership Project caused even this one example of convergence. At her year-end interview, Diana explained that their convergence in the teaching of how to subtract integers concept was long-standing in the department, having nothing to do with the work this year of the three seventh grade teachers. She said, “We’ve been teaching it that way for years.” (Diana’s Final Interview, June, 2008)

**Summary of Question 1 Findings**

The sixth grade group created a feeling of deep respect and trust among its members, while the seventh grade group was tense and somewhat frustrated with its interactions. Despite the different feelings that these groups generated among their members, the structures implemented through the Leadership Project encouraged productive conversations. Particularly after they had observed each other teach, teachers had more rigorous conversations about their practice. In one particular meeting, sixth grade teachers identified
a best practice as a direct result of the peer observation cycle. The seventh grade group members, furthermore, spoke excitedly about their own effectiveness when they discovered how closely they converged by observing each other teach a particular lesson.

The teachers in either group, however, did not attain a level of rigor in their discussions without the Principal/Researcher playing an assertive role in the discussion. At the same time, they discounted the significance of the Principal/Researcher and of the interventions. Ultimately, they did not realize how draining it is for teachers to identify and implement best practices. They did not see how, even when they liked and respected each other, that they usually stopped short of selecting one colleague’s practice as superior to another’s. Because they did not realize that the interventions helped move them towards the creation of a Professional Learning Community, they seemed less likely in the future to engage in the rigorous discussions that are necessary for the grade-level groups to be effective without the Principal/Researcher’s interventions.

*Question Two Findings: How similar did the teachers’ questioning patterns become by the end of the year?*

Research Question Number Two asked the researcher to determine how effective the grade-level groups were in producing lessons that converged. The Principal/Researcher measured the convergence of teaching in each of the two grade-level groups in three specific ways: content convergence, pedagogical convergence and the types of questions that teachers asked students. The reason that he chose these three ways was that content and pedagogy were the focus of the grade-level conversations. The researcher, in addition, made the questioning habits of the teachers, the focus of the conversation at the one-on-one post-
observation conference. The researcher will focus his analysis on a set of observations at four points in the year: November/December, January/February, March/April, and May.

**Content Convergence**

The researcher examined when the teachers in the study taught particular topics. He analyzed not only whether they agreed on content but also whether they agreed on the sequencing of that content. Ultimately, the teachers in both the sixth and seventh grade had a high rate of content convergence. The seventh grade teachers disagreed, in particular, about certain aspects of a survey project introduced in the fall. The project required that students gather data by asking a specific survey question to people from different age groups. The students then created graphs from these surveys. For the rest of the school year, the seventh grade teachers disagreed about the sequencing of certain content one more time: when to teach students how to find the slope for parallel lines. The sixth grade teachers diverged only once, in how they introduced Pi. Given the many content decisions that each group made throughout the year, this shows a remarkable level of agreement. The interventions that were part of the Leadership Project emphasized the infrequent differences by requiring the teachers to discuss them and defend them. Interventions that required teachers to compare their approaches when they diverged probably encouraged a consensus approach, even if just to avoid uncomfortable conversations. It is difficult to know whether the interventions definitely affected the content convergence because the Principal/Researcher did not continue the interventions with those grade-level groups the following year.
Content Convergence Among Sixth Grade Teachers (Question Number Two Continued)

On the unusual occasions that teachers approached content differently, the sixth grade collaborative reacted very differently to their discovery of divergent approaches than the seventh grade. When the non-tenured teacher in the sixth grade collaborative expressed concern that she had not yet introduced Pi to her students, Mary and Rhonda expressed no concern. They simply explained to her how she could integrate a discussion of Pi into the upcoming lesson. This surprised the Principal/Researcher because the sixth grade teachers had only decided to teach Pi over the last few years, after it had showed up on state testing. The Principal/Researcher had assumed that teachers would want to plan carefully how they would introduce the concept to their students. However, they seemed unfazed by the divergent manner in which students had learned about Pi. When Rhonda said, (Sixth Grade Meeting, May, 2008) “I already did Pi,” Mary responded by saying, “You did Pi? Did you do area and perimeter with them too?” Rhonda said, “No. I can do that.” Rhonda added area and perimeter to her lessons to converge with the other teachers without further discussion. In this situation, all members of the group worked quickly to re-align their approaches so that all of them agreed.

In fact, the sixth grade collaborative made difficult decisions throughout the year in the same relaxed manner. They agreed, for example, to use fractions as the basis for their study of a number of different topics, stretching out the fractions unit for about four months. During a sixth grade meeting in May, Mary congratulated the group on how it had integrated fractions so deeply into the curriculum, citing the students’ success with probability as a sign
that they had developed a deep understanding of fractions through their four-month study.

Rhonda agreed. The following is the dialogue between Rhonda and Mary:

Rhonda: The amount that we’re biting off for the probability unit is appropriate and its manageable.

Mary: It’s because we spent so much time doing fractions.

Rhonda: Yes. Exactly. I think that that helped immensely because it wasn’t like you had to re-teach anything.

Mary: Yep.

Rhonda: I’m very happy where we’re at with probability. I feel like most of the kids are on the train.

Mary: So when we talked about doing probability earlier in the year, I think I’m going to take that back and say I would do it here because it’s a nice review and check-in with fractions.

Rhonda: I’m with you. When they’ve gone on, when they’ve sort of lost it, it forces them to go back to it and it shows an application and why they need to know it. (Sixth Grade Meeting, May, 2008)

This dialogue shows the sixth grade teachers setting their approach to fractions for the following year, one of the most important curricular decisions they would make, in a matter of minutes. They decided so efficiently because they were confident that their meeting structure would enable them to thoughtfully review curriculum choices. In the fall, Mary had strongly advocated for an approach to fractions that would extend for months. (Sixth Grade Meeting, October, 2007) Rhonda had agreed to follow the same approach, and both Rhonda and Mary tracked the students’ progress with fractions. For the next several months, they
regularly re-visited their students’ developing understanding of fractions. When they had enough data to determine if their approach had succeeded, they launched into a rigorous, thoughtful discussion, concluding their dialogue with a final decision, as described above. It is not clear that the push for content convergence added momentum to the rigor of their collaboration. Rhonda had spontaneously brought up the wrap-up discussion of fractions without prompting from the Principal/Researcher. However, by encouraging Rhonda to try Mary’s approach in the fall, the interventions had probably ensured the follow-up conversation in the spring.

Even when the group encountered evidence that Mary’s emphasis on conceptual understanding might not be as motivating for students as she thought, the group’s overall confidence in her was not threatened. When the sixth grade students studied the order of operations, a completely procedural recipe in which students do mathematical operations in a defined order problem after problem, Mary herself stated (Sixth Grade Meeting, May, 2008), “They loved doing order of operations.” The conversation then continued as follows:

Rhonda: I understand their joy… because, you know what, it’s clean…someone can tell you here are the four rules and you can stick with it and it’s doable.

Mary: It’s hard-looking math that they can do…It’s a lot of parentheses, none of the numbers are more than fifteen, but they’re all excited that they can do that.

