

ABSTRACT

Title of Dissertation : A CASE STUDY: CHANGE FACILITATOR
ACTIVITY TO SUPPORT THE
IMPLEMENTATION OF A DISTRICT'S PRE-
K-12 ALIGNED MATHEMATICS PROGRAM

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James County Public Schools was a 74,000 student school district in Maryland that chose to implement a pre-K – 12 aligned mathematics program in response to state mandated assessments imposed by the *No Child Left Behind (NCLB)* federal legislation. Schools that fail to demonstrate Adequate Yearly Progress on these assessments may descend into a spiral of sanctions. Consequently, districts must choose and implement programs that will increase student achievement. This study sought to determine the characteristics of the pre-K – 12 aligned mathematics program and explore and describe the dynamics of its implementation through the lens of a change facilitator. The study used a case study design methodology. The findings revealed the district implemented four parts of an instructional component: district assessments, pacing guides, professional development, and a single text adoption program. The change facilitator undertook activities to support the implementation. The study found three positive results of the implementation: Creation of Student Support Courses, Creation of a Benchmark Data System, and Creation of a University of Maryland Baltimore County (UMBC) Cohort. When the

pace of the implementation was analyzed, conflict surrounded the implementation and it yielded four negative results: Competition for Scarce Resources, Defensive Professional Development, a Trail of Memos, and Professional Blunders. The findings of this study added to the research and literature on implementation, particularly the role of the change facilitator. The findings also will assist other districts in policy and practice as they too seek to implement new instructional programs in their efforts to comply with the demands of *NCLB*.

A CASE STUDY: CHANGE FACILITATOR ACTIVITY
TO SUPPORT THE IMPLEMENTATION OF A DISTRICT'S PRE-K-12
ALIGNED MATHEMATICS PROGRAM

By

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Chapter 1: Introduction

Background

James County Public Schools (JCPS) is a large school district in Maryland. It joined the other 23 districts in Maryland, as well as most school districts across the nation, in responding to the *No Child Left Behind (NCLB)* federal legislation as its demands swept across the nation. The JCPS curriculum department in the district went through particularly significant changes. Entire curriculums were rewritten in new formats from pre-Kindergarten through 12th grade in a short period of time. This brisk pace met curriculum goals; however, it also created conflict and left a host of problems in its path.

Honig (2006) captured the new climate of educational leadership that JCPS and other districts faced by noting the “short timelines for producing demonstrable improvements put a premium on swift and confident action” (p. 3). According to *NCLB*, states had to establish a definition of Adequate Yearly Progress (AYP) to determine the academic achievement of each school in a district (Paige, 2002). Achievement was determined each year by student performance on state-designed tests in reading and mathematics.

Districts have significant reason to be acutely concerned about the effects of *NCLB* on their schools: Then U.S. Secretary of Education Rod Paige (2002) helped to define the spiral of sanctions into which a school descended if it failed to make AYP for 2 consecutive years. These sanctions were called “School Improvement Options” and increased in intensity each year that the school failed to make AYP. For example,

in the first year of School Improvement, the school might have to implement an academic tutoring program. However, if a school continued to not make AYP for the next 5 years, it must take more intensive measures, such as implementing an alternative governance plan (Paige, 2002). The net effect was that the school and school district lost more administrative control with each descending step of the AYP spiral. Yet “the focus on system learning has been largely missing in implementation research, especially in education” (McLaughlin, 2006, p. 226).

Districts’ concern about their schools meeting the *NCLB* requirements was heightened by the fact that they did not have a large number of research-based strategies available to help them choose instructional programs. As mandated by *NCLB*, school districts had to seek research-based strategies to help identify and implement their own instructional reforms. These strategies were a costly drain on the limited resources available to a school district—time, money, and personnel. Their proper selection called for “urgency for educational leaders to become more savvy consumers of research” (Honig, 2006, p. 23).

Some districts turned to initiatives such as school-based management in an attempt to give instructional decision-making authority to those more closely accountable for student success. Schools in these districts formed local teams comprised of administrators, teachers, and community stakeholders in an effort to unite resources and share decision-making responsibility. Other districts embraced new student groupings, such as building smaller learning communities within their schools. These smaller learning communities broke down larger school populations

that were necessary for resource efficiency but too large for individual student attention.

Another initiative that school districts investigated, particularly in the field of mathematics, was alignment. *Alignment* referred to a district's effort to narrow and unify the content presented to students in assessment, curriculum, and instruction. In an aligned mathematics program, the curriculum was well defined in standards that described what students should know and be able to do. Each assessment item was written to determine students' ability to demonstrate that understanding and skill at a proficient or advanced level. Finally, the instruction in the classroom linked the desired curriculum to the assessment by providing appropriate instructional strategies. Each day's instructional outcome addressed one or more content standards that students should learn and be able to demonstrate through an assessment at the end of that class.

Alignment provided a common focus for student learning. By aligning the assessment, curriculum, and instructional components of a mathematics program to a set of standards, the components were able to unite and support each other. As districts turned to alignment for a strategic response to increase student achievement, more empirical studies were needed to guide and revise the selection and implementation of aligned mathematics programs in a school district. The new "standards-based mathematics reform ... further increases the urgency of understanding these issues" (Hill, 2006, p. 66). However, districts had little precedence for direction in this initiative.

In Maryland, the Maryland State Department of Education (MSDE) guided the school districts in two of the three components in an aligned mathematics program. For the curriculum component, districts referred to the Voluntary State Curriculum (VSC). For the assessment component, districts referred to the Maryland School Assessment (MSA). School districts acted independently, however, in their decisions to create an instructional component that aligned the VSC and the MSA. Districts had to choose and implement the instructional component of their mathematics programs; however, little research was available to facilitate the choices they made in the design process and in the method in which the components were implemented. Yet as the pressure to raise student achievement increased, “school district leaders want[ed] to make evidenced-based decisions” (Corcoran, 2003, p. 1).

The Role of the Change Facilitator

During the time of this study, I was assigned to the Coordinator of Mathematics position for JCPS. I was responsible for creating and implementing the instructional component of its aligned mathematics program. In this study, I critically examined my activities in light of research by Hall and Hord (2006) on the role of change facilitators in supporting the implementation of successful school change. Although literature is rich with implementation studies, it lacks the viewpoint and information gained through the change facilitator’s vital implementation role.

Hall and Hord (2006) mined past research, including the Southwest Educational Development Laboratory and the Concerns-Based Adoption Model, and united it with their own research to define the change facilitator’s role. They recognized six functions of intervention performed by the change facilitator:

Developing, Articulating, and Communicating a Shared Vision; Planning and Providing Resources; Investing in Professional Learning; Checking on Progress; Providing Continuous Assistance; and Creating a Context Supportive of Change.

Hall and Hord (2006) noted that, “for decades there has been a lack of understanding of and attention to the process of leading change efforts” (p. 184). The study of the change facilitator’s role became important “as policy makers seek to design mechanisms to create alignment between and across levels of the system, issues of who has the authority to define, interpret, and shape the meaning of policy come to the fore” (Coburn & Stein, 2006, p. 43).

Hall and Hord (2006) described how the change facilitator’s position may fall at many levels in the district, including the Curriculum Coordinator. Although change facilitators may not initiate the policy or be responsible for its mandate, they “provide the interventions that can increase the potential for success of change or allow it to fail” (Hall & Hord, 2006, p. 185).

Research Problem

Despite the claims of proponents of system-wide alignment, there is little empirical research on challenges that district-level change facilitators face when implementing programs. Researchers have yet to provide detailed descriptions of the key instructional components of district-wide aligned mathematics programs. Nor have studies explored the issues that change facilitators face when implementing these components.

Purpose

Districts must respond to the mathematics accountability requirements in *NCLB*, and implementing an aligned mathematics program is one possible strategy they could choose to satisfy those requirements. Of the three components in an aligned program (curriculum, assessment, and instruction), the state often dictated the curriculum and assessment components. Districts were left to design their own instructional components, relying heavily on the actions of a change facilitator to implement the new component in the district.

The purpose of this case study is to explore the characteristics of the instructional component that one district chose for its aligned mathematics program and to describe the dynamics of its implementation by examining the activities that I undertook in my role as the change facilitator.

Research Questions

This study has three main research questions.

1. What are the characteristics of the instructional component that JCPS chose to implement in its pre-K–12 aligned mathematics program?
2. What were the dynamics the district encountered when it implemented the pre-K–12 aligned mathematics program in the school district?
3. What change facilitator activity supported the district's implementation?

The research questions in this study are derived from the growing demand for research-based strategies for districts to implement in their attempt to increase student achievement in mathematics. "Recent federal emphases on scientifically based

approaches to improvement arguably up the ante on researchers and practitioners alike to better understand the value and applicability of particular educational research in specific educational contexts” (Honig, 2006, p. 3). District leaders must thoroughly understand the choices available to them and know how to best implement them in their own district. The research questions are based on a review of the literature on curriculum and implementation that demonstrates a need for more empirical work in this field.

National Context

School districts across the country are working to decrease the number of students who progress through our schools without ever achieving a minimal level of proficiency in mathematics. In JCPS, for example, although 73% of third-grade students were able to demonstrate proficiency on the MSA in 2003, only 64% of the fifth- and 39% of the eighth-grade students were able to demonstrate proficiency.

This same trend appeared at the national level for the United States, as reported in both the Third International Mathematics and Science Study (TIMSS), conducted in 1995, and the Third International Mathematics and Science Study Repeat (1999). In 1995, U.S. 4th graders performed well compared with the international average, U.S. 8th graders performed near the international average, and U.S. 12th graders performed below the international average (National Center for Education Statistics, 2000). Additionally, the 1999 eighth graders in the Third International Mathematics and Science Study Repeat (TIMSS-R) represent the same group of fourth-grade students in the 1995 TIMSS. Consequently, one of the findings in TIMSS-R was, “the mathematics and science performance of the United States

relative to this group of nations was lower for eighth-graders in 1999 than it was for fourth-graders 4 years earlier, in 1995” (National Center for Education Statistics, 2000, p. 4). Hence, students were not receiving a value-added program or even one that allowed them to maintain their competitive level of performance. Rather, a cohort’s performance actually decreased over time. The findings in the state and national data suggest that current mathematics programs were not properly serving our students.

Maryland Context

School districts in Maryland who sought to adopt new mathematics programs as a strategy to increase student achievement had MSDE available as a strong resource. To design an aligned mathematics program, districts framed the curriculum, assessment, and instruction components to support each other and form a cohesive program based on a set of standards.

The new Maryland mathematics curriculum was defined in content standards that are “broad, measurable statements about what students should know and be able to do” (Maryland State Department of Education, 2004, p. 3). These content standards are embedded in the Voluntary State Curriculum (VSC). The VSC was developed by hundreds of educators in Maryland “who were committed to the development of clear, concise, well-articulated documents that would afford every student access to a rigorous and meaningful education” (Stack, 2004, p. 1). This curriculum document was formatted in each subject and grade level to begin with a broad content standard, narrow that focus by adding an indicator level, and finally specify a discrete objective. In this way, teachers expected what learning should occur (Maryland State

Department of Education, 2004). Additionally, assessment limits were added to the curriculum component to clarify the level at which the content will be assessed on the MSA. Therefore, the Maryland Content Standards and the Maryland Assessment Program were aligned through the VSC (Maryland State Department of Education, 2004).

Maryland's new assessment system was designed to meet the requirements of *NCLB* (Glazer, 2004). The assessment system was called the MSA. The mathematics MSA was administered in the spring each year to all students in Grades 3-8 and after the completion of a high school Algebra course.

Maryland school districts, therefore, had a clear option available in the VSC for the curriculum their students were expected to know. The districts also had a clear target for the assessment of that knowledge in the MSA. MSDE delineated the content and skills that Maryland students were expected to know and are able to do at each grade level, and it defined the format and level of rigor at which this content and these skills would be assessed.

District Context

The mathematics program in JCPS was reflective of many of the other curricular programs in the district—fragmented. Each of the 12 high schools, 19 middle schools, and 77 elementary schools had its own instructional components to provide for their students. The result was a wide variety of programs available in the district, with supplemental instructional resources varying from school to school. Additionally, the loose framework allowed for great varieties in the instructional

program from classroom to classroom within the same school. Teachers were able to pick their own texts and instructional materials and used different text assessments or created their own.

The result of this fragmentation on the children in a 74,000student school district was twofold. First, a great inequity existed in the quality and quantity of the instructional materials available to teachers and students in different schools. Some schools were able to garner the resources necessary to purchase current materials of instruction, whereas others had outdated materials. The second result of the fragmentation in the large district was the lack of continuity available for students as they transitioned from elementary to middle school and then from middle to high school. Because teachers were using a variety of instructional materials in their schools, students left each school with different levels of content knowledge and skills. For example, one elementary program might have had an instructional program that advanced students to exposure of prealgebraic topics, whereas another elementary school might have chosen an instructional program that favored a mastery approach to basic skills.

This fragmentation also made it difficult for the professionals in the district. For example, it was not possible to have district-wide conversations centered on student learning because students were at various places depending on the school they attended. The district also was unable to provide timely topic-centered professional development for teachers because the needs of teachers varied even within the same grade level throughout the district.

However, teachers in the district enjoyed their freedom to shop for instructional materials that appealed to them. They also were quite comfortable with a certain level of independence in the way in which they implemented the various mathematics programs in their own classrooms. Overall, the district had a loosely defined mathematics program in all of its schools.

Consequently, the schools' ability to guide students through the VSC and prepare them for the MSA varied greatly. Some schools had continued to update their materials when the new VSC was announced, and others did not stay current with the curriculum. The district's role at this time was merely a support system to the local schools, and schools did not feel a strong sense of accountability to the central office.

When Dr. Matthew was hired as the new superintendent in 2002, he clearly communicated his focus on student achievement. He initiated numerous programmatic and personnel changes toward this effort. In April of the 2002/2003 school year, I was assigned to the position of Coordinator of Mathematics for JCPS. By that time, several schools had already been identified as deficient by AYP standards and were working to alleviate the sanctions.

In my new role as Coordinator of Mathematics, my primary task was to design, implement, and evaluate a pre-K – 12 aligned mathematics program to increase student achievement. I worked with other coordinators in the district and colleagues in similar positions in mathematics offices across the state. I was charged with the success of all students in mathematics courses and their corresponding assessments. I led a small team of mathematics resource teachers, two in secondary and six in elementary, in designing and implementing the district's program changes.

The office had one secretary. This small team worked directly with the school principals, their faculties, other curriculum departments, and the central office staff.

This section described the fragmented state of the mathematics program as it began to respond to the *NCLB* demands. Each of the 77 elementary schools, 19 middle schools, and 12 high schools functioned independent of each other, often even varying from classroom to classroom within a single school. Although a comfort level existed within classrooms and schools with the familiarity of the long-standing program, the unique differences of each school left wide variation in their ability to prepare students for the MSA, and collaboration among schools was difficult. The next section sets the problem, purpose, and research questions in the context of the existing literature.

Overview of the Literature

This study seeks to explore and describe the characteristics of the instructional component that a district chose to implement in its pre-K–12 aligned mathematics program and to explore the dynamics the district encountered when it implemented the program through the lens of change facilitator. An understanding of the literature is necessary to provide background knowledge and to describe the historical path the nation has taken in its quest to increase students' knowledge and skill level in mathematics.

Several bodies of literature provided insight into this phenomenon. The first body of literature is the history of accountability and the condition of education in the United States that led to *NCLB*. As calls for increased student achievement grew in

magnitude, the level of accountability rose proportionally. Additionally, as more policy mandates appeared, the responsibility for student achievement shifted in the education system. The new role of *NCLB* completes this body of accountability literature.

Another body of literature comes from the work done on alignment in mathematics programs for districts to implement in their schools. Although districts are independent in their choice of strategies to meet the *NCLB* demands, alignment appears as a potentially valuable response to increase student achievement. Each of the three components of an aligned mathematics program—curriculum, assessments, and instruction—was explored to provide an understanding of their use in an accountability system. The JCPS instructional component was broken down into its elements: district assessments, pacing guides, professional development, and a Single Text Adoption (STA) program. Each of these elements was reviewed in the literature section.