Rhonda: That’s why I like it too. Covering and Surrounding, is that [the next unit] we’re going to? (Sixth Grade Meeting, May, 2008)

In this conversation, these accomplished math teachers expressed no self-doubt even though the students’ reaction to order of operations, and its focus on straightforward procedural instruction, contradicted one of the bedrock principles of their guided-instruction math
curriculum. For most units in the curriculum, teachers had used a series of multi-step activities and a number of manipulatives to give students a strong conceptual understanding of a problem. With order of operations, however, by giving them a simple acronym to remember and asking them to solve a number of sample problems, they had taught them a procedure that the students enjoyed applying. Despite this significant piece of evidence, Rhonda simply moved on to the next unit without hesitation. If the group had had less faith in Mary, they might have stopped and questioned their conceptual approach to most math topics. From watching how the sixth grade teachers navigated disagreements, the Principal/Researcher found that groups maintain momentum far more easily if they agreed on the major thrust of the curriculum.

*Content Convergence Among Seventh Grade Teachers (Question Number Two Continued)*

The few deep curriculum conversations that took place in the seventh grade collaborative, on the other hand, seemed to threaten those teachers’ collegiality. In November, for example, Diana decided to diverge from Dan and Mary when she asked her students to develop their own question for a survey project. Mary and Dan had all of their students collect answers to the question: “Would you rather be able to fly or be able to be invisible?” Mary had wanted to use a survey question that all of the students would use because she could ensure that it was a good question, and she could combine the surveys of all of the students to lead them towards an understanding of an important mathematical concept. Neither Mary nor the Principal/Researcher required Diana to use this question, however. When the collaborative looked at the completed projects, Diana was happy with her results, showing what she felt was strong work from struggling students. She felt that her
students had particularly become engaged in the project because they had created and answered their own question. Mary expressed concern, however, with Diana’s divergence by questioning the quality of one particular question, “What do you like better, chocolate or vanilla ice cream?” After hearing that question, Mary said that she wasn’t sure what kind of analysis students could do for answers based totally on the vagaries of individual taste.

Mary also questioned the quantity of data that Diana’s approach gave the students. She began expressing her concerns by questioning the results of her own students:

I don’t think [my] kids had enough data in each of the three age groups within their groups to make any significant conclusions although… I have some groups who have said as people got older they preferred to fly far more than they preferred to be invisible… so their paragraphs are kind of cool because it’s like “maybe as they get older they can’t get around so much.” I was like, “Excellent. That’s exactly what your paragraph should say. You know and you’re going to support it with the data and these are some more questions that you will have.” But others of them are still at the “What’s your big conclusion?” [They say,] “More people want to fly”…[they do not have enough data] in each age group…In one age group, they only had one person in their sixties. If they had more people in their sixties, they might have had a better trend. (Seventh Grade Meeting, November, 2007)

Mary then continued her critique of her own project as a lead-in to a conversation with Diana about her project. She stated:

The other thing that I think I would do is to show them some kind of … research, I need to find something that would be interesting to them, just so they could see there are real people who do real research, ask the same questions, and they have the same
boring paragraphs about median age, and then they use their data to help them make
some conclusions. I would like to give them that up front. (Seventh Grade Meeting,
November, 2007)

Then, Mary asked how Diana’s approach of asking students to develop their own questions
worked. Diana responded as follows:

Some of them were really good questions…One of the questions was do you prefer
*Family Guy* or *Loony Tunes*…I think I might be glad that I had them do [their own]
questions because I think they really got into it.

Mary: What’s going to be their compelling finding in some of those questions? I’m
guessing the chocolate and vanilla one, not so compelling.

Diana: To fly or invisible is the same thing.

Principal/Researcher: Well, it’s not … there can be a reason other than “I like flying
or I like to be invisible.”

Mary: Like some kids said, “Because … as people got older they were less able to
move around, they preferred to fly.” Some kids said, “Because you’re older and
people treat you differently because you can’t get around, maybe you’d like to be
invisible.” Harry Potter, is that why most kids want to be invisible? So they had
other things that they wanted to speculate about. Whereas the vanilla/chocolate thing,
I’m not sure what you’re going to speculate about.

Diana: Right, and some things you’re not going to see.

Mary: Yep.
Diana: But I think it’s important to come to that conclusion [at the end of the survey]. There really is no difference [between who likes chocolate and who likes vanilla.] It really is a matter of taste.

At this point, Dan became involved with the discussion, summarizing the different approaches of his two colleagues. Dan stated:

Do we want to go out of our way and ask a question where we know there is going to be a generational gap or a gender gap or something like that or do we want to ask a question where there’s a possibility that there are no findings because sometimes not finding something significant is just as deep for the kids? … some people like chocolate and some people like vanilla, it doesn’t matter if you are male or female, young or old, it really comes down to the fact that we’re all individuals.

Mary: But I think it’s so hard for them to even come up with the fly/invisible sort of next question. I didn’t have a lot of kids making those kinds of insights. Most of them were happy to say “more people want to fly” and, given that, I’m looking at the Independent, so-called “Deep thinker people,” I’m concerned about that. So if you have a question that’s not going to have any findings, it’s not going to slap the kids in the face the same way as setting them up for something that’s going to have either generational or gender or that we anticipate might have some sort of a difference and then we can steer them a little bit to look at their data. Maybe if they had something up front that asked those next questions, it would get them on the right track.

Later in the conversation, Dan offered the following compromise:

I would like to consider, after seeing Diana’s different projects over time, having more than one question, maybe that we brainstorm, like fly or invisible that we had
all kids do, if we could get that to three, maybe four questions, and even hand it out like a random drawing.

Mary responded:

I’m going to wait until I see the presentations before I go with that. My hunch is… that they have very different data… What would happen if we pooled everyone’s data? What I want to do in the final days, pool the whole class… see if it supports one conclusion over another … By pooling the information, we can make a stronger conclusion, we make a strong case about doing a real survey.

Dan: Maybe we could take all of your data, Diana’s data, and my data and pool it together and say this is every seventh grader’s data.

Mary: And as you said, it leads in nicely into probability and the Law of Big Numbers.

Dan: Exactly.

During this part of the conversation, Diana had gone to a computer and was sending an e-mail to Dan. Neither Mary, Dan nor the Principal/Researcher were able to press her on her approach. Mary’s questions had not engaged Diana in a discussion of whether or not her divergence from the group had been helpful to her students.

Conclusions about Content Convergence (Question Number Two Continued)

Content convergence probably would have occurred at both grade levels without any interventions. The interventions, however, particularly the emphasis during the grade-level meetings on discussing small differences in content coverage, highlighted the role that a particular kind of trust plays in preserving the momentum of the work of a group of teachers. When Rhonda agreed to make fractions a thread that continued for months, she may also
have been skeptical of the wisdom of such an approach. However, she knew that she would have the opportunity to re-evaluate the group’s decision later in a thoughtful and respectful conversation. Diana, a member of the seventh grade group, did not seem to trust that a future conversation would enable her to re-visit adequately her concerns about Mary’s approach. As a result, when the initial decision about the survey was discussed, Diana did not want to engage in a deep discussion of her planned approach to the survey. When the conversation took place after the survey was completed, and became more intense, even when Dan proposed a possible compromise, Diana physically backed away, leaving the group’s table.

*Pedagogical Convergence Among Sixth Grade Teachers (Question Number Two Continued)*

While the sixth and seventh grade groups had a particularly high level of content convergence, one could assume that some of that convergence was the result of mandated state content standards. Pedagogical convergence, on the other hand, did not have standards to encourage consensus among the teachers. It required far more complex collaboration, asking that teachers follow the same approaches and use the same instructional strategies. In order to converge their pedagogies, teachers had to have more subtle conversations about the roles of students and teachers in individual activities. In this Leadership Project, they had to have these detailed conversations during relatively short meetings. Not surprisingly, the sixth grade teachers worked far more effectively than the seventh grade teachers to identify and resolve pedagogical differences. For example, in a November grade-level meeting, Rhonda was concerned about the group’s approach to teaching students how to find the greatest common factor of a given set of numbers. At that particular grade-level meeting, she expressed concern that at that time she could not ask her students to explain their thinking
about this topic in a couple of sentences because their understanding was not yet coherent enough. She agreed, however, that her students eventually should be ready to explain their reasoning in writing. After a brief discussion, Mary suggested a compromise for the group in which they would all delay the date that they asked students to write out their reasoning. In the following dialogue, the sixth grade group showed how they responded to the discovery that they were using different pedagogical approaches.

Rhonda: [The question is] very open-ended. I’m going to have kids that aren’t going to give me any information. I’m telling you they are going to struggle with this a little bit because … they’re not organized enough to organize that.

Mary: That’s why I think [we should not] do it tomorrow …

Other Member: OK. We’ll wait until Wednesday. (Sixth Grade Meeting, November, 2007)

The group addressed Rhonda’s concerns. The group made this complicated pedagogical decision without much discussion.

The table below charts all of the pedagogical decisions that the sixth grade group made during particular meetings. These decisions were often miniscule: for example, the phrasing of a question on a quiz or the order of questions in a discussion. The divergent use of pedagogies in November was primarily related to Rhonda’s delay in asking students to write out their explanations of how to find the Greatest Common Factors. Even in this situation, as we saw above, the group came to a consensus in the end.
Table 6: Pedagogical Convergence among Sixth Grade Teachers

<table>
<thead>
<tr>
<th>Date</th>
<th>Number of Pedagogical Decisions</th>
<th>How often pedagogies converged</th>
<th>Convergence Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>November 5</td>
<td>14</td>
<td>9</td>
<td>64%</td>
</tr>
<tr>
<td>December 17</td>
<td>11</td>
<td>11</td>
<td>100%</td>
</tr>
<tr>
<td>March 24</td>
<td>4</td>
<td>3</td>
<td>75%</td>
</tr>
<tr>
<td>May 5</td>
<td>22</td>
<td>22</td>
<td>100%</td>
</tr>
<tr>
<td>Totals</td>
<td>51</td>
<td>45</td>
<td>88%</td>
</tr>
</tbody>
</table>

Note: Table 6 charts the number of decisions that the sixth grade team made about how they would teach the content and on which decisions they were able to agree.

Pedagogical Convergence among Seventh Grade Math Teachers (Question Number Two Continued)

Compared to the sixth grade teachers, the teachers in the seventh grade addressed pedagogical convergence differently. For the most part, the seventh grade teachers used the same methods to convey their content to the students. At times, they were proud of their common approach. For example, when the Principal/Researcher asked them to clarify how they would teach subtracting and adding integers using red and yellow chips, all three teachers participated in showing him the same teaching strategy with great excitement, using the same manipulatives. When each of them spoke, they talked about the strategy as one that “we” use and “it really works.” (Seventh Grade Meeting, December, 2007) Diana, in particular, was eager to show how “it really showed [the students] neutral pairs.” (December, 2007) In late May, furthermore, all seventh grade teachers taught students equations using
marbles and cups as manipulatives. Again at the subsequent collaborative meeting, they
talked quite confidently about how effective this strategy was for teaching struggling students
about how an equation operates. (Seventh Grade Meeting, May, 2008) While the presence of
the Principal/Researcher encouraged them to converge their approaches, the impact of the
interventions in causing this convergence is not clear. In both cases, the teachers had used
these common approaches in prior years.

When the teachers’ pedagogies diverged however, it became clear that the Leadership
Project’s interventions could not maintain the positive tone described above. In April, for
example, Diana shared with the group that she had taught parallel lines just after she taught
about slope. As mentioned earlier, this disagreement in the sequencing of content was an
example of content divergence. Mary, however, wanted to discuss the pedagogical
implications of this divergence more. Mary looked at the question that Diana asked on the
accompanying quiz and told Diana that students would not be able to answer it because of the
way that Diana had presented the material. Diana responded by saying that the question was
extra credit and that she just wanted to see how the students “thought.” (Seventh Grade
Meeting, April 2008) The seventh grade teachers never resolved this issue. Diana gave the
question but the success of her students was not re-visited. In the following excerpt from the
April meeting, Diana and Mary briefly debated the value of Diana’s divergence:

Diana: I want them to make some guesses without having to graph it. That’s the part
that’s going to be a stretch because we haven’t talked about that their slopes are
perpendicular.

Mary: How are they going to know that the slopes are perpendicular without
graphing it?
Diana: We’ve talked about what perpendicular lines look like.

Mary: Have you talked about linear slopes?

Diana: No. I want to see [what they can do]. We actually covered this [in this order] last year [in seventh grade] … It’s a “nice to know,” not “a need to know” … I want to see: can they make some interesting guesses based on looking at their slopes, maybe one or two kids can make that connection … they might not, that’s why it’s a bonus … it’s a stretch … they’re so afraid to take a chance.

Mary: I don’t think … any of my kids … would get that one.

Diana: They might not. I’ll let you know.

Mary: I’ll be psyched if they get it. (Seventh Grade Meeting, April, 2008)

When asked about their different opinions about the appropriateness of this question in an interview at the end of the year, Diana told the Principal/Researcher that she had made her decision to diverge by “looking at the order that [Mary] did things” and deciding that she felt the order … was choppy, and I felt like the order that I did made sense to me … I think it made more sense to the kids because it made sense to me … Mary and Dan … didn’t do the linear equation to the extent that I did and they did ratio and proportion first and then they did Pythagorean Theorem and I did the reverse … I felt like because it made sense in my head … the way it all connected, it spiraled. One thing led to the next thing, it connected back to the previous thing … I had done it before in previous years … because the triangles came from the staircase … I don’t know how to prove it because we don’t give the exact same tests and we shouldn’t because she has Independent (the advanced level) and I don’t, and even though Dan and I give tests that are very, very similar, the only tests that are exactly the same are our mid-year … I
don’t necessarily think there is a right or a wrong way or a better or a worse way.

(Diana’s Final Interview, June, 2008)

Then Diana spoke about her philosophy of teaching:

I think that deep down if you as the teacher believe in the way that you are doing it, you can portray that and kids will go with the flow and they’ll internalize it…Part of the issue, I think is, and this is going to come out like a stupid statement, pretty much if you know kids and you can relate to kids, you can teach them almost anything. You may need to go back and re-learn what it is. I’m not saying I would be an expert English teacher, but I know how kids think, I know how middle schoolers are. I may have to go back and learn some grammar rule or something but I could certainly [teach clearly] because I would believe it deep down inside… I think [my approach] was great. My Directed (lowest level) kids had high averages on their tests…One class had an 88.8 average and the other class had a 90 average so that’s phenomenal.