The final body of literature necessary in this study is the work done on implementation. This literature provided insights into what is known about the dynamics of implementation and the success of programs. The role of those responsible for implementation, from the classroom to the district level, was analyzed. Additionally, the pace of implementing a district initiative is discussed. This body of literature will show that “implementation research should aim to reveal the policies, people, and places that shape how implementation unfolds and provide robust, grounded explanations for how interactions among them help to explain implementation outcomes” (Honig, 2006, p. 2).

Significance

The results of this study will contribute to the small body of current research on a pre-K–12 aligned mathematics program and the critical role the change facilitator plays in the dynamics of implementing it in a district. These efforts will also provide much needed information to policy and leadership practice in school districts searching for research-based instructional programs needed to increase student achievement. This research is particularly timely because it examines one school district’s effort at alignment after the first year of implementation. The details of the new mathematics program could help to validate existing efforts or establish a new line of thinking for districts (Creswell, 1998).

The process of studying individual districts in their own context is important because the context and dynamics of a district might actually facilitate or hamper the effectiveness of a program, thereby masking its true effectiveness. Also, educational leaders might also better understand how that same program might be adapted to their own district’s context and dynamics. Malen (2006) adds that “policy implementation is a messy process marked by combinations of contests, contingencies, and disruptions that can no be fully anticipated let alone readily controlled” (p. 101). However, additional studies are needed because “bringing that reality into view is arguably an important service” (Malen, 2006, p. 101). Multiple districts must be studied in their unique contexts. The reporting of those findings, in turn, is case-specific in lieu of searching for universal applications.

I chose JCPS in Maryland as the district to study because it recently implemented a pre-K–12 aligned mathematics program in an attempt to increase

student success in mathematics. In the first phase of the study, I make a qualitative exploration of the instructional component—district assessments, pacing guides, professional development, and a STA program—by analyzing artifacts from the district. The results of this phase will yield a greater understanding of what a pre-K–12 aligned mathematics program looks like in a school district, and the product could serve as a model to other districts.

In the second phase of the study, I explored the dynamics that the district encountered when it implemented the program and the role of the change facilitator. “A productive viewpoint for the next generation of implementation researchers would integrate lessons from implementation research with current ideas about learning systems and knowledge management to understand how exacting systems can learn as part of policy implementation” (McLaughlin, 2006, p. 227).

The results of this phase of the study will add to the research base of district program implementation as a possible strategy for districts to utilize in response to increased accountability for student achievement. The second phase of the study will help educational leaders responsible for the policy and practice of implementing programs understand the dynamics of implementation. When uncovering the history of another district’s experience, it is important to not only determine implementation results, but also understand the variables in that district that served to enhance the implementation or caused it to crumble. In fact, the second phase of this study contributes to the fuller understanding of the first phase because without a detailed understanding of the parts of the instructional component, it would not be clear if whether each part’s success or failure was due to its design or implementation. It is

only with careful scrutiny to implementation that one can uncover whether “the will and the capacity of local actors and local implementation contexts could compromise even the most well-developed policies and delivery systems” (Smylie & Evans, 2006, p. 187).

The Change Facilitator Lens

I was the Coordinator of Mathematics for JCPS during the time that the new aligned mathematics program was examined in this research, and the change facilitator lens allowed me to elaborate on all aspects of the case. I was motivated to study a case that would add to the literature on the role of change facilitators during the implementation of district initiatives, such as designing their own instructional programs. I also was eager to add insight to policy and practice for districts motivated to undertake reform initiatives.

As the Coordinator of Mathematics for JCPS, I acted as the change facilitator to design and implement the instructional component of the aligned mathematics program. This insider knowledge provided a unique view of the program’s implementation. However, the political nature of policy implementation also “involves the ability to take a broad and (curiously) an almost disinterested view of the kaleidoscope of interacting forces that impinge on a school system problem-solving and decision-making process” (Blumberg, 1985, p. 56).

Through the change facilitator lens, I was often able to see into the executive offices at the district level where many of the implementation decisions were made. The proper allocation of resources was a constant topic. As a result, central office staff continuously looked for validation that the resources were yielding positive

results; however, all personnel realized the MSA would not even be administered until spring and the results not received until summer.

The change facilitator lens also allowed me to see into the view of those responsible for implementing the change at the school level, and this view also an important factor during the implementation. The complexity of the new instructional component and the fact that all parts were implemented simultaneously caused significant normative adjustments for schools, particularly classroom teachers. As the change facilitator, I had to bring to the forefront the benefits of the new program for students to facilitate the shift for teachers (Fuller, 2001). The focus on student achievement was an appropriate goal and provided a basis for measuring success (McLaughlin & Hyle, 2001). “When teachers work on personal vision-building and see how their commitment to making a difference in the classroom is connected to the wider purpose of education, it gives practical and moral meaning” (Fullan, 1993, p. 145).

Because the district had other personnel with and without official titles who were influential in the change, it promotes a discussion of the Change Facilitator being defined by the activity one undertakes to facilitate change. Hall and Hoard (2006) defined six functions of interventions necessary for making change happen, and this lens defined how I collected, organized, and analyzed the data.

Function I: Developing, Articulating, and Communicating a Shared Vision of Change—As the Coordinator of Mathematics, I had to follow the direction of the superintendent, yet interpret that leadership into a framework appropriate for the

mathematics program. This role necessitated the need for a clear mission for the math office and multiple visual and audio opportunities to communicate that vision.

Function II: Planning and Providing Resources—Along with every other Coordinator in the district, I was responsible for determining the needs of the program and acquiring the resources necessary to meet them.

Function III: Investing in Professional Learning—The need for structural change in the mathematics program necessitated systemic change in district personnel’s knowledge, understanding, and skill. Professional development, therefore, became a key focus for the mathematics office.

Function IV: Checking on Progress—Such a significant allocation of time, personnel, and money necessitated the monitoring of the program’s effectiveness. The math office had to develop a monitoring procedure that would cut across the district to highlight advancements and deficiencies.

Function V: Providing Continuous Assistance—The change process is assuredly nonlinear; as the Coordinator of Mathematics, I had to constantly adjust to implementation fallout.

Function VI: Creating a Context Supportive of Change—The first five functions all integrate to find the best environment conducive to change. The enactment of these roles allowed me to gain a district perspective in the implementation of the new policies. I had occasion to see into the central office decision-making arena for the policies and into the school-level policy implementation arena. With this perspective, I was able to better design a study that would enable me to fully understand the dynamics of the implementation.

Limitations

This case study has limitations. First, it was limited by a geographical boundary—JCPS, Maryland. Consequently, only the characteristics of the instructional program in this district were available to study. Although the four parts of the instructional component chosen by the district appear in the literature, they are not inclusive of all possible choices. Also, the use of a single district limits the sample representation of elementary, middle, and high schools available to study.

Another limitation of the study is that it was bounded in time—namely, a historical framework. Because the implementation of the new mathematics program occurred in the 2003/2004 school year, I only collected artifacts and data that were available in the county for that period of time. Additionally, during this period of time, principals were under tremendous pressure from the district to increase student performance. This pressure may have translated into the principals making an overzealous effort to fully implement the program.

The study of a single district, however, is not without merit. As researchers began to wrestle with understanding the dynamics of implementation in district policies in the current accountability arena, they had to consider the different contextual permutations that exist in districts. The context of a district may well affect the outcome of a program's implementation, and an argument can be made that research in this area strengthens educational leaders' understanding of the best programs to design and implement. These variations affect "another set of factors affecting an implementing site's response to policy goals and instruments: the agent's

capacity, internal administrative structures, and norms of actions” (McLaughlin, 2006, p. 213).

Another limitation of the study is the lens through which it was viewed. As the Coordinator of Mathematics acting as the change facilitator, I had access to most activities and communications regarding the implementation of the math program. I was not privy, however, to confidential communication. For example, the executive staff in the district held regular meetings in which occasionally aspects of the program were discussed, and I was not able to attend. Also, MSDE often directly communicated to superintendents, and I only had access to the information that was forwarded to my office.

Definition of Terms

Accountability—an educational system in which those responsible for student achievement are rewarded or sanctioned based on the performance of their students on measurable outcomes.

Alignment—requiring the linkage among the intended curriculum, the instructional process, and the postinstructional assessment (Walker, 1998).

Assessment—a test used to determine student achievement as measured by mastery of content and skills.

Change Facilitator—“facilitators provide the interventions that can increase the potential for the success of change or allow it to fail” (Hall & Hord, 2006, p. 185).

Curriculum—the content standards for a grade level or course in “documents that define what students should know and be able to do in given subject areas” (Wixon, Dutro, & Athan, 2003, p. 69).

Implementation—the ability to implement a program is “the product of interactions between people, policies, and places” (Honig, 2006, p. 2).

Instruction—the educational decisions made to ensure that students could demonstrate mastery of the content on the assessment.

Chapter 2: Review of the Literature

Introduction

Changes in the scope and magnitude of federal and state education policies heightened districts' concerns because they were often responsible for the implementation of these policies and consequently measured against their outcome. In a *Review of Research in Education* journal, the editorial board noted that, although these policies had received much attention in the past, the new mix of these policies and the actors who implement them presented a need to update an examination of the research (Floden, 2003). Additionally, Massell (2000) recognized that districts had often been ignored in the change process, although they are the legal and fiscal agents overseeing schools. Districts are a “major source of capacity building for schools—structuring, providing, and controlling access to professional development, curriculum and instructional ideas, more and more qualified staff, and so on” (Massell, 2000, p. 6).

Districts, therefore, were searching for strategies that increase student achievement in mathematics in response to policy mandates. One such possible strategy is the implementation of an aligned mathematics program. Each of the three components in an aligned mathematics program—curriculum, assessment, and instruction—has received varying degrees of scrutiny in the education arena. Curriculum has historically been the topic of standards-based reform, and assessment has been the focus of high-stakes testing debates. The next step was to study the activities necessary to link these two entities through the least understood component:

instruction. The newness of alignment work and the pace at which it has developed, however, left little opportunity or time to fully research the instructional component and its significance.

The following is a review of the current literature available on the necessity to develop an aligned mathematics program as a response to a policy mandate to increase student achievement and a particular need to study the dynamics of the implementation of the instructional component through the lens of the change facilitator. This review contributes to a new body of research on a not well-understood phenomenon of implementing a pre-K–12 aligned mathematics program and its role as a possible strategy for districts to choose in response to new policy mandates and the change facilitator’s activities that promote or inhibit its success.

This literature review begins with a historical analysis of accountability policies and follows their path toward the current accountability landscape. I then provided a summary of the implications for districts as a result of the *NCLB* legislation and some of its consequential critiques. The possibility of curriculum alignment as a strategy for districts to implement in response to *NCLB* is then examined. Curriculum, assessment, and instruction are each analyzed as a separate entity and as part of an aligned mathematics program. I then reviewed the history of policy implementation studies and further explored the necessity to fully understand the dynamics of policy implementation. The inevitable conflict that results in such an implementation is then discussed. Next, I introduce Honig’s model as a base for studying the dimensions of policy implementation with a particular focus on the pace

of implementation. The review ends with a conceptual framework that was used to design the study.

Accountability History

Accountability is sweeping the landscape at the national, state, district, school, and classroom levels, and all those in the path are being measured and rated, praised or punished. The goal of “test-based accountability systems is to improve student achievement” (Hamilton, 2003, p. 39). Accountability has affected all educators, and it has had a significant impact on the way in which we school children. The catalyst for these changes was summarized in one federal piece of legislation, the *NCLB*, which directed “the implementation of accountability systems that include standards, assessments, annual progress goals, and incentives” (Hamilton & Stecher, 2004, p. 579). In response to this legislation, states began to examine their own curriculum, assessment, and instruction structures. Rod Paige, former Secretary of Education, called the rate of the nation’s progress a record pace in implementing change (U.S. Senate Hearing, 2004).

The current accountability environment, however, did not appear on the educational landscape overnight. Linn (2000) noted that as early as the 1950s, students had to perform successfully on a test to be selected for higher education or to be identified for gifted programs. Then in the 1960s, Title I was evaluated based on a collective set of student results to determine the effectiveness of its program. In the 1970s, minimum competency tests became a means to determine whether students had mastered a basic knowledge set.

The catapult to move toward comprehensive accountability systems, however, landed solidly in the education arena in 1983. At that time, the National Commission for Excellence in Education (NCEE) “was created as a result of the Secretary’s (of Education) concern about the widespread public perception that something is seriously remiss in our educational system” (National Commission for Excellence in Education, 1983, p. 1). This report swept the accountability literature when it first heralded that “the educational foundations of our society are presently being eroded by a rising tide of mediocrity” (National Commission for Excellence in Education, 1983, p. 5) in American education. The release of the Commission’s report, entitled *A Nation at Risk*, began “what might be called the ‘learning through standards and accountability era of American education’ ” (Sloane & Kelly, 2003, p. 12). Although it was prepared for the U.S. Secretary of Education, *A Nation at Risk* became part of American culture when it brought to light the failings of our schools to adequately prepare students, particularly in mathematics and science. The primary concerns of the report were focused on the inadequate education that schools were providing to students (National Commission for Excellence in Education, 1983). Schools and school systems began to react to the recommendations of the report. Some of the recommendations of the report included:

- The curriculum in the crucial eight grades leading to the high school years should be specifically designed to provide a sound base for study in those later years (p. 26).
- Standardized tests of achievement (not to be confused with aptitude tests) should be administered at major transition points from one level of schooling to another (p. 28).
- Textbooks and other tools of learning and teaching should be upgraded and updated to ensure more rigorous content (p. 28).

This report was viewed as a catalyst for change, not only by the U.S. Department of Education, but also by educators, policymakers, and even the general public. In fact, members of the Commission wrote that they were “confident that the American people, properly informed, will do what is right for their children and generations to come” (National Commission for Excellence in Education, 1983, p. 2). Merseth (1984), who commented on the educational impact of the report, acknowledged that “not every recommendation will be accomplished with equal speed or success. But the time has come to begin” (p. 42). Education, henceforth, became a forefront item on the American public policy agenda.

Merseth (1984) concluded that the concern for all students—whatever their race, gender, economic position, linguistic background, or career aspirations—was a central element to the future of our nation. The findings in the 1995 TIMSS heightened these concerns. In the United States, the comparison of student achievement of our students to students in other countries yielded a surprising deficit in the performance on the part of U.S. students. Consequently, additional political pressure was placed on school districts to increase the accountability of public education (McGhee & Griffith, 2001). McGhee and Griffith (2001) reasoned that “the results of these large-scale assessments will provide much needed individual student data, allowing states, districts, schools, and teachers to make instructional decisions that are data driven” (p. 3).

Historically, the schoolhouse doors were only opened to helpful parents and an occasional community event, but the workings of schools began to be of increasing public interest. For example, Merseth (1984) stated that the “mathematical, scientific,

and technological curricula presently being taught in our schools need immediate review and revision with particular attention given to content, emphasis, and approach” (p. 38). In Maryland, for example, the Maryland Business Round Table and the higher education community took a serious interest in Maryland’s move toward an accountability system. These business and education leaders expressed their concerns to Dr. Nancy Grasmick, State Superintendent of Education. The concerns focused on the quality of the product—namely, high school seniors who were graduating from high school to enter the workforce or continue further in education. Of particular interest to these groups was the minimal amount of mathematical knowledge and skill required to pass the Maryland Functional Mathematics Test, which was the only mathematics test used as a graduation requirement at that time. As a consequence of these pressures at the state level, Maryland became one of the first states to have a school-based accountability system (Hannaway & Woodroffe, 2003).

Current Accountability Systems

The U.S. federal government historically played a minimal role in education, leaving that charge to the states. However, when the achievement of our students began to be compared to other countries and was found lacking, that tide quickly changed. This section describes the consequential accountability system that states and districts are now working under in response to the federal government’s new role.