(Diana’s Final Interview, June 2008)

Diana added:

One of the things that I do for Directed and I don’t know if Dan does it or not, is that I’ll either give them a page at a time if it’s a lengthy test or for this particular test I gave them a double-sided [test], but side one was only ratio and proportions and then the other side was only the Pythagorean Theorem…so that they can kind of transition their brain… (Diana’s Final Interview, June, 2008)

When the Principal/Researcher asked Diana why she hadn’t advocated for her above method of giving tests more assertively with Dan and Mary, Diana said that “the only problem is if you get too similar, it takes away from your personality, too…if we become too similar in
our teaching, we become robotic.” (June 2008) After the study had been completed, Diana felt strongly about the success of her own teaching but still was deeply ambivalent about asserting that others should use her methods. She did not feel comfortable experimenting with the instructional strategies of other teachers or asking other teachers to experiment with her strategies.

Table Six, below, shows that the seventh grade group did not achieve nearly the pedagogical convergence that the sixth grade group achieved in the sample time period: twenty-five percent overall compared to eighty-eight percent convergence for the sixth grade. The seventh grade group also made far fewer decisions during their meetings, reflecting the negative effect that divergence had upon their momentum.

Table 7: Pedagogical Convergence among Seventh Grade Teachers

<table>
<thead>
<tr>
<th>Date</th>
<th>Number of Pedagogical Decisions</th>
<th>How often pedagogies converged</th>
<th>Convergence Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>November</td>
<td>8</td>
<td>1</td>
<td>13%</td>
</tr>
<tr>
<td>December</td>
<td>2</td>
<td>2</td>
<td>100%</td>
</tr>
<tr>
<td>March</td>
<td>5</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>May</td>
<td>5</td>
<td>2</td>
<td>40%</td>
</tr>
<tr>
<td>Totals</td>
<td>20</td>
<td>5</td>
<td>25%</td>
</tr>
</tbody>
</table>

Note: Table 7 charts the number of decisions that the seventh grade team made about how they would teach content and the percentage of those decisions in which they found consensus.
Conclusions about Pedagogical Convergence (Question Number Two Continued)

The Leadership Project exposed significant divergences among the seventh grade teachers in how they delivered the content to their students, a divergence not seen among sixth grade teachers. Most importantly, the Leadership Project’s interventions could not help the seventh grade teachers have consistently rigorous discussions about their differences in pedagogy. Ultimately, Diana asserted her belief that teachers need freedom to teach differently from each other, and to use their intuition. The seventh grade as a whole resisted adopting a new approach even if they could re-visit and evaluate its effectiveness after it was implemented.

Convergence in the Types of Questions Asked (Question Number Two Continued)

The researcher also measured how much the teachers converged their teaching approaches by categorizing the types of question that each teacher asked the students in the first fifteen minutes of class. Not only did he track the questioning patterns to measure convergence, the Principal/Researcher also used transcripts of the class to focus the discussion during the post-observation conferences. The researcher hoped that the transcript would provide clear evidence of times when teachers’ questioning patterns diverged. Once the teachers acknowledged how they had diverged, the researcher could ask them to determine which strategy was the most effective. Typically the researcher began his audio-taping a few minutes after the observed class had begun, after basic classroom housekeeping duties had been completed. He then continued taping for the next fifteen minutes of class. When analyzing the transcripts for convergence, the Researcher compared one class that each teacher taught in November, December/January, and May. The researcher compared the types of questions that teachers asked, categorizing the questions by what types of answers
each required. The researcher counted the number of questions that required a response in
the form of a sentence. He compared this number to the number of questions that required
only one-word answers or a short phrase.

*Questioning Practices of Sixth Grade Teachers (Question Number Two Continued)*

Each of the sixth grade teachers established a clear pattern of how they asked
questions. Rhonda asked questions that required complete sentence answers more
consistently than Mary. While the difference between the teachers’ question patterns became
smaller as the year progressed, it is not clear that it is evidence of converging teaching styles.
Mary taught a much higher percentage of learning-disabled students whose verbal skills were
weaker. As a result, even with the interventions, Mary was less likely to ask students to
explain their answers in complete sentences. However, the Principal/Researcher did find it a
useful starting point during the post-observation conferences to focus on the order and types
of questions the teacher had asked because it quickly provided context for a rigorous
examination of teaching techniques.
Table 8:

Ratio of Complete Sentence Answers to Incomplete Sentence Answers

<table>
<thead>
<tr>
<th>6th Grade Teacher</th>
<th>November (% complete sentence answers)</th>
<th>December/January (% complete sentence answers)</th>
<th>May (% complete sentence answers)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mary</td>
<td>35%</td>
<td>33%</td>
<td>36%</td>
</tr>
<tr>
<td>Rhonda</td>
<td>68%</td>
<td>50%</td>
<td>49%</td>
</tr>
</tbody>
</table>

Note. Table 8 shows the percentage of questions that required a complete sentence response from students as opposed to answers that required only one word or a sentence fragment.

Questioning Practices of Seventh Grade Teachers

The teachers in the seventh grade, on the other hand, did not follow a discernible questioning pattern. In certain units, Mary asked for the most full-sentence responses. In others, Diana or Dan asked for the most complete-sentence responses.
Table 9

*Ratio of Complete Sentence Answers to Incomplete Sentence Answers*

<table>
<thead>
<tr>
<th>7th Grade Teacher</th>
<th>November (% complete sentence answers)</th>
<th>December/January (% complete sentence answers)</th>
<th>May (% complete sentence answers)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dan</td>
<td>0%</td>
<td>42%</td>
<td>43%</td>
</tr>
<tr>
<td>Diana</td>
<td>25%</td>
<td>16%</td>
<td>29%</td>
</tr>
<tr>
<td>Mary</td>
<td>56%</td>
<td>29%</td>
<td>9%</td>
</tr>
</tbody>
</table>

Note. Table 9 shows the percentage of questions that required a complete sentence response from students as opposed to answers that required only one word or a sentence fragment.

*Conclusions About the Types of Questions Asked (Question Number 2 Continued)*

The Principal/Researcher spent far more time discussing questioning patterns when he met with teachers individually after observing them than he did during grade-level meetings. He found that, in one-on-one meetings, distinguishing questions by the types of answers they required was a useful starting point for identifying explanations that worked and didn’t work for struggling students. The questioning patterns of the seventh grade teachers diverged in various types of ways throughout the year while the differences among the sixth grade teachers shrunk, illustrating a difference that could be useful in a group conversation. Teams that think that they have established consensus approaches can see significant differences when they analyze the subtler aspects of their approaches.
Conclusions about Findings for Question Two

The tense tone of the seventh grade meetings, examined in the findings for Question One, showed up in the subtle divergences that were illustrated in the findings of Question Two. While both groups achieved a high level of content convergence, more subtle measures, such as pedagogical convergence and the convergence of questioning patterns revealed far greater divergence among the seventh grade teachers. Throughout the Leadership Project, the seventh grade teachers were less willing to experiment with a new approach. They did not trust each other enough to try a new approach and assume that its effectiveness would be open to comment in a later meeting.

Findings for Question 3: What challenges did the Principal/Researcher face in implementing the collaborative structure?

The Principal/Researcher’s Third Question asked the following: What challenges did the Principal/Researcher face in implementing the collaborative structure? The first challenge that the Principal/Researcher faced was getting participants to accept his active and regular attendance at weekly meetings. In the final interview, the Principal/Researcher asked participants to evaluate his impact on the work of the group. Mary explained that he was a more objective member of the weekly conversation who offered a different perspective to the participants. Mary stated:

As an outsider you can ask a question that we might have talked about in department meeting or in another week’s meeting, just the three of us (grade-level math teachers), and because you are from the outside, but you are someone from the outside with clout, people have to really be thoughtful in their responses and communicate that
thoughtfulness and that deeper thinking and rationale in a way that they don’t when they are just in a group of colleagues. (Mary’s Final Interview, June 2008)

Responding to the Principal/Researcher’s positional power, Diana and Dan felt that it was helpful that the Principal/Researcher attended meetings to ensure that the group met regularly. (Diana and Dan’s Final Interviews, June 2008) Mary, however, questioned the role that his positional authority had upon the rigor of the conversation. She stated: “I don’t think either one [of the seventh grade teachers] generally pushed the conversation unless it was to say ‘Look this is what I did.” (June 2008) Mary believed that the Principal/Researcher’s attendance was useful in theory, but according to Mary, in practice, the accountability it offered caused teachers to censure their statements, except to show-off their individual work to the Principal/Researcher.

The sixth grade teachers were even more skeptical about the usefulness of the Principal/Researcher’s presence. Rhonda believed his presence would be more helpful if he were present with teachers who were resistant to working together. She said that he made little difference in the quality of the collaboration of her group. (Rhonda’s final interview, June 2008) In her final interview with the Principal/Researcher, she brainstormed a way of tracking decision-making at the grade-level meetings by having each grade-level group create a shared binder that documented all of their curriculum decisions. She felt that this paper trail might help, but also might annoy teachers. Rhonda felt that, regardless of what emotional response the teachers had, the formal requirements could not mandate that these groups share deeply. Effective collaboration occurred because of the “personalities” (Rhonda’s Final Interview, June, 2008) of the people involved. Rhonda had mostly had good experiences with teacher groups in the past. However, as proof of her point of view, she
reminded the Principal/Researcher of a bad experience she had had two years before, and how the Principal/Researcher’s intervention did not help significantly.

In addition to his presence, the Principal/Researcher hoped that certain structures could help the grade-level groups be productive regardless of the personalities involved. The Principal/Researcher, for example, set up the following protocol for the grade level meetings: Part of the meeting would be devoted to discussing what had worked and what hadn’t in the previous week, a part of the meeting would be devoted to planning future units, and a smaller portion would be devoted to the logistics of picking dates for assessments and projects. When discussing what had worked and what hadn’t during the meeting, the Principal/Researcher asked the teachers the following questions: “How do you know the students were learning? What did you do that caused them to learn?” When discussing future lessons, the Principal/Researcher asked, “What will be a struggle for students? How will you address that struggle?”

As the study progressed, the Principal/Researcher felt that he continued to need to express to teachers that the meetings were supposed to be structured in a certain way. For example, he described in his Leadership Journal in early January 2008 how he was still struggling with getting the teachers to follow the protocol. Getting teachers to examine rigorously what worked and what didn’t from past lessons still remained a “goal”: “My goal is that we will identify from each teacher at least one strategy that worked and see if we can use it in the future.” (Principal/Researcher’s Leadership Journal, January 2008) In this quotation, the Principal/Researcher shows that in January he is still struggling to get teachers to agree on one strategy. Later in the year, the Principal/Researcher was still searching for ways to structure their discussion more carefully. In his Leadership Journal in March 2008,
the Principal/Researcher wrote that he was not completely satisfied with the seventh grade collaborative: “I [need to] encourage teachers to develop [a more] efficient protocol for probing each other’s practice deeply.” (Principal/Researcher’s Leadership Journal, March 2008)

**Distributive Leadership (Question Three Continued)**

Perhaps the greatest challenge that the Principal faced in establishing the Leadership Project was creating a dynamic at the group meetings that would enable teachers to take responsibility for the success of the project. He needed to spur the participants to take responsibility for identifying divergent teaching approaches and rigorously discussing those decisions. This challenge is essentially the challenge that all leaders face when trying to encourage distributive leadership. The effective distribution of leadership requires individual teachers to step forward flexibly, playing different roles depending on the needs of the group: a teacher/leader might articulate an effective instructional technique, might find valuable research, or pose an important question. In an effective teacher group, teachers will temporarily adopt several roles during a particular discussion.

The graphs below show the changes in the roles that the sixth and seventh grade teachers played throughout the course of the study in their grade level groups. The roles that they played, and how those roles shifted throughout the year, had a significant impact on how seriously they took the group’s discussions. Below is a record of the decision-making experiences of the seventh grade and the sixth grade groups during one meeting in November and one meeting in March/April. These graphs record all of the decisions that each grade level made throughout the meeting, including all decisions about content and pedagogy. The figures also describe the roles that each participant played in the meeting. The
Principal/Researcher did not assign anyone a particular role. He simply asked them as a group to follow the normal protocol for identifying divergence and determining how each teacher would proceed. For each decision, the Principal/Researcher labeled each participant as playing one of the following roles: the member raising the question (“the questioner”), the teacher making the decision on the approach the group would use (“the decider”), the teacher supporting that decision (“the supporter”), or the teacher presenting a different approach that was not the consensus of the group (“the outlier”). If the person did not express any opinion during the conversation, they were not counted.
Figure 1.

6th Grade Role Evolution: Nov., 2007

- Rhonda
- Mary

Figure 2.

6th Grade Role Evolution: March/April 2007

- Rhonda
- Mary
In the sixth grade November graph (Figure 1), Mary was the decider on almost all content or pedagogy issues. She made decisions in fifteen out of the sixteen possible opportunities. Rhonda asked questions and supported the decisions that Mary and the other group member (who was not part of this study) made. Rhonda was teaching sixth grade for the first time in several years. She may have felt obligated to agree with all of the decisions that Mary made and agreed to follow them. No one in the group posed as an outlier during this meeting. At this point, Mary made the great majority of decisions, showing that leadership was not distributed through the group.

By March/April of 2008 (Figure 2), the sixth grade team had a far more distributed decision-making process. Rhonda made more than sixty-five percent of the pedagogy and content decisions during the March/April meeting. She asked far fewer questions. She also continued to make frequent supportive comments. Mary and Rhonda each raised one question. In other words, Mary and Rhonda had begun to play different roles. Furthermore, in the spring, Mary played the outlier on two occasions, a completely different role than she had played in the fall.
Throughout the year, the seventh grade group made decisions very differently than the sixth grade collaborative. “Outlier,” a role not played at all in the fall in the sixth grade group, was the most prevalent role in November as the seventh grade teachers expressed a desire to diverge. The seventh grade also made fewer decisions on content and pedagogy decisions during their November session than the sixth grade made, deciding on twenty-five issues while the sixth grade decided on thirty-one issues. This data shows that the momentum of seventh grade meetings was slowing as members began to diverge.

While deciders played slightly more of a role in March/April (figure 4) in the seventh grade grade-level group, making four decisions instead of just two, the outliers continued to dominate the discussion. Diana questioned the approach of her colleagues on two separate occasions and decided that she would continue to disagree with the group. The sixth grade group continued to make more decisions than the seventh grade group in March/April, deciding on twenty-seven issues as opposed to eighteen at the seventh grade meetings. The seventh grade group did not allow its members to take strong leadership roles in which they could convince others to follow the same approach.

Conclusions about the Findings for Question 3

In using convergence to drive the relatively rapid creation of a Professional Learning Community, the Principal/Researcher attempted to establish himself in a supportive role and the other members in flexible roles. He was hoping that the groups would eventually operate effectively without the help of administration. He faced a far greater challenge in establishing and maintaining effective practice in the seventh grade group. The tension and lack of trust
that the members felt for each other made it difficult for them to switch roles freely. As a result, the pace of their decision-making was slower.