Educators have recently been increasingly called on to verify that students received a quality education while in their care. Goertz and Duffy (2001) recognized

that “public reporting of programs and performance is the most basic form of school accountability” (p. 3). A move to have high-stakes decisions predicated on test performance became common in states (La Marca, 2001). By 2001, large-scale assessments were an important part of the education culture of the country, and mathematics achievement was a particular target of interest (McGhee & Griffith, 2001). Increased accountability started a “significant movement by political and educational leaders to search for solutions—so far centered on the nearly desperate need for the increased support for the teaching of mathematics and science” (National Commission for Excellence in Education, 1983, p. 12).

The struggle to educate all children did not go unnoticed at the national level. The precedence for federal government interaction with education, however, is limited. In 1954, the U.S. Supreme Court passed the *Brown v. Board of Education* (1954) decision that integrated public schools. Title I was later passed to increase funding to schools containing a high percentage of low-socioeconomic students. Also, Title IX was passed, which paved the way for gender equity in schools. Education, in most other respects, had long been delegated to the states. Despite the NCEE’s plea in 1983 to the Secretary of Education to “continue to provide leadership in this effort by assuring wide dissemination and full discussion of this report, and by encouraging appropriate action throughout the country” (National Commission for Excellence in Education, 1983, p. iii), the federal government played a modest role in the education of American students for almost 20 years. States maintained an exclusive domain in the education of children.

NCLB

The U.S. Department of Education responded to the growing volume of educational concerns in 2000 with a strong and all-encompassing piece of federal legislation, *NCLB*. Schmidt (2004) captured the dramatic change in the education domain by recognizing that *NCLB*'s vision emanated from the federal government; therefore, it challenges the long-standing tradition of local control of the curriculum. Secretary of Education Paige (U.S. Senate Hearing, 2004) called the federal government's new paradigm a "historic partnership with the states" (p. 16).

Consequently, educators at the state, district, and school levels had turned their energy and efforts to meeting the purpose of this federal legislation—increased academic achievement for all students. Paige (U.S. Senate Hearing, 2004) stated that the starting point of view for *NCLB*'s philosophy was "every student is of concern to us and the law should provide the same kind of protection for every single student" (p. 36). The federal government used this appeal to educators' moral purpose (Fullan, 2003) as a catalyst for significant changes in education. The most significant change was that schools were now required to meet performance goals based on student performance or face sanctions. This "high level of intrusion into education policy represents a sea of change" (Hannaway & Woodroffe, 2003, p. 13).

D'Orio (2004) claimed that two of those changes—the ability to force schools to examine achievement by subgroups of children and a new focus on standards—will always remain part of K–12 education in this country. A hallmark of *NCLB*, for example, was that scores were reported at the level of schools and disaggregated by race/ethnicity, gender, disability status, English proficiency, and status as

economically disadvantaged (Hamilton, 2003). The focus on subgroups caused an immediate rethinking of previously accepted levels of success in education.

Historically, the academic success of a school was determined by evaluating the average performance of its students. The design of *NCLB* was to mandate accountability for student outcomes, yet it also was designed to give states, districts, and schools flexibility over the educational process (Hamilton & Stecher, 2004).

Student-level accountability, therefore, was like a gale force wind in the traditional safe harbor of evaluating schools based on average student performance, but the new stress being placed on schools was not completely viewed as a negative result of *NCLB*. For example, Rep. George Miller (CA) claimed that the new “angst felt by school district and principals is great because they are thinking how to improve the achievement of children” (Matthews, 2003, p. 19). In some instances, a school that might have previously been judged successful on all academic measures might now be identified as failing to properly educate a subgroup of students. For example, many school-ranking systems stem from assessments such as the SAT, ACT, or Advanced Placement (AP) scores. Students self-select these tests, which often resulted in them only being taken by top-performing students. Therefore, a school might receive a high ranking based on one of these tests, yet the rank masked the fact that part of the school population did not even participate in the test. For this reason, groups such as the Education Trust praised the new legislation for “exposing educational inequalities” (Schemo, 2003, p. 6). Now “educators must learn to operate in the environment of accountability defined by *NCLB*” (Hamilton & Stecher, 2004, p. 579).

Under *NCLB*, the performance of each subgroup weighed equally as much as the total school scores. Therefore, the performance of the students in these subgroups became a focus, rather than an omission. Paige (U.S. Senate Hearing, 2004) claimed that the historic *Brown v. Board of Education* decision began the movement to break down barriers that prevented access for some students, but that decision alone was not enough. Students who were historically “left behind” in education are now the targets of interest, hence the naming of the federal legislation *No Child Left Behind*.

The consequences of this shift in focus left schools scrambling to find strategies to provide an education for students in all student groups so that they could demonstrate proficiency on the state assessments. This approach translated into a rethinking of what can and should be done for students in mathematics education.

To determine the success of these efforts, states were required to test every student in Grade 3–8 and 10 in reading and mathematics. Although some factors of test design were left up to the states, students had to be evaluated as performing at a basic, proficient, or advanced level in each of the two subjects. The total population of students in each grade in a school and the subgroups in each grade must make AYP each year on these reading and mathematics tests. Additionally, elementary and middle schools must make a satisfactory attendance rate and high schools must have a satisfactory graduation rate. AYP is the part of the legislation that allows no school to rest. No matter where the school is currently evaluated according to the performance of its students, progress must be made each year in each subgroup. In other words, the bar that denotes an acceptable percentage of students reaching the proficient or advanced level continues to be raised each year. According to the legislation, schools

have the eventual goal of 100% of all students being deemed either proficient or advanced in both subjects by 2014. In this way, “the *NCLB* legislation requires that all students have opportunities to learn rigorous mathematics” (Schmidt, 2004, p. 11).

The requirement in the legislation for all students to eventually reach at least the proficient level has stirred the most controversy and received the most criticism. Consider, however, the possible opposing view raised by John A. Boehmer (R–Ohio), and we “assume for a moment that Congress had decided to set a goal of 95 percent of all students being proficient in reading and math” (Matthews, 2003, p. 4). This proposition might lead to the conclusion that the same groups of students who traditionally perform poorly will continue to receive little or no attention, whereas now they are the focus of educators’ attention.

Opposition to NCLB

The acceptance of *NCLB* and its desired positive impact on student achievement, however, has not been without considerable opposition, which has caused a fractured policy environment. Advocates of *NCLB* claim “accountability is as necessary as accounting, from which it arose in the first place” (Doyle, 2004, p. 607), but this opinion is not unanimous among educators. Whereas Secretary of State Paige (U.S. Senate Hearing, 2004) claimed that educators have made “tremendous progress in building a solid foundation for educational achievement” (p. 15), opponents hold a much different view. Kohn (2004) notes that *NCLB* party liners intend for the *NCLB* requirements to make public schools improve, yet *NCLB*’s requirement to have every child score at least at the proficient level by 2014 is “something that has never been done before and that few unmedicated observers

believe is possible” (p. 572). For antagonists of the legislation, the ability for the public education system to successfully educate all students to a proficient level in reading and mathematics is believed to be impossible, and the efforts to create such a system are doomed to failure.

The use of high-stakes testing to determine student proficiency levels is the primary element of contention. As an advocate against sanctions, Kohn (2004) argued that the existence of a descending spiral of sanctions for a school that does not make AYP is a reason to believe that “the engine of this legislation is punishment” (p. 573). Opponents of this viewpoint do not believe that sanctions are an appropriate action in the education field. They are opposed to “the idea that we should feed the accountability beast” because it is a “fool’s errand” (Kohn, 2004, p. 575). Additionally, the “state and federal policies intended to develop greater school accountability for the learning of all students has been counterproductive” (Jones, 2004, p. 584). Whereas the legislation spells out what states, districts, and schools must do to comply with the components of *NCLB*, these opponents argue that their “obligation is to figure out how best to resist” (Kohn, 2004, p. 576).

The Citizens for Effective Schools recommends a different focus for *NCLB*—a deemphasis on school sanctions and more strategies for helping schools to improve (Schemo, 2003). Rothberg (2001) agrees, citing that the *NCLB*’s underlying assumption—hold teachers and students accountable for students’ scores on standardized tests and academic standards will rise—will not work.

One concern raised by Rothberg (2001) is that the use of a high-stakes testing system will weaken the academic standards if the test becomes the educational

program. Bracey (2001) added that other nonacademic elements of the educational program suffer greatly at the cost of high-stakes tests. He cited how the Board of Education in Virginia Beach, Virginia, called a special session to investigate rumors that many elementary schools omitted recess in favor of additional test preparation. Wasserman (2001) brought a different perspective to the opposition by criticizing the use of a single test to evaluate student progress when new standardized testing programs appear every few years. Finally, Bracey (2001) foreshadowed the grim possibility of the *NCLB* testing program becoming the test mania current practiced in Singapore. In that country, mothers pray during 100-day vigils before their children take the rigorous high school exit exams. On the day of the tests, cheering throngs greet the students, and even the airport bans takeoffs and landings during the test.

NCLB is clearly dominating the current educational landscape. Educators do not uniformly welcome its components and application in schools; however, the magnitude of its impact on the way we educate children is certainly a focus for further study. A starting point for review, therefore, is the reaction of districts to this federal legislation.

Alignment

When American students' performance in mathematics found their results lacking when compared against the progress of other countries' students, the federal government responded with an increasing interest in the education of children. Poor student performance and other factors resulted in the *NCLB* legislation, which mandated that states monitor the performance of student groups in each of their

districts. This section describes one such response option that a district may choose to implement—an aligned mathematics program.

“Demands for better (student) performance have brought about an array of new policy levers and policy partners” (Hannaway & Woodroffe, 2003, p. 1). Massell (2000) adds that the role of the district in particular has become a focal point because the school district influences the strategic choices that schools make to build teacher capacity and increase student achievement.

Districts “act as gatekeepers for federal and state policy by translating, interpreting, supporting, or blocking actions on their school’s behalf” (Massell, 2000, p. 1). Therefore, before a district commits to a new program as a strategic response, “policy makers, administrators, and others who are charged with the task of developing or modifying a large-scale program need to weigh the options and their likely effects” (Hamilton, 2003, p. 55). Corcoran (2003) agrees that if those responsible for translating policy into action would make evidence-based decisions, then student performance would increase.

Hannaway and Woodroffe (2003) cite the “lack of good information about process, product, and behavior” (p. 2) as the cause that led to loose coupling that was endemic to education 25 years ago. The education literature at that time “offered no policy prescriptions that would promote greater effectiveness or efficiency” (Hannaway & Woodroffe, 2003, p. 2). The National Science Foundation, for example, invested hundreds of millions of dollars on systemic initiatives. Now “Government Performance and Results (GPRA) personnel are seeking hard evidence

of what the true impact of its massive effort to improve science and mathematics student performance has been” (Webb, 1999, p. 1).

“The education community was attracted by the call from the low-level, basic skills curricula that had dominated American education for decades toward higher expectations for all students” (Wixon, Dutro, & Athan, 2003, p. 70) following the publication of *A Nation at Risk* in 1983. Schools and school districts began to use accountability as one type of policy instrument as an “attempt to build incentives into the system through administrative accountability schemes that incorporate rewards and sanctions” (Hannaway & Woodroffe, 2003, p. 3). Former Secretary of Education Rod Paige (2002) identified accountability as a central aspect of the success of *NCLB*. “States need to set high standards for improving academic achievement in order to improve the quality of education for all students” (p. 2).

In mathematics, educators are searching to acquire, implement, and evaluate programs that increase the proficiency rates of all students each year as mandated by *NCLB* (Paige, 2002). “It is important to recognize, however, that any organization or institution responsible for implementing a large-scale testing program faces inevitable constraints in regard to time, personnel, and financial resources” (Hamilton, 2003, p. 55). Additionally, although districts now have access to a “dizzying array of new policy tools” (Hannaway & Woodroffe, 2003, p. 1), limited available resources force them to prioritize their actions (Hamilton, 2003).

“Despite the problem, however, the feasibility of monitoring classroom practices and other responses, even among a sample of teachers and schools, should be explored” (Hamilton, 2003, p. 53). Some of the tools that districts might use to

increase student achievement, such as professional development, are currently in a situation that “begs for conceptual clarity and empirically based insights” (Wixon, Dutro, & Athan, 2003, p. 110).

Smith and O’Day first introduced systemic reform as a theory in 1991, and Webb (1999) later recognized it as one possible “change strategy for surmounting the difficult problem of enabling all students to meet challenging content standards” (p. 1). Now, “virtually every national standards document, every state framework, and every local set of standards calls for fundamental change” (Love, 2002, p. 53) in curriculum, instruction, and assessment. In fact, curriculum, instruction, and assessment are now referred to as a single vehicle by the National Council of Teachers of Mathematics (NCTM, 2000). This change implies they are an integrated system (Love, 2002). Under such a system, curriculum materials and classroom instruction reflect state standards, and the corresponding assessments are used to measure student achievement (Resnick, 2003).

Alignment, however, is a relatively new and not well-understood strategy available to districts. Fitzpatrick (1995) was one of the first researchers to promote congruence of the instructional program as one of the defining features of a genuine outcome-based system for teaching and learning. Walker (1998) went on to further develop the concept of curriculum alignment as requiring the linkage among the intended curriculum, the instructional process, and the postinstructional assessment. Barnes, Clarke, and Stephens (2000) also defined *alignment* to be how well all the policy elements of a system work together to guide both instruction and what is assessed. *Education Week* later recognized the work done by Achieve, a nonprofit

group that promotes state standards and assessment initiatives. Achieve claimed that the traditional alignment definition “was not good enough to tell students, parents, teachers, and the public whether the test results reflect the attainment of standards” (“A Primer on Alignment,” 2001, p. 1). Rather, Achieve used the criteria of content, performance, level of difficulty, and balance and range to judge curriculum alignment. Campbell (2004) cited a call for alignment to address the need for instructional program coherence as a strategy to increase student achievement in mathematics. Finally, Porter, Smithson, Blank, and Zeidner (2007) stated that student achievement results should increase when an aligned instructional guidance system results in an aligned classroom instruction and is measured by an aligned student achievement test.

Kilpatrick (2001) recognized that educators are motivated to use an aligned instructional program so that a standards-based assessment can be accompanied by a clear set of grade-level goals so that teachers, parents, and others can work together to help all children in a school achieve those goals. The belief that a coherent system of expectations and assessments will improve student outcomes is the premise of an aligned mathematics program (Webb, 2003). Love (2002) ties together the elements of an aligned mathematics program—curriculum, assessments, and instruction—as the vehicle to move student learning in a reform effort.

Districts are seeking to achieve alignment through a variety of methods (Massell, 2000). One earlier method was to ask principals to form content committees in their buildings to decide everything from the curriculum objectives to the assessments (Reichman & Rayford, 1988). A similar option is to purchase a

workbook for administrators to learn a structured process to facilitate curriculum alignment in their schools (Steffy, 1999). However, a more recent study by the Consortium for Policy Research in Education (Massell, 2000) found that districts are now exerting more technocratic control over the creation of their aligned mathematics programs for two reasons. First, districts saw the need for greater continuity in mathematics, and, second, because “they believe their elementary teachers are less comfortable with this subject” (Massell, 2000, p. 5).

Once a district has created an aligned mathematics program, it can use the criteria created by Webb (2003) to judge the alignment. The criteria are grouped into five categories: content focus, articulation across grades and ages, equity and fairness, pedagogical implications, and system applicability. These criteria allow districts to determine whether they have “a coherent system where the power of these policy documents converges to better support students’ learning of important mathematics” (Webb, 2003, p. 1). Hamilton (2003) notes that, despite the difficulty in achieving alignment, “the importance of alignment to the proper functioning of accountability systems requires efforts to evaluate its multiple dimensions” (p. 53).