**Conclusion**

Chapter Five will summarize the findings of Chapter Four and then discuss them in the context of the literature discussed previously in Chapter Two. Subsequently, the Principal/Researcher will discuss the implications for practice and policy, discussing new models for preparing and sustaining the kinds of rigorous discussions of practice that are integral to the success of PLCs. The Principal/Researcher, in addition, will examine what he learned personally about leading an effort to cultivate more rigorous discussions of best practices. Finally, he will discuss the limitations of the study and the implications for potential new research that the study raises.
Chapter 5: Analysis and Implications

This chapter begins with a review of the findings related to the three research questions. It reviews the interventions, individually and as a whole group of actions, their impact, and the group members’ perceptions of their impact. It discusses their effectiveness in producing convergence and, ultimately, in creating a process for the careful identification and implementation of best practices. It also discusses the challenges that the Principal/Researcher faced as a leader in carrying out the Leadership Project. Subsequently it places these findings in the larger context of the research on professional learning communities. The Principal/Researcher then discusses how these findings might be applied to national and local policy efforts to impact the practices within schools and districts. The Principal/Researcher will also discuss what he learned about leadership in carrying out this Leadership Project. Subsequently, he discusses the limitations of the study and how those limitations might affect the use of these findings. Finally, after the findings have been placed in proper perspective, the author suggests areas for further research and summarizes the major insights drawn from the study.

Summary of Findings

Summary of Findings for Research Question Number One: What impact did the various aspects of the collaborative have upon efforts to build a common set of pedagogies for teaching math to struggling students?

Prior to the Leadership Project, the Principal/Researcher hoped that a certain array of interventions would transform the mind-set of the sixth and seventh grade math teachers
from competent individual teachers into two groups that debated their practices on a weekly basis, agreeing on the best practices to use in upcoming classes. The journal writing, observation and post-observation conferences were designed to build the confidence of individual teachers so that they felt emboldened to share their approaches for teaching particular content. The grade-level team meetings were structured to build a trusting environment in which teachers systematically addressed minute parts of lessons where students might struggle. After four years of working with the Central Valley faculty, the Principal/Researcher had learned that comparing student performance on common assessments, the conventional approach to developing a set of best practices in a PLC, might backfire. Therefore, in order to give the teachers a reason to look in detail at their instruction and its impact on student performance without competitiveness and defensiveness, the Principal/Researcher asked teachers to present their ideas for how to best approach upcoming material to struggling students at the weekly meeting and then reach consensus on how they would teach the material. To build a sense of team and to enable each teacher to have a visual sense of the teaching style of their colleagues, the Principal/Researcher asked teachers to observe each other teach and de-brief on their observations.

Prior to the beginning of the Leadership Project, the Principal/Researcher made some assumptions, some of which were quickly dispelled. First of all, he anticipated that peer observation would have the most significant impact on the success of the teacher groups in selecting a best practice. During the study, however, he found it difficult to separate out the different interventions because the work involved in each intervention overlapped with others. Peer observation, for example, was only meaningful because the teachers spent time discussing their insights at grade-level meetings.
The Principal/Researcher, also predicted prior to the Leadership Project that the grade-level groups would use the interventions productively. All of the teachers began the Leadership Project with confidence that their time together would be productive. After all, they had worked as a math department and with individuals within the math department effectively for years. The Principal/Researcher also knew that the group felt an urgency to improve the achievement of its struggling students as a result of disappointing results on the state assessments.

Both grade-level groups, indeed, responded to the interventions positively. They wrote thoughtfully in their journals, they had engaging grade-level meetings, and they enjoyed observing each other. The Principal/Researcher ensured that meetings took place and encouraged the groups to find the differences in their approaches, and thus disagree regularly, before determining as a group a best practice. The interventions seemed to make the sixth grade teachers more engaged in the ongoing development of the sixth grade curriculum. Mary felt that the group had identified a best practice effectively regarding the integration of fractions into several other units in the math classroom. Rhonda expressed excitement that the next year she would contribute more effectively because she would be teaching sixth grade for the second consecutive year. The seventh grade group was less comfortable with the careful discussion of different instructional approaches. The rapid-fire disagreements that the Principal/Researcher encouraged as part of the grade-level meeting protocol did not make the group members more comfortable.

Ultimately, the Leadership Project’s interventions did not enable the members of either group to create a systematic approach in which a best practice was identified at each meeting. Even Mary and Rhonda, two teachers who respected and enjoyed each other
immensely, and had co-taught extensively in the past, did not consistently question their assumptions about effective practice. When evidence presented itself that Mary’s focus on teaching conceptual understanding to struggling students might be flawed, for example, Rhonda encouraged the group to move on to the next topic rather than re-examine their whole philosophy.

Summary of Findings for Research Question Number Two: How similar did the teachers’ questioning patterns become by the end of the year?

The grade-level groups attained a high level of convergence of content. In-class discussions that led to slightly different assessments did not represent significant philosophical differences among teachers. Throughout the sixth and seventh grades, all math teachers emphasized guided instruction, expecting even their struggling students to develop a conceptual understanding of most math topics.

When occasional disagreements occurred, the grade-level groups responded differently. When the sixth grade group disagreed, the build-up of positive feelings among members allowed them to agree on a best practice fairly quickly. While these conversations frequently did not re-examine the deeper flaws in an approach, the group functioned well, finding solutions to any problems quickly. The seventh grade group’s discussions, on the other hand, became less spontaneous and thoughtful when the members disagreed. Awkward silences at times slowed down the momentum of the group. As a result, the seventh grade group made fewer decisions about instructional techniques that they would all pursue in their classrooms.
Summary of Findings for Research Question Number Three: What were the challenges that the Principal faced in implementing the collaborative structure?

The Principal/Researcher’s attendance at team meetings encouraged difficult conversations to take place. However, he had hoped to create a model PLC that could run itself after eight months. Specifically, he needed to see the teachers adopt a habitual approach to finding and using best practices and avoid competitiveness and defensiveness.

It is not clear that he succeeded. Rhonda and Mary exerted initiative at various points during the Leadership Project, suggesting flexibility and a distributed quality to the leadership crucial to the creation of a PLC. Even in the sixth grade, however, teachers often stopped short of acting as a PLC because at times they implemented practices that they did not all agree were the best ones. In the seventh grade group, furthermore, members did not accept that approaches should converge.

Discussion of Findings

The findings described above support the view of researchers, cited in Chapter Two, that providing teachers with clear avenues for expressing conflicting beliefs and coming to agreement on how to proceed holds significant promise for improving instruction. If colleagues have a basic level of respect for each other, and it is understood that convergence is critical, they are capable of arguing a point vigorously and resolving their disagreements to reach consensus on one particular approach. Helping less verbally articulate teachers develop clear arguments for their approach prior to the meeting, as the Principal/Researcher did at his post-observation conferences, is an effective approach to jump-starting this discussion and collaboration.
Chapter Two documented how some researchers who study PLCs believe that principals can have a greater impact in molding positive relationships among participants by participating actively in facilitating the discussions. Bezzina’s work (2006) suggested that a Principal/Researcher can play a more authoritative role that will make less effective groups, like the seventh grade math group in the study, function more effectively. Bezzina quoted one teacher in a school in a different study that felt that if the principal had exerted greater control group discussions would have surfaced best practices more consistently. The teacher stated:

When there was no designated authority or person who could bring out the various mental models of the group, problems were not really resolved … we [did] find it hard at times to reach a compromise, especially when some members [were] adamant about their point of view, and are unwilling to see alternative viewpoints. (p.163)

Without the principal’s facilitation, the group was not able to have thoughtful discussions in which all members felt heard.