However, few districts have had the opportunity to explore the benefits of an aligned mathematics program. For the few that have, all reported favorable results. One district was so successful with its eighth-grade-aligned program, which was created to support students on the state assessment, that district leaders decided to investigate alignment strategies for all grade levels (Ippolito, 1990). Another district also found alignment to produce an unusually high achievement gain, particularly with economically disadvantaged students (Elia, 1994).

The existence of states' accountability systems caused districts to seek new instructional strategies "that are likely to lead to changes in the nature and quality of curriculum and instruction provided to students" (Hamilton, 2003, p. 37). This type of systemic reform, first heralded by Smith and O'Day (1991), recognized high standards and a common vision as essential elements in reform. The use of an aligned instructional program is one such systemic reform strategy. Resnick (2003) explained the "theory is that student achievement will improve if all parts of the system pull in the same direction" (p. 1). Therefore, the alignment of curriculum, assessments, and instruction is viewed as a critical element in current efforts to create systemic and standards-based reform (Resnick, 2003; Walker, 1998; Webb, 2003).

Curriculum alignment, therefore, is now considered a possible strategy to assist districts in meeting the demands of *NCLB*. The three components of an aligned mathematics program—curriculum, assessments, and instruction—are the tools available in the strategy. Districts must work with these tools under the accountability system established by their state and demonstrate their effectiveness through student achievement.

Curriculum

Curriculum alignment is one strategy that a district may choose to increase student achievement. An aligned program consists of a well-defined curriculum, an assessment system that evaluates student understanding and skill level of those standards, and instruction that facilitates student learning of that curriculum. This section further explores the curriculum component of an aligned mathematics program.

Goertz and Duffy (2001) identify the establishment of challenging standards for all students as a key component in the standards-based reform. Content standards are “documents that define what students should know and be able to do in given subject areas” (Wixon, Dutro, & Athan, 2003, p. 69). The analysis of any mathematics program, however, yields the conclusion that “mathematics topics are not interchangeable pieces that we can place in an arbitrary sequence” (Schmidt, 2004, p. 9). McGhee and Griffith (2001) summarized the challenges faced in mathematics education as establishing performance criteria or standards in what students need to know and be able to do so educators can ensure their success in the next phase of their education. Therefore, content standards connect the essential curriculum across the years in a child’s education (Wixon, Dutro, & Athan, 2003).

Historically, however, “the legacy of U.S. education embedded within our federalist construct allowed individual schools, teachers and textbook companies to dictate what was taught in schools” (Wixon, Dutro, & Athan, 2003, p. 70). Nelson (2002) refers to the 1995 TIMSS data as an illustration at that time of “the lack of curricular coherence and rigor in the United States” (p. 4). In 1999, the National Commission on Mathematics and Science Teaching for the 21st Century agreed that a standards-based curriculum is a premise of high-quality teaching (Education, Research, & Politics, 1999). The NCTM then released the Principles and Standards for School Mathematics in 2000, which was intended to be a “resource and guide for all who make decisions that affect the mathematics education of students in pre-kindergarten through grade 12” (National Council of Teachers of Mathematics, 2000, p. ix).

Although the process of achieving consensus on standards and their purpose is difficult, the “emphasis on accountability through annual testing in NCLB virtually dictates a view of content standards as measurable objectives” (Wixon, Dutro, & Athan, 2003, p. 82). Alignment, therefore, provides the opportunity to determine whether the forms of mandated assessment do match more closely the expectations of a system’s curriculum documentation, thus allowing this conjunction to act as a powerful force for system-wide coherence among expectations, classroom practice, and assessment (Barnes, Clarke, & Stephens, 2000).

As districts design their mathematics curriculum, however, they realize that, “even teachers with a strong mathematics background cannot teach well in a context defined by a fragmented and incoherent curriculum” (Schmidt, 2004, p. 11). Dutro and Valencia (2004) stated, “state standards can be benign, helpful, or bothersome to local efforts” (p. 34). In addition, “NCLB assumes that state content standards will be the primary means of communicating what is expected of students and that these standards will provide an adequate basis for curricular and instructional improvement” (Hamilton & Stecher, 2004, p. 580). Furthermore, the relationship between state and district standards is “in need of attention if content standards are to resume their rightful place in the reform dialogue and gain prominence in practice as well as theory” (Dutro & Valencia, 2004, p. 34).

A seamless “curriculum is crucial for improving mathematics achievement” (Schmidt, 2004, p. 7). In fact, districts are struggling to create strong curriculum documents, believing that the only real hope for success is a common, coherent, and challenging curriculum. Schmidt (2004) argues that our teachers deserve it, our

students need it, and the laudable vision of *NCLB* demands it. In fact, “the most common feature of the school experiences of students in most other countries, especially those in countries whose test performance is very high, is that of a common, coherent, and challenging curriculum through 8th grade” (Schmidt, 2004, p. 6).

One disagreement that still lingers in mathematics standards is the place of constructivism in mathematics teaching and learning. Elkind (2004) defines *constructivism* as the belief that a child should actively create reality, compared with a more traditional approach where the child is a passive recipient. For example, if “the nightmare of the traditionalists is the kid who can’t get the right answer, the nightmare of the other reformers is the kids who don’t know what the right answer means” (Clune et al., 2003, p. 3).

Before the release of the NCTM standards, a review of four papers in a set of Commentaries on Mathematics and Science Standards identified the primary issue discussed and debated in the papers as “the shift in emphasis from memorizing procedures to problem solving and understanding” (Clune et al., 2003, p. 1). NCTM did include four process standards in “the belief that all students should learn important mathematical concepts with understanding” (National Council of Teachers of Mathematics, 2000, p. ix).

Opponents to constructivism argue, however, that constructivism did not take seed as intended due to what “might be called failures of readiness: teacher readiness, curricular readiness, and societal readiness” (Elkind, 2004, p. 2). No consensus in mathematics teaching and learning has been reached. The constructivism debates

continue and “echo similar discussions in other fields: between whole language and phonics in reading, between prophetic and priestly in the social sciences, between positivists and antipositivists in general” (Copes & Latterell, 2003, p. 1).

The existence of standards, however, is only the beginning of the alignment process. *NCLB* demands that students be held accountable for demonstrating proficiency on the state’s content standards, and that component of *NCLB* has caused the creation of accountability systems based on state assessments. The use of large-scale tests then “serve the purpose of surveying the curricula being implemented in schools and classrooms” (Knapp, 2003, p. 29). According to Secretary of Education Paige (cited in D’Orio, 2004), “the standards are not going away” and “assessments against those standards are going to be here. That’s the new world. We are not going backwards” (p. 31).

In Maryland, the VSC is the document that defines what each child should know and be able to do at each grade level. The Mathematics VSC begins in pre-Kindergarten and ends in the eighth grade, and other documents called the Core Learning Goals (CLGs) currently detail the curriculum for Algebra I and Geometry. All administrators, teachers, and parents have access to the VSC from their Assistant Superintendents for Instruction, their Mathematics Coordinators, and web access.

Assessment

A district may choose to implement an aligned program to increase student achievement. An aligned program consists of a well-defined curriculum through a set of standards, an assessment system that evaluates student understanding and skill levels of those standards, and instructional strategies that support student learning of

the curriculum. This section explores more fully the role of assessment in an aligned mathematics program.

Once a state has developed mathematics content standards that detail what a child should know and be able to do in each grade, the next piece of an aligned program is the design of assessments. Nelson (2002) found that, “in the context of standards-based reform, assessments aligned with learning standards and achievement goals are a critical component of effective evaluation” (p. 8). “These assessments themselves may become agents of change for mathematics education” (McGhee & Griffith, 2001, p. 2). Furthermore, Frase and English (2000) note that schools are measured by the achievement of students on assessments because “test scores are what the legislature, the State Department of Education and most parents use to judge school success” (p. 5).

According to *NCLB*, the state must establish an assessment system to determine student proficiency in reading and mathematics. States were charged with designing their own assessments because commercially published standardized achievement tests “are frequently not aligned with the teaching materials used in districts or with district goals” (Kilpatrick, 2001, p. 7). To ensure alignment, assessment writers must “take into consideration the cognitive complexity or challenge associated with test items and standards in addition to content match” (Hamilton, 2003, p. 53).

When states create these assessments, they must include items or tasks that “reflect the range of performance specified in curriculum documents, syllabuses, or courses of study” (Barnes, Clarke, & Stephens, 2000, p. 626). The matching of

assessment items to content standards is critical in the creation of a valid assessment. La Marca (2001) explains that the match is not only a methodological requirement, but also an ethical requirement because it would be disadvantageous to students and schools to judge achievement of academic expectations based on a poorly aligned system of assessment. To achieve this alignment, states must have sound standards and assessment development activities (La Marca, 2001). Furthermore, “as the decisions associated with test performance carry significant consequences, the degree of confidence in, and the defensibility of, test score interpretations must be commensurably great” (La Marca, 2001, p. 19). The NCTM identifies four purposes of assessment: promote growth, improve instruction, recognize achievement, and modify program (National Council of Teachers of Mathematics, 2000). However, in the Spring 2004 NCTM bulletin, Tucker recognized that “it is very difficult to design a reliable standards-based test that can consistently measure, over time, the sort of mathematical reasoning that a high-quality K-12 mathematical education should develop in our future citizens” (National Council of Teachers of Mathematics, 2000, p. 5).

The use of student assessment scores to determine whether a school makes AYP, therefore, has received significant criticism. Love (2003) is one opponent to these high-stakes tests, arguing that a single data point should not be used to make such serious decisions in education. Opponents such as Love (2003) base their argument on the belief that, “not one test, not even a good one, can possibly give us a full picture of what students understand and can do in relationship to national or local standards or curricula” (p. 14).

Finally, “a fully developed and coordinated assessment system based on standards of learning in mathematics does not guarantee substantial achievement gains” (Stotsky, 2001, p. 59). For example, Kilpatrick (2001) illustrates that previous use of high-stakes assessments, such as high school exit exams, has shown that performance on such tests has often been considerably below what was anticipated or desired. The preparation of students for these high-stakes assessments, therefore, becomes critical because “large scale assessments are here to stay” (Lewis, 2001, p. 3).

In Maryland, the accountability system is called the Maryland School Assessment (MSA). Students take the mathematics MSA in Grades 3–8 and after the completion of a course in Geometry. These large-scale tests are “intended to provide efficient measurement for large numbers of students and to facilitate comparisons across classrooms and school” (Knapp, 2003, p. 27).

Assessments have become “the shared responsibility of all who are concerned with students’ learning in mathematics” (National Council of Teachers of Mathematics, 2000, p. 3). Some states and districts are even using test scores to measure the alignment between standards and instruction (Dutro & Valencia, 2004). The last piece of an aligned mathematics program, therefore, is the instruction and instructional materials available to students.

Instruction

An aligned mathematics program is one option that a district may choose to implement to increase student achievement. The program consists of a curriculum based on well-defined standards, an assessment system that determines student

mastery of the curriculum, and instruction that ensures student learning of the curriculum. The instruction of the content enables students to demonstrate their proficiency on the assessment. This section explores the instructional component of an aligned program.

Although La Marca's (2001) definition of *alignment*—the degree of match between test content and the subject area content identified through state academic standards—is an acceptable beginning, more recent alignment models include a crucial third piece—instruction. Hannaway and Woodroffe (2003) note that “an accountability system with defined standards and tests might lead to a more stable instructional focus, and stability alone might promote student learning” (p. 14). For this reason, “an understanding of how testing affects instructional practices is critical” (Knapp, 2003, p. 32). Additionally, if “tests scores are associated with clear consequences that are important to teachers, it is likely that instruction will be affected” (Knapp, 2003, p. 33).

The case for creating and adhering to documented curriculum was first brought to the public's attention in 1979, when the National Association for the Advancement of Colored People (NAACP) filed a lawsuit against the state of Florida (*Debra P. v. Turlington*, 1979). The NAACP based the suit on the claim that it was unconstitutional to deny high school diplomas to students who had not been given the opportunity to learn the material covered on a test that was a requirement for graduation (Anderson, 2002). Historically, however, “teachers have struggled to translate state standards into effective curriculum and instruction, in large part because they lacked appropriate curriculum and instructional materials and were not

provided with relevant professional development opportunities” (Hamilton & Stecher, 2004, p. 580). Those involved in creating mathematics programs are charged with examining these issues and making them “understandable in a way that informs teacher practices” (McGhee & Griffith, 2001, p. 137).

An example of one link by Frase and English (2000) is that a necessary requirement of preparing students to achieve is “testing what is taught.” They define topological alignment among what is written, taught, and tested as the first step. Deep alignment, in contrast, is necessary to produce the parallelism required to ensure substantial student achievement gains, particularly in economically poor children (Frase & English, 2000). Deep alignment can be gained through the use of various instructional components that work together to promote student learning.

Four examples of possible parts in the instructional components of an aligned mathematics program are a single text adoption, pacing guides, county-produced assessments, and staff development. Each one is briefly discussed.

1. **Single Text Adoption:** A district may choose to adopt a single text for an entire program, such as the elementary mathematics program for students in Kindergarten through Grade 5 to provide continuity and coherence in the program. Numerous textbooks are produced by companies on any given subject. Giving schools the freedom to choose their own texts for every subject in every grade might seem like a viable opportunity; however, a “district with a high mobility student population found that this lack of consistency yielded significant problems in learning and school performance” (Massell, 2000, p. 5). Yet a Single Text Adoption program

provides coherence from school to school in a district and between grades in a school.

2. Pacing Guides: School districts are crafting their own versions of curriculum reforms and adopting new materials to meet state standards (Grossman & Thompson, 2004). Queen and Gaskey (1997) recommend pacing guides as one development to help teachers plan the appropriate amount of time spent on each topic in a course. A pacing guide is a document that breaks down the curriculum into segments of time to be covered before the assessment. “Teachers derive a high degree of comfort from the organization developed in a guide” (Queen & Gaskey, 1997, p. 160). This type of curriculum support can be especially beneficial to new teachers because they “are hungry for curriculum—and the guidance it can provide” (Grossman & Thompson, 2004, p. 37). Without pacing guides, teachers are more likely to deviate from the curriculum, such as those found in a 1997 survey in Arizona where less than half of the teachers surveyed responded that they were using state curriculum guidelines (Zambo & Sowell, 1997). Additionally, a pacing guide is a plan for material presented to students as they progress through a mathematics program. The ability for a student to progress is important, as Tate (1999) found that course taking is a powerful element in closing the achievement gap.
3. District Assessments: Although the state-mandated high-stakes tests have a “prominence in state and local education policies, these tests represent a

small fraction of the tests that students take during the school year” (Hamilton, 2003, p. 31). A teacher-made test or one that is copied from a textbook company is the traditional form of classroom assessment. Therefore, some districts “have begun to bridge the two forms of assessment by providing ‘interim’ or ‘benchmark’ tests that mirror the state tests but provide ongoing, formative feedback” (Hamilton, 2003, p. 49). Benchmark tests are used by a district to take a snapshot of student performance in a school compared with other schools in the district and against curriculum criteria. Hamilton (2003) stated that these benchmark tests “are often omitted from policy discussions but can exert a powerful influence on student learning and other educational outcomes” (p. 31).

4. Professional Development: Even a completed assessment system based on standards is not a guarantee that student achievement will increase (Stotsky, 2000–2001), and some districts use extensive professional development activities as another support to alignment initiatives. Districts are creating professional development opportunities tied to standards, curricular goals, and the assessment system hoping that it will be a tool to help staff achieve the ambitious goals of the reform (Wixon, Dutro, & Athan, 2003).

The new focus on professional development arose after implementation researchers increasingly came to see “the problem of educational policy implementation as one of teacher learning” (Coburn & Stein, 2006, p. 25). Positive results from policy implementation “rest on

assumptions that implementers understood a policy's intended messages" (Spillane, 2006, p. 47). However, if they do not understand the purpose and intent of the policy, "teachers risk 'lethal mutations' of the project in their classrooms" (McLaughlin, 2006, p. 219).

The NCTM Principles and Standards document, for example, "emphasizes the need for well-prepared and well-supported teachers" (National Council of Teachers of Mathematics, 2000, p. 1). Some districts view professional development as an essential element of reform because "it is obvious that teachers need help getting up to speed on the latest approaches to assessment, standards-orientated practice, approaches to student learning, and so forth in the context of standards-based reform" (Wixon, Dutro, & Athan, 2003, p. 109). Professional development as this type of tool to facilitate a reform is "more orientated toward increasing the capacity of a school system" (Floden, 2003, p. ix).

Wixon, Dutro, and Athan (2003) note, however, that, "while the logic of these initiatives is generally clear and powerful, the issues these initiatives raise for the design and enactment of policy are anything but clear" (p. 109). Districts must realize that, despite an investment in professional development activities as an instrument of enhancing policy, it is likely that this investment "will not yield quick or consistent results" (Wixon, Dutro, & Athan, 2003, p. 109). Specifically, although "nearly all districts regard building teachers' knowledge and skills as a crucial component of change" (Massell, 2000, p. 2), the strategies that they use

vary along a number of dimensions, such as time allocated, incentives provided, and focus (Massell, 2000).

In Maryland, for example, the classroom practices of teachers make the standards stated in the VSC meaningful to children so that they can perform successfully on the MSA. The content standards define what students should be taught, and the assessments determine how they will be evaluated, but instruction brings the student from the curriculum to the assessment. Anderson (2002) summarizes the importance of instruction by recognizing that teachers may be teaching up a storm, but are teaching in vain if what they are teaching is not aligned with the state standards or state assessments.

Therefore, it is the professional development part of the instructional component that unites and supports the other three parts—STA, Pacing Guides, and District Assessments. The professional development provides teachers with the content and skills necessary to properly implement the other parts for the greatest benefit to students. Additionally, whereas the other parts are an investment in the mathematics program, professional development is an investment in the people responsible for that program.

The four parts of the instructional component—Single Text Adoption, Pacing Guides, District Assessments, and Professional Development—are each an instructional change and, taken together, caused a significant normative shift in teacher practice. Although significant resources must be tapped to build new curriculums and assessments, policymakers also realize that “the reactions of

educators to the accountability system are critical determinants of whether the system raises student achievement” (Hamilton, 2003, p. 52). Compounded by the simultaneous implementation of these parts and the district-wide scale of application, the reaction of teachers to these changes is a targeted area of interest.

Prior sections in this literature review examined the changing role of the federal government in the education of children, culminating in the federal mandates in the *NCLB* legislation. The new role of accountability left districts scrambling for research-based strategies to increase student achievement. An aligned curriculum was introduced as one possible strategy, and its three components—curriculum, assessment, and instruction—were each examined. It was noted that in Maryland, the curriculum and assessment components are both heavily dictated by the state. Districts are left, however, to create their own instructional component. A brief review was provided for pacing guides, professional development, district assessments, and an STA program that were chosen in JCPS. I now turn to a review of the literature on the implementation of school policies.

Implementation

Prior sections in this literature review explored the increasing role of the federal government in education, the increasing existence of accountability, and the use of an aligned mathematics program as a possible strategy for districts to choose to increase student achievement. This section begins with an overview of the history of the implementation of such policies so that the context for the development of this case study may be better understood. It follows with a development of the factors involved in the current study of policy implementation.

Honig (2006) described the history of policy implementation studies as having occurred in three waves. Wave 1 can be characterized as “A Focus on What Gets Implemented” (p. 4). This first wave started in the 1960s and was a focus on policies that attempted to achieve broad societal goals by spreading resources. Wave 2 consisted of studies that focused on “What Gets Implemented Over Time” (Honig, 2006, p. 4). The studies in this second wave occurred during the 1970s and forecasted the importance of people, places, and policies as variation in implementation. Finally, Wave 3 started in the 1980s with the publication of *A Nation at Risk* and illustrated the “Growing Concern With What Works” (Honig, 2006, p. 4). The quest for studies to examine the variables in implementation and the outcomes of the implementation began. This section explores the implementation of programs that districts chose in response to policy mandates aimed at increasing student achievement.

Robert Chase, president of the National Education Association, aptly illustrated the tension between what is and what should be in public education when he commented, “if we truly want to educate all children to high standards, we need to make unprecedented investments in our schools” (Chase, 2000, p. 9). These investments often translate into time and money spent by districts on implementing new programs. Goertz (2001) notes, however, that a recent Consortium for Policy Research in Education (CPRE) study showed that districts often require standards-based reform, but actually achieving the goals is a different matter. An unanticipated but possible outcome, therefore, is that a district might pursue a noble educational reform, but the haphazard, breakneck implementation of that reform actually reaps havoc instead of improvement (Chase, 2000).

The charge to district leaders, then, is to ensure that the policies surrounding the new reform are properly implemented. “Educational reform and change are impossible if policies are not implemented properly” (Cooper, Fusarelli, & Randall, 2004, p. 84). Hamilton (2003) adds, “the effect of any large-scale testing system will depend to a great extent on the details of implementation” (p. 55). Dutro and Valencia (2004) recognize that “it is not the presence of standards per se but standards-in-action” (p. 35) that are the critical link to instructional strategies that improve student achievement. Hill (2001) additionally describes the importance of actors in the implementation of reform. He states that the reform process is like water that travels through a set of small dams: States write ambitious new standards and spur districts to do the same, which in turn cultivate improvement efforts within individual schools and, last, in individual teacher classrooms. From the perspective of the state, then, local actors serve as the primary agents of change.

Goertz (2001) found, however, that the methods districts deployed for curricular and instructional change through their systems varied greatly. Corcoran (2003) explains that some of the variability found in implementation stems from the pressure applied by different civic leaders and parents to do “something” to raise student scores expeditiously. Whereas district staff might have preferred to base decisions on solid rationale or current research, they did not have the luxury of time (Corcoran, 2003). Learning, for these districts, truly happens on the edge of chaos (Fullan, 1999). Cooper, Fusarelli, and Randall (2004) attribute some of this implementation chaos to politics and other stages of policy process. They argue that the “sheer number of actors responsible for implementing policy create multiple ‘veto

points' in which policy can be manipulated or altered" (Cooper, Fusarelli, & Randall, 2004, p. 87).

The role of school personnel, therefore, becomes essential in the implementation of policies. "Policies, like laws, are neither self explanatory nor self enacting" (Cooper, Fusarelli, & Randall, 2004, p. 83). Honig (2006) summarized the shift in the study of policy implementation by noting that, "whereas past implementation research generally revealed *that* policy, people, and places affected implementation, contemporary implementation research specifically aims to uncover their various dimensions and *how and why interactions among these dimensions* shape implementation in particular ways" (p. 14: italics original). Policy implementation studies must consequently be able to capture the interactions of these dimensions.

Overall, the interaction among policy, people, and places defines each implementation as a unique event. The realization that policy implementation is a contextualized event led researchers to focus on the interactions in each specific case. "Variation in implementation outcomes is not the exception but the rule and researchers aim to understand how different dimensions of policies, people, and places combine to shape implementation processes and outcomes" (Honig, 2006, p. 19). "Economic theory highlights that if policy designers do not attend to differential preferences across the system, they may miss opportunities in policy design to create adequate incentives for implementation" (Loeb & McEwan, 2006, p. 179).

In summary, the study of policy implementation promises a rich discovery of interactions among the dimensions of people, policies, and places. "Experience shows

that the policy process is neither linear nor a set of discrete phases” (McLaughlin, 2006, p. 217), and this process is certain to yield a host of interesting outcomes.

Implementation Conflict

Prior sections reviewed the development of policy implementation studies. This section brings to light the need to examine new aspects of policy implementation as a result of prior findings. The study of policy implementation uncovers “a dynamic political process that affects the relative power of diverse actors and the institution environmental forces that condition the play of power” (Malen, 2006, p. 85). This process places members of the organization in new situations that affect their ability to interpret and implement new policy. This section, therefore, describes the presence of conflict in policy implementation when people, places, and policy interact.

Whereas “norms, expectations and sanctions can provide the impetus and imperative for change” (Smylie & Evans, 2006, p. 192), the change process experienced by the organization can provide a wealth of opportunity for conflict. Although conflict caused by change is a natural event in education arenas, the social capital available in the organization must be strong enough to endure the change (Smylie & Evans, 2006). Discovering the complexities in process is what Honig (2006) refers to as “confronting complexity” (p. 20).

“Change resistance, implementation success, and the general well-being of an organization and its members are based in the health of the organization’s culture” (Hall & Hord, 2006, p. 265). The current culture and historical experiences in an organization are both important focal points because the implementation of new policies can necessitate a reallocation of resources that “can awaken dormant

conflicts, aggravate existing cleavages, and spark new battles about what constitutes an appropriate course of action” (Malen, 2006, p. 84). Coburn and Stein (2006) add that it also is important to study outside of individual schools or professional learning communities because teachers’ connections may extend beyond these boundaries with their professional colleagues. Within those boundaries, this study is necessary because “once the classroom door closes, anything (or nothing) is liable to happen” (Cooper, Fusarelli, & Randall, 2004, p. 89).

Honig’s Policy Dimensions Model

In her book, *New Directions in Education Policy Implementation: Confronting Complexity*, Honig (2006) presents a model that names the dimensions of policy studies—people, policies, and places (see Figure 2.1). As previously stated, Honig argued that earlier policy studies recognized the importance of these dimensions, but did not further develop the importance of how and why they interacted. Cooper, Fusarelli, and Randall (2004) best support the necessity of studying these interactions: “All too frequently, policymakers assume that the goals and objectives of a policy are known to everyone, that everyone involved in implementing a policy understands their roles and responsibilities, and that implementation is simply a matter of carrying out administrative mandates” (p. 88).

The first dimension in Honig’s model is policies and includes an examination of goals, targets, and tools. Historically, “the lack of goal alignment among various educational actors including superintendents, teachers, school principals, and community members has been a source of concern for many policy makers” (Loeb & McEwan, 2006, p. 176). However, the study of goals has recently been enhanced due

to districts attempting large-scale initiatives in an attempt to increase student achievement. Specifically, the study of policy goals examines these efforts in case-specific criteria.

The variation in policy goals also ignites a focus on the actors in the organization. “For a program or policy to be effective, both those charged with implementing the policy and those affected by it must agree with the program’s goals” (Cooper, Fusarelli, & Randall, 2004, p. 92). “Actors may use a variety of overt and covert strategies to convert their sources of power into policy influence” (Malen, 2006, p. 88). The responsiveness of the actors prevents the failed assumption that a policy can be merely “mandated, with little attention to issues arising during the implementation phase-almost as if saying so makes it so” (Cooper, Fusarelli, & Randall, 2004, p. 88).

The policy dimension also includes the policy target and the tools used to accomplish its intent. Many current “systemic reform initiatives focus on the decisions of leaders in schools, school district central offices, and state educational agencies consequential to the alignment of curricular content, instruction, and assessments” (Honig, 2006, p. 12). The source of the policy is important because it can be used as a lever.

Unfortunately, much of the research on policy implementation fails to consider the origins of policies, an important fact affecting implementation...Policies originating from different institutional actors, branches of government, or political processes often differ

substantially in the degree to which they are accepted by other participants. (Cooper, Fusarelli, & Randall, 2004, p. 85)

The second dimension in Honig's model is people and includes an exploration of those responsible for implementing the policy and those affected by its implementation. Although "early analyses of policy implementation tended to minimize the degree to which politics shaped the implementation process" (Cooper, Fusarelli, & Randall, 2004, p. 84), "researchers have come to reveal that people's participation in various communities and relationships is essential to implementation" (Honig, 2006, p. 16). "Political perspectives reveal that actors at all levels of the system can influence policy implementation" (Malen, 2006, p. 86). "All are likely to be concerned with student outcomes, but they also care about their own income, working conditions, and opportunities for advancement" (Loeb & McEwan, 2006, p. 171).

McLaughlin (2006), in contrast, noted that not only is the researcher's understanding of various actors' perceptions of policy implementation important, but also his or her own understanding of the policy. "Implementation involves a process of sense making that implicates an implementer's knowledge base, prior understanding, and beliefs about the best course of action" (McLaughlin, 2006, p. 215). Based on their own understanding and beliefs, actors can "forge political compacts that affect the extent to which policy may be broadly and faithfully implemented, or, routinely and strategically ignored, deflected, altered, or overturned" (Malen, 2006, p. 83). The importance of these understandings from the

highest to the lowest level is important because even “street level beaurocrats are key players in determining the extent to which policies are implemented in schools” (Cooper, Fusarelli, & Randall, 2004, p. 89).

The final dimension in Honig’s model is places, and it addresses the importance of understanding the contextual factors in policy studies. “Many contemporary researchers name their districts and states in their studies in an effort to build a body of knowledge about how implementation unfolds in these locations and to call attention to how deep-seated historical institutional patterns shape implementation outcomes” (Honig, 2006, p. 18). These contextual factors illuminate the inability to make broad conclusions in research, yet validate the deep understanding of local variables.

Implementation Pace

Previous sections in this literature review explored well-defined and popular aspects of policy implementation studies. Their contributions highlight past successes, yet also illuminate the need for further study. One area, however, that must be teased out and further explored in policy implementation research is implementation pace. The current accountability era thrives on increasing high performance expectations; it also demands this performance in unprecedented time intervals. This combination of performance and time pressure yields a variable in policy implementation that demands further study—pace.

In simplest terms, *NCLB* requires that districts demonstrate that every student in their charge can perform at the proficient or advanced level in reading and mathematics by 2014. Districts measure their schools from starting intervals against

required gains that are expected each year until 100% of students achieving is attained in 2014. Those requirements have left districts searching to find, implement, and benefit from successful reading and mathematics programs that demonstrated marked improvement from year to year. Consequently, implementation pace has risen as an unprecedented prominent variable. District leaders are left to question, “How much time is needed for successful systemic reform efforts? Can these projects be shortened?” (Hall & Hord, 2006, p. 56).

The new pace required to complete these requirements exists despite researchers such as Hall and Hord (2006), who have stated that their “research and that of others documents that most changes in education take three to five years to be implemented at a high level” and “there are very few shortcuts” (p. 4). Coburn and Stein (2006) also “view policy implementation as a process of learning that involves the gradual transformation of practice via the ongoing negotiation of meaning among teachers” (p. 26). The difference between what is considered reality by researchers and what is expected by policy lays the foundation for an examination of the variable pace in policy implementation.

Conceptual Framework

This study seeks to explore the characteristics of the instructional components in an aligned mathematics program and to understand the dynamics of its implementation by examining the change facilitator’s activity. A conceptual model must display the relationship of curriculum, assessments, and instruction in an aligned mathematics program and the relationship among each of the instructional

components: district assessments, pacing guides, professional development, and an STA program.

This research seeks to build on the work done on curriculum alignment by Anderson (2002). In the work entitled *Curricular Alignment: A Re-Examination*, Anderson makes the argument that, “during the past half-century, there has been a growing body of evidence supporting a fundamental truism: that what and how much students are taught is associated with, and likely influences, what and how much they learn” (p. 255). According to Anderson, curriculum alignment can be represented by a triangle. The three vertices of the triangle represent the components of alignment: objectives, instructional activities and supporting materials, and assessments. For the purpose of this study, which is set in the context of the State of Maryland, I use the Maryland categories: curriculum, instruction, and assessments. Additionally, for the State of Maryland, curriculum refers specifically to the VSC, and assessment refers to the MSA.