While emphasizing the use of positional power in creating effective collaborative structures, De Lima (2001) did not emphasize the role of the principal in making the group members comfortable during discussion or in the importance of group members enjoying each other’s company. De Lima, in fact, stated that what he called “strong personal ties” at times “[could] even be an obstacle to the vigor of a professional community.” (p.108)

Teachers may be more likely to take risks as teachers in front of colleagues with whom they do not have deep emotional ties. De Lima emphasized the importance of “cognitive conflict” (p. 111) among colleagues, not close friendships, in causing improvement in instructional approaches, and avoiding the impulse of many collaborative enterprises to engage in
“groupthink.” (p. 113) De Lima argues that schools must make collegial interactions a requirement of all teachers. He suggests that school administrators foster group identity through competition among teaching teams. In a sense, De Lima’s research supports the Principal/Researcher’s findings that groups that identify best practices through a rigorous sharing process and an emphasis on convergence can develop a group identity that moves beyond ”groupthink” and motivates each individual member to teach as effectively as possible.

Ultimately in the Leadership Project, despite a high level of convergence, consensus in both grade-level groups only reached a certain depth. Even in the smoothly functioning sixth grade group, Rhonda did not dispute Mary’s focus on developing conceptual understanding for struggling math students. Rhonda did not stop the group’s progress when evidence arose that showed that students engaged more deeply when they learned a task through a simple procedural explanation. Apparently, Rhonda did not want to engage in a version of De Lima’s “cognitive conflict” with her colleague who was also her friend.

While it is clear in the research and this study that in order to develop a PLC, school leaders must value vigorous discussions of practice over the short-term comfort of staff, it is also clear that the eight months of this study was not enough time for colleagues to develop fully functional PLCs. Lam, Yim and Lam (2002) explained how when they tried to impose “contrived collegiality” they needed to “[sacrifice] administrative efficiency for the slow formation of shared beliefs, values and norms among the teachers.” (p. 190) Their patience enabled them to gradually initiate trusting relationships among teachers and eventually spark valuable conflict during staff discussions. Clearly, school leadership must find some way, whether through a mission statement, core values, or an improvement plan, to make effective
“joint work” (Little, 1990, p. 513) a long-term initiative of the school staff, and give it the
time to flourish. With that culture in place, teachers can put aside their emotional needs for
comfort and engage with each other in the search for a best practice.

Once the values of the school staff have established a climate for successful
collaboration, school leaders should make the comparison of practice as simple as possible
for staff. The Principal/Researcher found that even when he had set the stage for a rigorous
discussion of practices, teachers often hesitated to pick a best practice because they viewed
their students as different from their colleagues’. At times, they also gave different
assessments, making the results of diverging approaches less clear. As part of making
continuous collaboration a value at the school, principals should build agreement among staff
that structures that provide commonality are helpful. Protocols and common assessments
bring predictability to discussions in which teachers might be nervous about looking less
competent than their colleagues. While in the years prior to the Leadership Project, the
Principal/Researcher encountered great resistance to using protocols and common
assessments at Central Valley, the research and this study encourages him to continue this
work patiently. DuFour and Eaker (1998), in fact, see the process of creating and using
common assessments as a re-assuring and energizing exercise for teachers. They write:

The process provides teachers with useful feedback on their performance… The
teacher who has no idea of how the performance of his or her students compares to
that of other students in the next room, the next county, the state, or the nation is
unfortunately the norm rather than the exception. People cannot improve their
performance when they work in a vacuum. Individuals need feedback and
comparative information to help them assess and enhance their effectiveness. This
process provides feedback mechanisms that help teachers improve their performance. This process motivates teachers to continually improve. (p. 177)

The re-assuring feeling that comes when teachers know the standard for excellent teaching provides them with the comfort necessary to overcome their natural tendency towards isolation.

*Implications for Practice and Policy*

Medical physicians engage in a far more rigorous process than teachers in enhancing their skills as their careers progress. At a hospital where doctors are continually improving their practice, the process of “daily rounds” is institutionalized. In these hospitals, groups of doctors operate as a team, integrating the latest academic research into their lengthy conversations about the progress of a single patient. “Lesson study” seems the closest approximation of this approach in an elementary or secondary school setting. During lesson study, groups of teachers revise a single lesson several times, observing several teachers implement it before determining that they have arrived at a best practice.

Clearly it is not possible for schools to completely replicate the medical model of “daily rounds.” Several doctors can spend long periods of time discussing one patient, while secondary-level teachers are responsible for delivering five lessons a day to more than one hundred students. Teachers’ discussions of an individual student cannot be as thorough or as complete as those of doctors, but they can help serve to improve their practice. Even lesson study groups, which exist in different forms throughout the country, can only perfect one lesson at a time, over several weeks. Common assessments, therefore, are valuable because they immediately focus the teachers’ discussion on areas in which students have struggled. Principals need more training in creating the supports that teachers need to create common
assessments that effectively identify student needs and improve teacher practices in the most
efficient way possible.

Teacher training institutions also have a significant role to play in preparing teachers
to engage in mutual collaboration. Schools should require that students develop the technical
and analytical skills necessary to develop effective assessments and chart student progress.
Schools, furthermore, should be able to expect that their new teachers have significant
experience in working with specific protocols for looking at student work.

Educational policymakers and leaders could spur more effective collaboration among
math teachers, furthermore, by agreeing on mathematical approaches that work. Currently,
math textbooks and curricular materials present contradictory approaches that confuse
teachers. The United States Department of Education could play an important role in
resolving the unresolved Math Wars. They could focus research on determining how much
conceptual understanding struggling math students need in order to retain math knowledge.
With a clear, general sense of the balance that reluctant math students need to be successful,
teachers could move more deeply and efficiently towards integrating explicit and guided
approaches to teaching mathematics.

Leadership Lessons

As the leader of this research project, the Principal/Researcher played a few different
leadership roles. He played the role of coach and cheerleader in his post-observation
conferences, emphasizing in his conversations with teachers what strategies they used that
were effective. He then encouraged them to discuss those strategies, as best practices, at the
grade-level meetings. The Principal/Researcher also played the role of facilitator at grade-
level meetings, making sure that the groups followed a protocol of discussing specific aspects of the lesson. He probed the teachers when he saw that they were employing different instructional strategies and encouraged them to discuss their differences in order to converge. Finally, the Principal/Researcher expressed his leadership by serving as a supervisor, making sure that staff attended meetings and shared what they had discussed individually with the Principal/Researcher. By playing these different roles, the Principal/Researcher built closer relationships with his colleagues. They appreciated the fact that he knew their curriculum and could speak about it knowledgeably. He also could contribute to conversations as an objective outsider, questioning assumptions that the math teachers had not noticed they had made. (Mary and Diana’s Final Interviews, June 2008)

The Principal/Researcher discovered that building capacity among teachers is a process that is not entirely predictable. In his years as Principal at Central Valley, he has seen previously insecure teachers bond professionally and create an effective learning community within months. At the same time, he has seen veteran teachers with spotless reputations back away from intense collaboration. Clearly, establishing school norms and a culture of relentlessly searching for improved practice is crucial. However, during the Leadership Project, the Principal/Researcher also learned that teachers needed to experience the ups and downs of carefully comparing each other’s work several times before they could see the benefits of this collaboration for their students. Clearly, a principal needs time to build these beliefs and habits before teachers have the capacity to carry on independently.