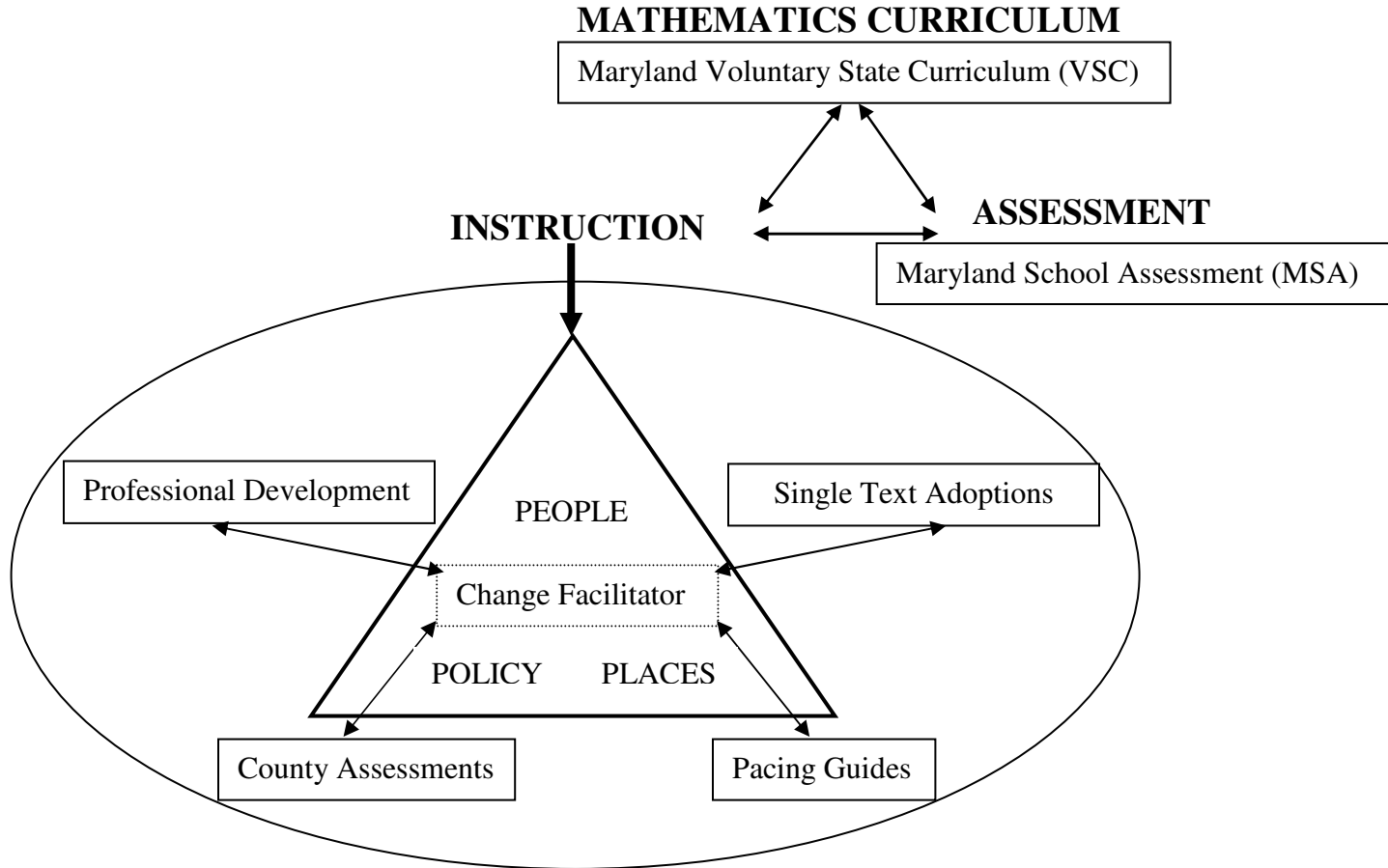
Anderson argued that true curriculum alignment happens when there are strong links among the three vertices of the triangle that can be shown by connecting the three vertices with a line segment. In this study, however, I have modified Anderson’s original triangle to display that the instruction vertex is subdivided into the four components used by JCPS: district assessments, pacing guides, professional development, and STA. By examining each one independently, I was able to fully describe each one and then describe its relationship to the other aspects of the instructional component. I then added the interaction of people, policy, and places to indicate the use of Honig’s model (2006) as the framework for studying

implementation. Finally, I added the concept of change facilitator to the conceptual framework to represent the lens I took to conduct the study. Consequently, I created a new model that represents change facilitator activity to support the implementation of a district's pre-K–12 aligned mathematics program. I used this conceptual framework to guide the study (see Figure 2.2).

Figure 2.1 Conceptual Framework

Guiding Conceptual Framework:

Change Facilitator Activity to Support the Implementation of a District's Pre-K-12 Aligned Mathematics Program



Conclusion

The triangulation of the three vertices—content standards, assessment, and instruction—is the basic structure of an aligned mathematics program. Barnes, Clarke, and Stephens (2000) summarize the basic premise of an aligned curriculum as “all elements of a school system should work together to give consistent messages to teachers, parents, students, and the wider community about what is being valued” (p. 625). Alignment is a strategy that “should play an effective role in accountability systems” (La Marca, 2001, p. 24).

However, Linn (2000) notes that the remaining question is “whether the assessment-based accountability models that are now being used or being considered by states and districts have been shown to improve education” (p. 4). A concern remains that “many state, district, and school administrators and other educators have been so busy building and implementing their *NCLB* accountability systems that they have not been able to spend much time thinking about how to make these systems work better” (Hamilton & Stecher, 2004, p. 583). States, districts, schools, and teachers are now working in these created accountability systems and are beginning to wonder whether “the real accountability question is, *What can you do, at what level of proficiency, with what you’ve got*” (Doyle, 2004, p. 608).

Educators are seeking to determine, therefore, which parts of their aligned instructional programs are benefiting students. Further research is necessary to determine the meaning and role of the instructional component. However, answering these questions and “doing systemic work in organizations is in its infancy” (Hall & Hord, 2006, p. 56). “Thus, the study and research of systemic efforts, especially in

schools and districts, would be invaluable” (Hall & Hord, 2006, p. 56). This research “is needed to understand the complexity of change in urban school districts” (Dewan, 2000, p. 61).

“It is equally important that the organization must change as well as the individual” (Bohach, 2004, p. 32). However, the study of district reform must untangle the intricacies of several stakeholder groups within the larger district. The change facilitator must work among and within each group, realizing that “most adults have a tendency to resist or avoid new learning more than young people because their lives have been organized and a comfort zone established” (Ramsey, 2002, p. 22). The change facilitator must “establish a sense of urgency and an understanding of the rationale behind that change” (Ramsey, 2002, p. 22).

Consequently, the change facilitator’s lens is of particular value to examine district reform. From the Coordinator of Mathematics position, I was able to interact with central office-level personnel, but I was also the conduit of information to school-level personnel. As the change facilitator, I was able to be an integral part of the implementation of the instructional component. In the next chapter, I describe the case study design I used to explore this conceptual design.

Chapter 3: Methodology

Introduction

This chapter describes the methodology I used in this study to answer three research questions: What were the characteristics of the instructional program that JCPS chose to implement in its pre-K–12 aligned mathematics program? What were the dynamics the district encountered when it implemented the pre-K – 12 aligned mathematics program? What change facilitator activity supported the district’s implementation? The methodology stems from prior qualitative research studies and takes into account the unique variables of the case.

Rationale for Case Study Design

The methodology for this research is a qualitative case study using an embedded design. Qualitative methodology allowed me to discover and to describe the characteristics of the elements in the instructional component that JCPS created and to examine the dynamics of its implementation. Qualitative data allowed me to “preserve chronological flow, see precisely which events led to which consequences, and derive fruitful explanations” (Miles and Huberman, 1994, p. 1). Creswell (1998) argued that this method is appropriate when the researcher “builds a complex, holistic picture, analyzes words, reports detailed views of informants, and conducts the study in a natural setting” (p. 15).

An embedded case study design provided the framework to examine the characteristics of the instructional component in a districts’ mathematics program and

to explore the dynamics the district encountered during its implementation. McMillan (2004) advocated the use of the case study methodology when investigating an entity that can be bounded by time and place. This study can be encapsulated by the physical boundary of one school district. It also is historically bounded by the period of time covering the development of the newly aligned mathematics program, its implementation, and the related student assessment. The short amount of time bounding the case, 15 calendar months, adds a unique aspect to the study. The physical and historical bounding of the case helped narrow the focus of the study so that the dynamics of the mathematics program implementation could be fully explored.

The climate of the district during this time also played a role in the implementation of the mathematics program. Several schools had already entered into the new AYP sanctions. The new superintendent clearly communicated to district personnel his focus on increasing student achievement, and principals knew that AYP was a public measure of their school's success but were still adjusting to its requirements. Therefore, this study clearly falls within the definition of "an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" (Yin, 2003, p. 13). In this way, the case study method allowed the researcher to cover contextual conditions of the district that might be significant to the phenomenon of this study (Yin, 2003).

The embedded design allowed for the study of two similar questions in the same case. The first part of the embedded design was an investigation of the

instructional component chosen by JCPS—district assessments, pacing guides, professional development, and an STA. The use of qualitative methods produced a thorough understanding of each part in the instructional component. Original artifacts and memos were included in the study. Each part of the instructional component was analyzed as a separate entity and as a contributor to the entire program in the context of the district. The product of this section was a model of an aligned mathematics program that other districts can examine.

The second part of the embedded case study design was an analysis of the dynamics the district encountered when it implemented the instructional component as viewed through the lens of the change facilitator. This part of the case was important to understand how the people, policy, and place of the case interacted to yield the outcome of the implementation. The product of this section provided valuable implications for policy, theory, and practice. Yin (2003) provided a pictorial representation of a case study that has two distinct units of analysis embedded in the case.

Case Context

During the time this case took place, school districts were on the cusp of responding to *NCLB*. The first cohorts of schools across the nation were descending into the spiral of sanctions for not having met AYP on state assessments, including some schools in JCPS. These schools were looking for exit routes from the grasp of AYP, and their counterparts were looking for strategies to keep from following their fate.

In response to the pressure to have students perform well on state assessments, central offices across the nation began to intensely examine their reading and mathematics programs. Districts began unprecedented evaluations of programs, with a particular emphasis on finding the right mix of variables that positively affected student achievement. The importance of reading and mathematics rose to the forefront of the education agenda.

Site Selection

James County Public Schools, Maryland is a large urban school district and the site chosen for this research. It was 1 of 24 school districts in Maryland trying to achieve the educational demands the state has imposed on the school districts as a response to the federal *NCLB* legislation. Maryland's accountability system, the MSA, is the umbrella under which the 24 school districts in Maryland had to demonstrate growth in student achievement for reading and mathematics. The district chosen for this case relied heavily on state guidelines to create its mathematics program.

JCPS was a school district that eagerly joined the pursuit of finding exemplary reading and mathematics programs. Under the helm of Dr. Matthews, JCPS began an unprecedented reallocation of resources, with the reading and mathematics programs receiving a favorable amount of the wealth.

JCPS was one of many school districts that explored alignment as a strategy to increase student achievement. An aligned mathematics program consists of three components: curriculum, assessment, and instruction. Although the curriculum and assessment components were proposed by the State of Maryland in the VSC and

MSA, the district had to join other districts in the state to design their own instructional component. District leaders, however, had few models available to help them fully understand the instructional component. Also, they did not have a thorough understanding of how the instructional component should best be implemented.

The district's size and wealth enabled it to garner the resources required to purchase or produce the required elements of the instructional component within the bounded time of the study. The district agreed to supply all requested artifacts necessary to undertake the research. These materials helped provide the rich description of the instructional component typical of qualitative research.

The personnel in the case fall into two categories: those who created artifacts in the case and those who used them. The math office created or directed the creation of a significant portion of artifacts studied in the case. Other participants who created artifacts were classroom teachers, MSDE, board employees at the central office, principals, and the superintendent. The participants who used the artifacts were board employees at the central office, the math office, MSDE, principals, the superintendent, and classroom teachers.

Data Collection

This study sought to explore and describe the characteristics of the instructional component in a pre-K–12 aligned mathematics program and to determine the dynamics of its implementation in a school district through the lens of the change facilitator. One artifact data set was necessary to complete the study.

However, due to the nature of the embedded case study design, the analysis of the data to answer the three research questions was completed using different methods.

I requested original documents, memos, agendas, and other artifacts from the district. In all, 325 artifacts were collected and analyzed. These items illustrated the content and purpose of each part of the instructional component and provided significant insights in its contextual setting (Gall, Gall, and Borg, 2003). McMillan (2004) suggests that the qualitative method contributes to a better understanding through words and pictures. To capture this description, I used a set of guiding questions for a data-collection tool (see Appendix A). This tool's purpose was to fully document and explore the contribution of each artifact in the case. The tool allowed me to examine the artifacts independently and then synthesize this information.

Data-Analysis Procedures

The artifacts required to complete this research are in one set, yet the analysis of these artifacts was completed in two parts to answer the three different research questions. I analyzed the collected data with two different, yet situation-appropriate, methods.

First, the instructional component chosen by JCPS in their aligned mathematics program had to be analyzed to understand the characteristics of each part. The results of this process would answer the research question: "What are the characteristics of the instructional component chosen by the district in its aligned mathematics program."

I began by collecting all relevant artifacts from the district that contributed to the case. They appeared in electronic and hard-copy formats. I physically sorted the hard-copy artifacts according to their content into four stacks: districts assessments, pacing guides, professional development, and STA. I also collected electronic copies of district artifacts and sorted them into a folder system on my computer according to their content: district assessments, pacing guides, professional development, and STA.

I set up a labeling system to cross-reference each document's original source as either an electronic or a hard copy and its primary folder: assessment, pacing guide, professional development, or STA. For example, "ah76" was the 76th artifact in the hard-copy folder for assessment artifacts. This labeling system proved invaluable in the constant cross-referencing and sorting necessary in data analysis.

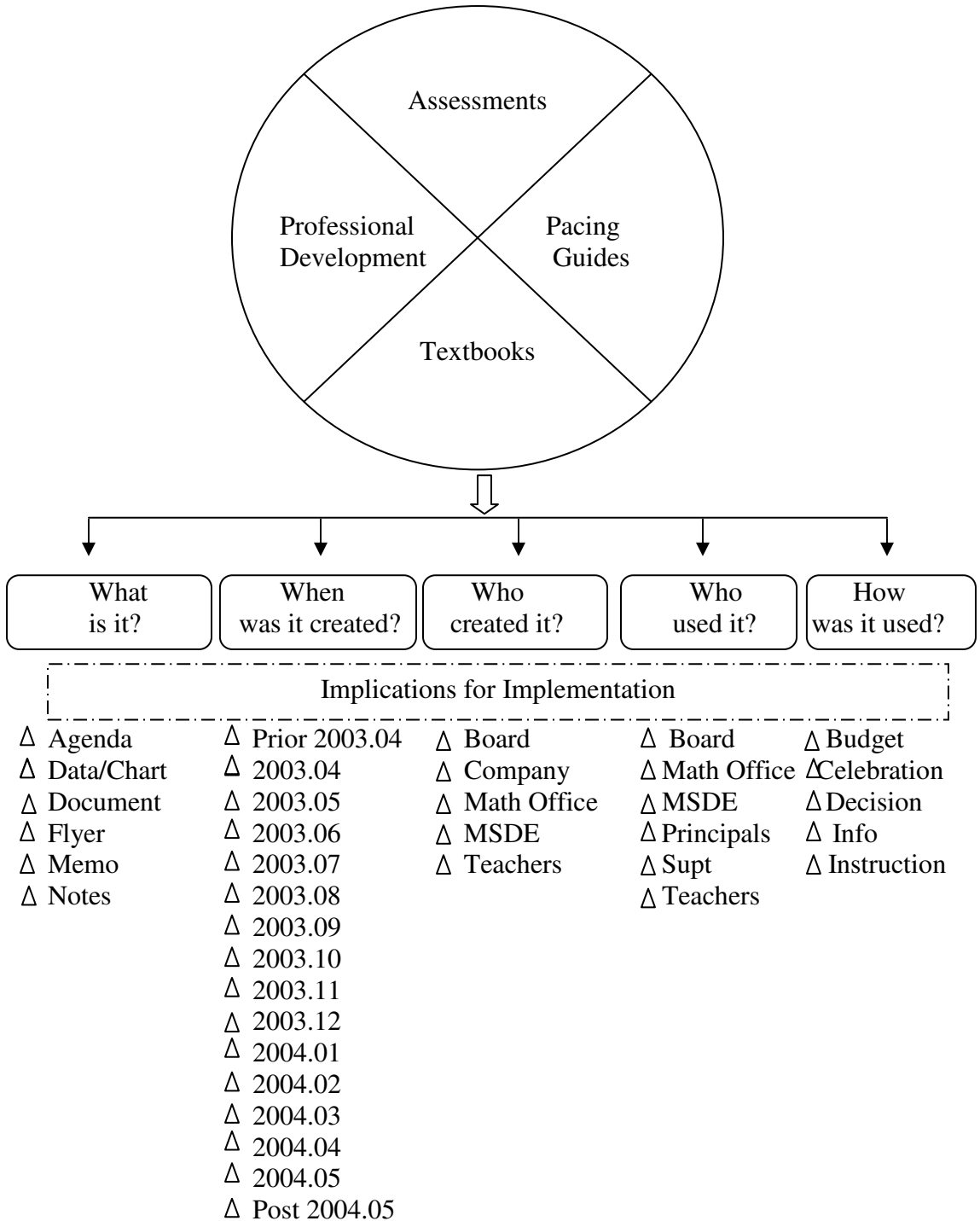
I then examined each of the 325 artifacts and wrote a two-part memo to answer the questions for that artifact using a Qualitative Data Analysis Collection Tool. The answers to the first questions helped quantify each artifact's type, source, and purpose. The last question's answer helped describe each artifact in its context of the mathematics program.