The Principal/Researcher found that the size of the grade-level groups, three teachers, may be problematic, particularly when both genders are represented. When conflict arose about implementing one of two approaches, one teacher probably felt more isolated because
the other teachers had agreed. The Principal/Researcher should look for opportunities to make grade-level groups of four.

By repeating to the group that its goal was to find a “best practice” and agree to implement that practice in all of their classrooms, the Principal/Researcher raised the stakes of the group’s discussions during the study. His intention was to encourage all members of the group to participate fully and vigorously debate different approaches. The disadvantage to this strategy is that the teachers felt nervous that implementing the same approach might strip them of their independence. Diana said that striving for a best practice could make teachers “robotic.” (Diana’s Final Interview, June 2008) Dan, even after stating that a colleague’s approach was a better practice, expressed great reluctance to compare the quality of even one of his strategies with the strategy of another teacher. He said, “I don’t think any of us would say that we do something better than the other person, just different in some cases.” (Dan’s Final Interview, June 2008) The Principal/Researcher learned that he must spend significant time during each grade-level meeting re-assuring teachers that a consensus approach simply provides a foundation that allows them to more fully express themselves as teachers.

The Principal/Researcher learned that establishing stronger behavioral norms could have helped teachers feel more comfortable questioning each other’s practices. More formal norms could have established discrete times for members to process their feelings towards each other, preventing frustrations from festering. Clearer norms could also have helped the Principal/Researcher ensure that the teachers relaxed during their meetings by establishing ways to make probing questions feel less personal.
The Principal/Researcher learned that one of his most important jobs was to help the participants minimize the negative impact of conflict by focusing them on the ultimate goal, serving struggling students. A regular feature of meetings, for example, could have focused on discussing the growth of certain struggling students, taking the spotlight off of the teachers, while, at the same time, giving credit to the teachers for their hard work.

Limitations of the Study

A significant limitation of the study was that the sample size included only two teacher groups, with a total of four subjects, one person participating in both of the grade-level groups. The sample site, furthermore, is not “typical”: Central Valley Middle School has a student body that is over ninety percent white and is affluent. The study, therefore, adds to the growing body of research regarding PLCs but cannot easily be generalized. Perhaps the greatest limitation of the study was the fact that the Researcher was also the Principal at the school. Clearly, the fact that he supervised the staff members that participated affected their actions during the research project. His presence at the meetings probably limited the spontaneity of the conversations, curtailing certain disagreements that might have occurred. The teachers may have also participated differently because they wanted to impress and please the Principal.

Implications for Further Study

Far more research is conducted on improving teaching in under-resourced schools than at high-performing schools. The high average test scores of these schools often masks the needs of their struggling students. In order to develop best practices to help these students, the state and the Federal government must spotlight the needs of this small isolated
group by continuing the practice of requiring schools to show improvement on standardized assessments among all disaggregated groups and supporting research in best practices in all schools. High-performing suburban schools could learn a lot about how to address the needs of struggling students by looking to the expertise of many urban schools whose teaching methods are primarily designed for struggling students. Researchers should study what motivates high-performing districts to seek the advice of schools whose average scores on standardized tests are often lower. Researchers should also identify private non-profit organizations that have had success in convincing both high-performing and struggling schools to use similar best practices.

Conclusion

The Principal/Researcher studied the impact that encouraging teachers to find a common approach would have on the quality of their collaboration. In just eight months, he sought to develop groups of sixth and seventh grade math teachers to achieve a consistently rigorous exchange of best practices and could accurately be called Professional Learning Communities. The researcher found that, while the Leadership Project was a positive experience for the teachers involved, eight months was not enough time to form a PLC. Perhaps, if more participants had been involved in the study, individuals in the study might have felt a greater sense of urgency to conform to the goals of the interventions. He also discovered that encouraging convergence could not replace the need for teachers to use common assessments to compare their different approaches. At the same time, the researcher found that emphasizing the group’s responsibility for developing a common set of practices is a useful tool for getting teachers to choose the best practice for struggling students.
References


Appendices

Appendix A: Prompt for Participants’ Journal Responses

1. Labeling: Please write the date at the top of the entry and your name on the first page.

2. Completion Request: Please complete this entry soon after a weekly grade level meeting or directly after your peer observation to make the entries as fresh as possible. I will keep all entries confidential, locking journals in my office when I am not reading them. I would like you to complete at least one entry every month.

3. Format: Please write at least one page of each entry in which you discuss the following:

   - What part of the curriculum content did you discuss at your meeting?
   - Have you taught this content differently than your colleague?
   - Will you change the way you teach your content? Why or why not?
Appendix B: Pre-Intervention Interview Questions for Participants in study:

Background of Participant

1. How long have you taught at CMS? Where did you teach before? Have you taught any other subjects at CMS?
2. Why did you decide to become a teacher?
3. Why did you decide to become a math teacher?
4. Describe particularly satisfying experiences working with colleagues?
5. Describe particularly challenging experiences working with colleagues?
6. How have administrators best supported your work?

The Math Department at CMS

7. How has your meeting time with other math colleagues evolved over your career?
8. How has the math curriculum evolved over the last several years?
9. What do you think of the texts that you currently use in your teaching?
10. What do you see as the greatest challenges in sharing work with your math colleagues?
11. What are the characteristics of a strong math colleague and why?
12. What do you anticipate the greatest challenges will be in working with other grade-level math teachers?

Teaching Struggling Math Students:

13. How do you balance the teaching of concepts and procedures to struggling math students?
14. What types of problems in your curriculum cause particular trouble for math students who struggle? Why?

15. How have you addressed the students’ weaknesses in the particular unit that you describe in number 2? How has that worked?

16. What kind of discussion questions do you ask students during this lesson? How did they answer?

17. Describe how the assessment impacted your teaching.

18. How do you use assessments?

19. How do you think we can improve the assessments described above?
Appendix C: Post-Leadership Project Interview Questions

1. How successful was the weekly collaborative this year? (0—entirely unsuccessful, 5 extremely successful) Why do you say this?

2. How did you feel about how the meeting was structured?

3. What specific strengths did your specific colleagues offer you?

4. What specific strengths did you offer your colleagues at these meetings?

5. What impact did you have on the effectiveness of the collaborative?

6. How have your feelings towards your grade-level colleagues changed this year? (much more distant, more distant, the same, closer, much closer)

7. Has your teaching strategies converged with your colleagues this year? How much? Any particular units where this was true?

8. How effective did you feel your teaching was with struggling math students this year compared to other years? (much less effective, less effective, the same, more effective, much more effective)
9. Did you use a new strategy with a struggling student this year? If so, what was it?

10. What had the most impact on the effectiveness of your teaching struggling students: peer observation, common assessments, principal observation/post-ob conferences, writing in the journal

11. What had the most impact on the convergence with your colleagues of your teaching struggling students: peer observation, common assessments, principal observation/post-ob conferences, writing in your journal

12. How would the meetings have gone differently if the principal had not been present?

13. What was the impact on you of the post-observation conferences with the Principal?

14. If you could do this collaborative again next year, knowing what you know now, what should be changed?

15. What do collaboratives need to be ideal?