To assist with the volume of artifacts, I used the NVivo 7 qualitative data software. I first devised a set of possible attributes that were written as questions on the document memos. Next, I created a list of all possible values for each attribute. A framework to guide the understanding of this analysis is provided in Figure 3.1.

Figure 3.1 Methodology Framework for Research Question 1

Research Question 1: What are the characteristics of the components a district implemented in its pre-K–12 Aligned Mathematics Program?

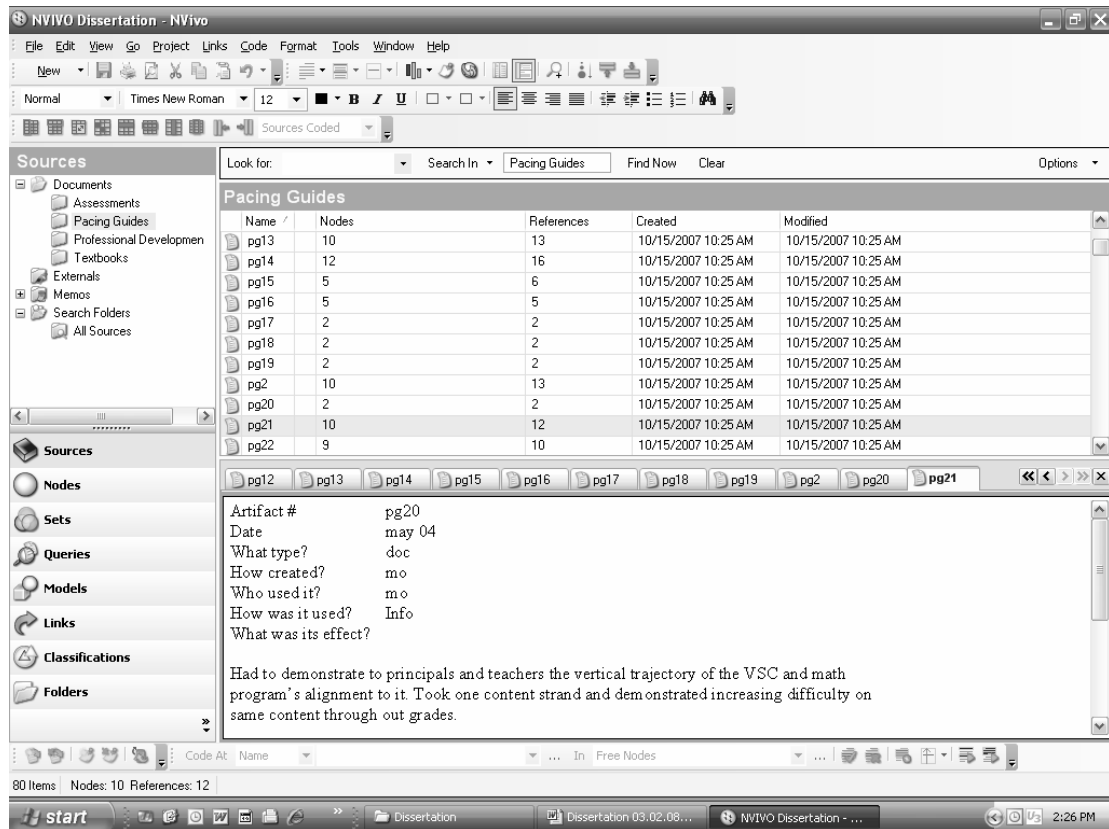
Components of the District’s Mathematics Program



After the initial setup work in NVivo, I imported each Word memo into NVivo as a case. I opened each case and assigned the appropriate values for each attribute. These attributes for each case allowed me to quantify the volume of artifacts. I then ran multiple NVivo Reports for summaries of each of the attributes and their values. I exported these reports into Word documents and then translated report data into EXCEL. Once in EXCEL, I was able to create EXCEL graphs to represent the data. This repeated process allowed me to graphically see the nature of the numerous original artifacts.

The sorting of data using NVivo created mutually exclusive categorical sets of data ready for analysis. I used the attribute summaries and groupings of data into smaller sets for the analysis. This process allowed me to answer the first research question: What were the characteristics of the instructional component chosen by the district in its aligned mathematics program? An example NVivo screen shot for the data after they were sorted and ready for analysis in the professional development category is provided in Figure 3.2.

Figure 3.2 NVivo Screen Shot for Pacing Guides



In the second phase of the data analysis, I used the concept demonstrated in Creswell's (1998) Data-Analysis Spiral as a tool to guide me through the data-analysis process: collecting relevant documents, managing the material acquired in the collection process, reading the available information critically, and representing the analyzed data (see Figure 3.3). I used my insider knowledge as a change facilitator to write the context of each artifact in the case, and then analyzed the text written at the bottom of each memo using NVivo coding software.

Figure 3.3 Using Creswell’s Data-Analysis Spiral

Step	Procedures	Examples
1	Data Collection	Text, Images
2	Data Managing	Files, Units, Organize
3	Reading, Memoing	Reflecting, Writing notes across questions
4	Describing ,Classifying, Interpreting	Context, Categories, Comparisons
5	Representing, Visualizing	Matrix, Trees, Propositions
6		Account

I formed multiple NVivo coding and queries to answer the second research question: What were the dynamics the district encountered when it implemented the pre-K–12 aligned mathematics program? The codes and queries also answered the third research question: What change facilitator activity supported the district’s implementation? I first explored the relationship of each of the participants by generating reports from queries that searched the artifacts for intersections of these participant values taken two at a time. To guarantee that I explored every possible relationship, I completed a matrix as I ran each query (see Figure 3.5).

Figure 3.4 Relationship Study Using Query Text Searches

	MSDE	Math Office	Parents	Principals	Supt	Teachers
MSDE	omit	X	X	X	X	X
Math Office		omit	X	X	X	X
Parents			omit	X	X	X
Principals				omit	X	X
Superintendent					omit	X
Teachers						omit

In each of the reports generated from these queries, I analyzed the intersections for the how and why of their relationships. For example, I ran numerous searches for the intersection of MSDE and the superintendent on the hypothesis that this relationship was harnessed as a lever for implementation. However, because I only found two artifacts to support a strong relationship, I had to investigate other driving forces in the implementation.

I then began an analysis of the data using NVivo for a coding process. The first step of this process was to generate possible nodes for the text in each memo. Based on the initial writing of the memos, I chose the following node categories: Alignment, Communication, Conflict, Data, Monitoring, MSDE, Relationships, Resources, and Workload. I began the process of opening each of the 325 memos and coding their text relevant to the chosen nodes. When other themes began to appear that were not in the original generated list of nodes, I formulated new nodes. This result demanded recoding at each juncture for previous uncoded memos in light of that new node. For example, I had coded up to memo 83 using the previously list of nodes, only to realize upon another reading that several memos had discussed a theme concerning mistakes made in the implementation of the instructional component which was not an option in the node list. I then created a node called Professional Blunders and began again in the list of 325 memos to recode them for this new option. When I picked up again at memo 84, I had a more complete set of nodes. I repeated this process numerous times to complete the original list of nodes with these additional options: Celebrations, Changing Beliefs, New Problems/New Solutions, Pace, Quick Professional Development, and Trail of Memos.

I then created a summary report for each of these nodes. To back up this data for security purposes, I exported a copy of each report into a Word document. At this point, I proposed several models to illustrate the dynamics of implementation using flow charts to facilitate the understanding of the dynamics of the program implementation.

In the phase of the analysis for the second and third research questions, I also used NVivo Queries. The volume of artifacts coded under the New Problems/New Solutions node indicated that that node hid a critical element of the program's implementation. I mined this node to understand its importance and found three significant categories: a Benchmark Data System, Student Support Courses, and a UMBC Masters Cohort for district teachers. I then filtered each set and created a new parent node called New Problems/New Solutions with three children nodes: Creation of Benchmark Data System, Creation of Student Support Courses, and Creation of UMBC Cohort. By creating these children nodes, I could independently analyze each of these finds under the umbrella of a new problem the district encountered during implementation and the solution it created to resolve the situation.

The volume of memos in the Conflict node also made it come to the forefront as a node that needed to be further explored. Once again, I mined the text in this node using searches and found that the data within it fell into four categories: Competition for Scarce Resources, Defensive Professional Development, a Trail of Memos, and Professional Blunders. I analyzed each of these independently and together as a whole set to find common themes.

The data generated in this second phase of data analysis came from the codes and queries I used in NVivo. It allowed me to answer the second research question: What were the dynamics the district encountered when it implemented the mathematics program? It also allowed me to answer the third research question: What change facilitator activity supported the district's implementation?

Validity

Both internal and external validity threats were present in this study. First, a significant number of artifacts were collected from the district and had to be properly analyzed to paint a detailed and accurate picture of the instructional component, otherwise the internal validity would be threatened. Second, and more important, if the study is not accurately framed in a bounded case, then the external validity is threatened as a valid contribution to the research base. The result would be inappropriate transfer of the descriptions to other districts.

To verify my findings, I relied on the numerous artifacts available from the district. I often was able to triangulate my findings in the data using the artifact labeling system. I used memos to assist in the NVivo process, but my labeling system allowed me to find and cite original source artifacts. Dates and signatures verified original documents.

I also used three critical friends to review and critique my findings. The first was a principal during the time of the study who was able to offer a knowledgeable, yet balanced, perspective of the study. The second was a Coordinator in another district who can understand the nuances of the change facilitator role, yet measure the stated findings. The third critical friend held two positions: professionally, a principal

in another district, and, personally, a parent in JCPS during the time of the study. This person adds the external view and can understand the district dynamics.

Personal Biography

The data required for this study came directly from JCPS. During the time that the actual events of the case took place, I was employed as the Coordinator of Mathematics for JCPS. Therefore, I had direct knowledge of the wealth of material available. I continue to be an employee in the school district selected as the site for study, but I now serve in a different administrative position—a high school principal. Through contacts with the Assistant Superintendent for Instructional Services and the Superintendent, however, I was given access to all requested artifacts necessary to complete the study.

The use of my own personal voice is appropriate for the insider view I present as the change facilitator. I present the findings from the district's agendas, charts, documents, flyers, and memos and my own personal notes from the change facilitator lens. As a former curriculum specialist and a current administrator, I have a strong interest in the results of the study. Educators strive to provide the best education for students, but we often find ourselves repeating prior mistakes or not building on prior work. This research will add significantly to the research base on curriculum alignment and guide for policy. This research is timely because the era of accountability and AYP is a reality for every public school in our nation. The results of this research will provide valuable instructional information to other districts seeking curriculum answers. The study also adds lessons for those who also find themselves in the change facilitator role.

Chapter 4: Findings—Research Question 1

Introduction

This chapter is one of two chapters that present the findings of the research. In this chapter, I answer the first research question: What are the characteristics of the instructional component that JCPS chose to implement in its pre-K–12 aligned mathematics program? This rich description is necessary to fully understand the dynamics of the implementation answered in the second and third research questions.

The findings are viewed through the lens of the change facilitator as defined by Hall and Hord (2006). I use my voice as an insider to best capture and present the activities that occurred during the implementation. This lens is an important contribution to the literature because, as the Coordinator of Mathematics for JCPS during the time of the study, it was my responsibility to monitor the development and implementation of the instructional component of the mathematics program. My primary responsibility as change facilitator was to seek interventions that increased the potential for the program's success. According to Hall and Hord, there are six functions of interventions: Developing, Articulating, and Communicating a Shared Vision; Planning and Providing Resources; Investing in Professional Learning; Checking on Progress; Providing Continuous Assistance; and Creating a Context Supportive of Change. Each of the four characteristics of the district's instructional program is examined through the lens of these six functions.

JCPS was the focus for this research. The physical context of the district was 1 of 24 school districts in Maryland, and the policy context was set in a time responding to the demands of *NCLB*. School districts across the nation at that time

tried to amend or avoid sanctions against their schools as a result of poor student performance on mathematics assessments administered by each state. Maryland clearly defined its assessment in the MSA and further defined the curriculum that drove the MSA in the VSC. Some Maryland school districts investigated the implementation of an aligned mathematics program to improve student performance; however, they had to design and implement their own instructional component. The answers to the research questions, therefore, might add to the theory of implementing an aligned mathematics program and assist other districts as they seek to improve student performance in mathematics.

Chapter Overview

Sections in this chapter describe the findings of the case study related to the characteristics of the JCPS's instructional component. Working within the context of Maryland, the JCPS math office was under guidance from the MSDE in regards to its mathematics program. Districts designed their own instructional component that would weave the VSC and MSA into an aligned mathematics program. This chapter describes the district assessments, pacing guides, professional development, and STA program chosen by JCPS.

The chapter begins with a chronological overview of the district activity during the time of the study. I then provided a general analysis of all the artifacts found in the study. Next, I broke the analysis down into each part of the instructional component and described each part through the six functions of interventions of the change facilitator. I concluded with a chapter summary.

Chronological Overview

This case begins in April, 2003 when I was first appointed to the Coordinator of Mathematics position for JCPS. The district was simultaneously beginning to implement four major initiatives in an instructional component.

April was the beginning of a focus on professional development for stakeholders in the JCPS mathematics program. Most importantly, school based leaders had to become aware of the new vision for the aligned mathematics program. I attended the elementary, middle, and high school principals and Department Chair (DC) meetings that month to create the sense of urgency for change (see Appendix B). I also had a significant learning curve in my position in the math office in April. I learned the purpose and format for pacing guides. I also gained a new district perspective as I recruited teachers from all schools to train to review materials for the STA and train to write the district assessments.

May and June were consumed by the activities necessary to complete the pacing guides for all grade levels and subjects. Several central office departments worked together to coordinate these activities. At the same time, I had to communicate the upcoming summer activities to the school based staff so that I could enlist their support before the summer.

The summer of 2003 was filled the final edits for the pacing guides and the challenge of printing and distributing so many documents in time for the opening of school. Technical difficulties hampered any sustained progress. I also trained and monitored the progress of the math office staff as they worked with teams of teachers from all over the district to write the district assessments. The first round of

assessments also had to be available for the opening of school as each elementary school teacher and every mathematics teachers in secondary school was trained on the new STA and its corresponding pacing guide and assessment package.

Fall included a struggle for the math office staff to finish the district assessments with the teachers as the majority of the workforce now back at school. Fall also included the first day of school in the new mathematics program and the task to coordinate the questions, problems, and complaints from so many schools and their communities. I also had to answer the problems associated with the first district assessment administration and began the arguments for students support courses to be built into the high school master schedules for the next school year.

The winter was an intense time of preparation for the MSA. Pacing guides were adjusted and professional development was constantly tailored to providing schools the most recent information to help them be successful on the MSA. I worked closely with central office staff to develop a system that would help my office and school based personnel better monitor the district assessments so that we could provide more timely interventions. Winter was also complicated by a growing dissatisfaction with the pacing guides that required significant time and numerous interventions on my part.

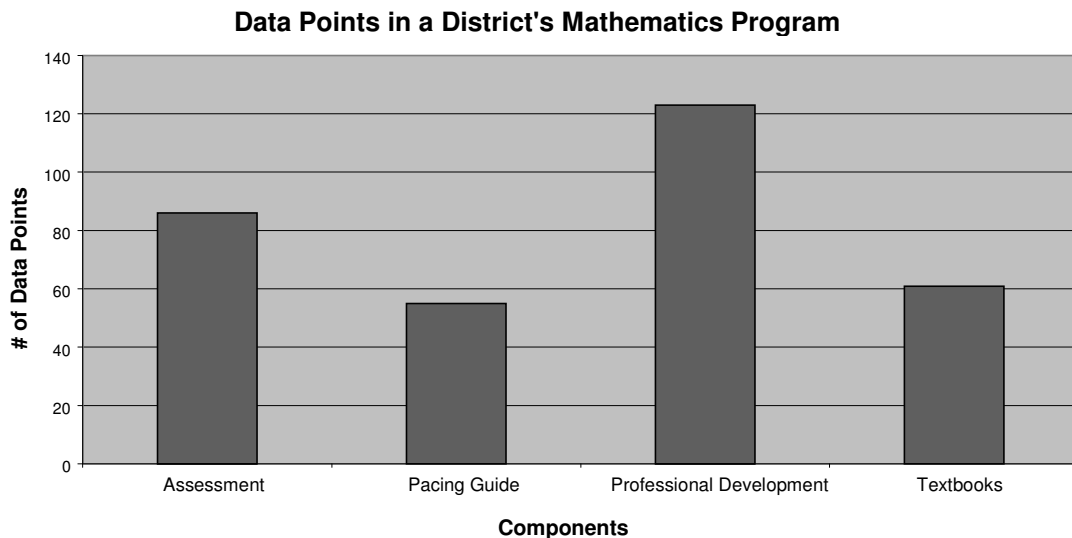
Spring was consumed with activities surrounding MSA. I mediated questions, answers, and strategies between MSDE, the central office, and the schools. I also had to create a solution to the pending shortage of secondary math teachers due to the new student support courses that were approved in the high school master schedules for the next school year.

The following summer was again full of the activities necessary to have a smooth opening to the school year but this time focused on editing the pacing guides and assessments by factoring in the lessons learned from the first year of implementation. Also, the second round of STA began and training had to be provided to that new group of teachers for these remaining courses in the high schools. However, the primary focus of the second summer was increasing school based capacity and leadership. The capstone event was a week long professional development which welcomed classroom teachers from every school and grade level or course in the district. Another event, although smaller, targeted the secondary DCs to improve their leadership skills because we recognized their important role within their own schools.

Summary of Artifacts

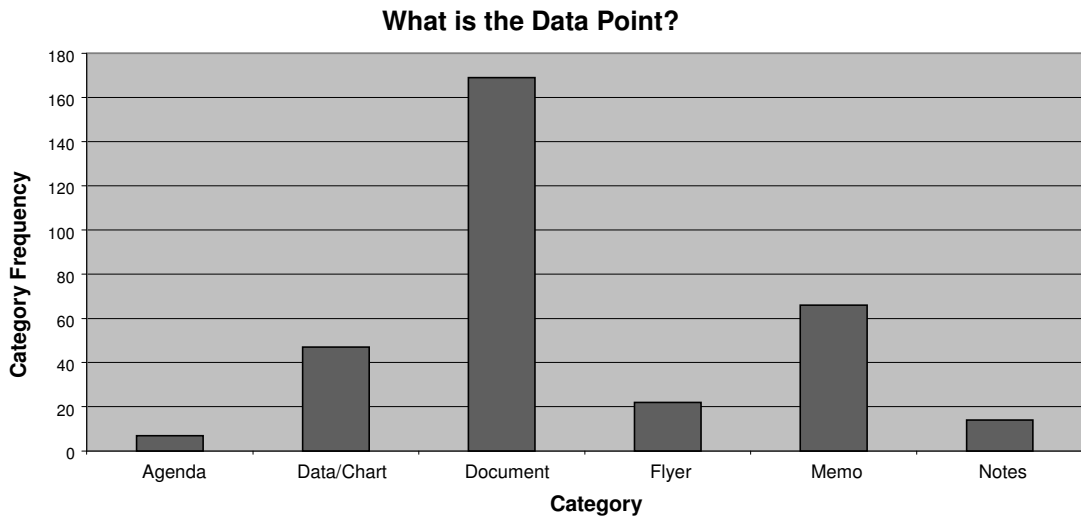
The district provided 325 artifacts to complete the study: 86 assessment, 55 pacing guide, 123 professional development, and 61 STA program (see Figure 4.1).

Figure 4.1 Parts of the Instructional Component



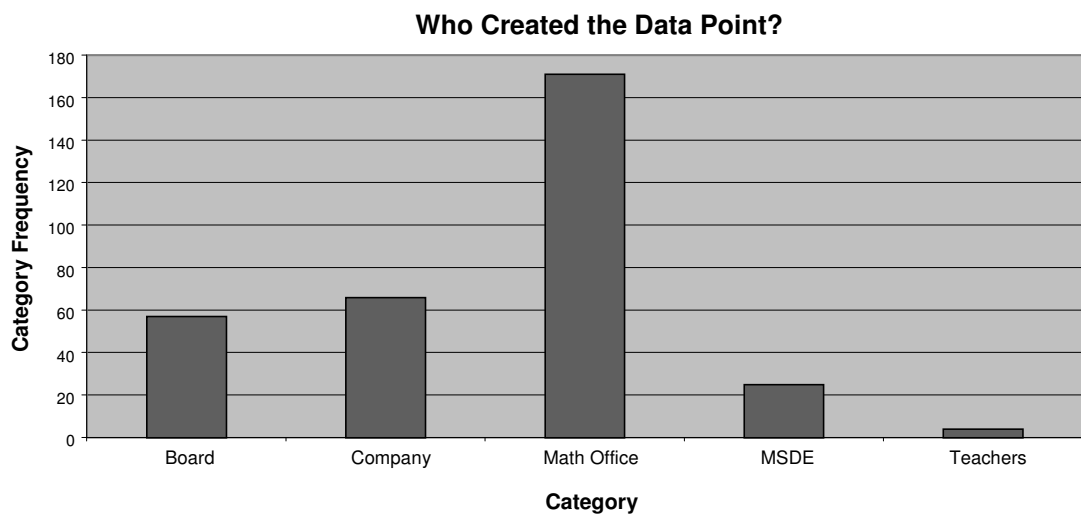
I assigned each artifact one of the possible values for each attribute described in chapter 3, and I concluded that the vast majority of artifacts were district documents, followed by memos, charts, flyers, notes, and agendas (see Figure 4.2).

Figure 4.2 Description of Instructional Component Artifacts



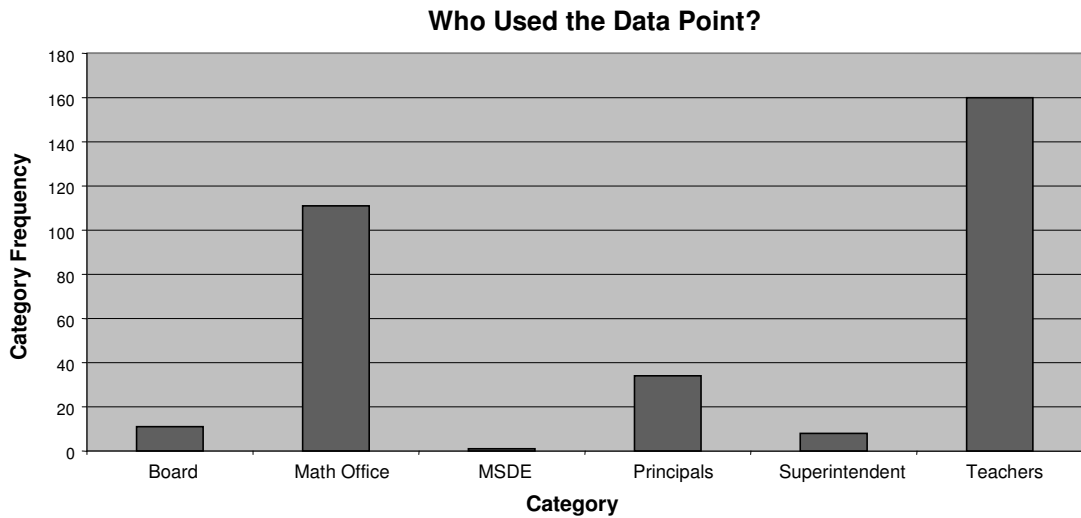
I also found that the math office created the largest percent of these artifacts. Other sources were private companies, the Board of Education, MSDE, and teachers (see Figure 4.3).

Figure 4.3 Creators of the Instructional Component Artifacts



Teachers and the math office used the majority of artifacts. Principals, the Board of Education, the superintendent, and MSDE combined only used a small portion of the artifacts (see Figure 4.4).

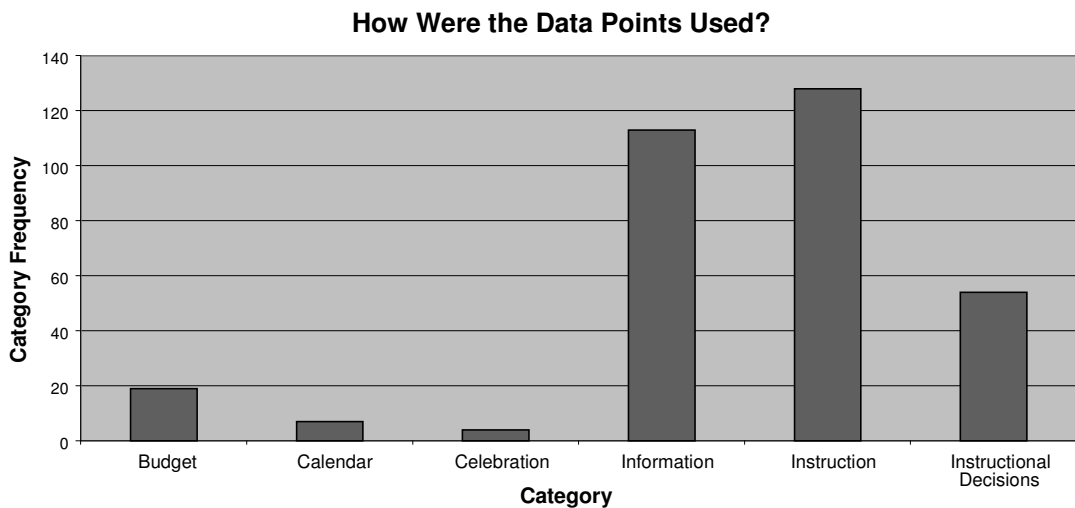
Figure 4.4 Users of the Instructional Component Artifacts



These artifacts were used, in large part, for instruction and corresponding decisions. Many were generated to provide information. By comparison, few artifacts were created for budgets, calendars, or celebration purposes (see Figure 4.5).

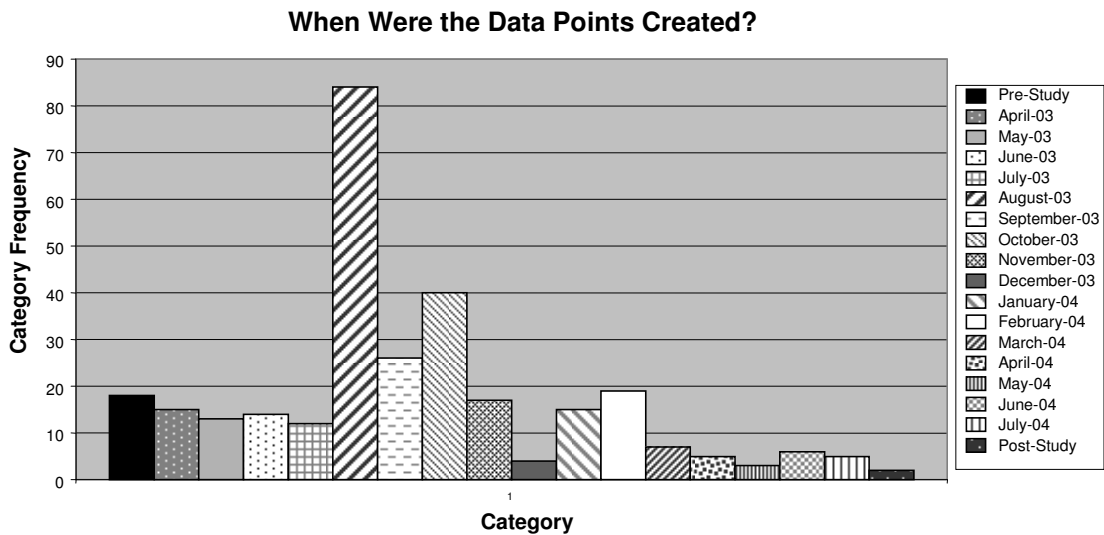
Figure 4.5 Purpose of the Instructional Component

Artifact



The data demonstrated that August 2003 yielded the most documents, in which 84 artifacts were produced. Other peaks in production occurred in October 2003 and February 2004 (see Figure 4.6).

Figure 4.6 Creation Timeline for Instructional Component Artifacts



Each of the following sections dedicates the same detail to each of the parts of the instructional component: district assessments, pacing guides, professional development, and an STA program.

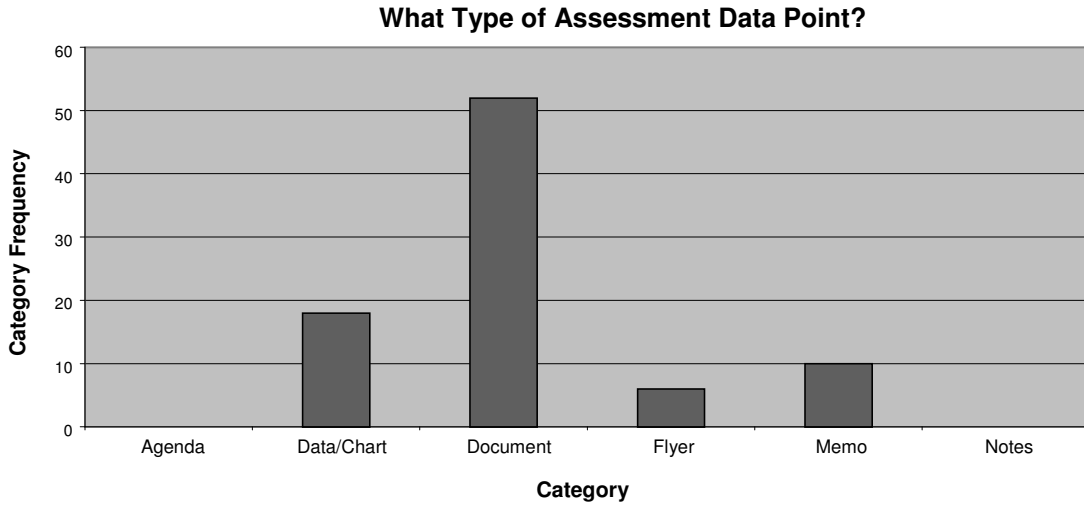
District Assessments

This section describes the comprehensive district assessment program that the math office created for every elementary grade and secondary course for Grade 6 through Geometry. I describe each aspect of the district assessment program from the lens of one of the change facilitator’s six functions.

I collected and analyzed 86 artifacts related to the district assessment program. The vast majority of those artifacts were documents. Eighteen artifacts were charts or data used to describe the program’s successes and failures. A few documents were

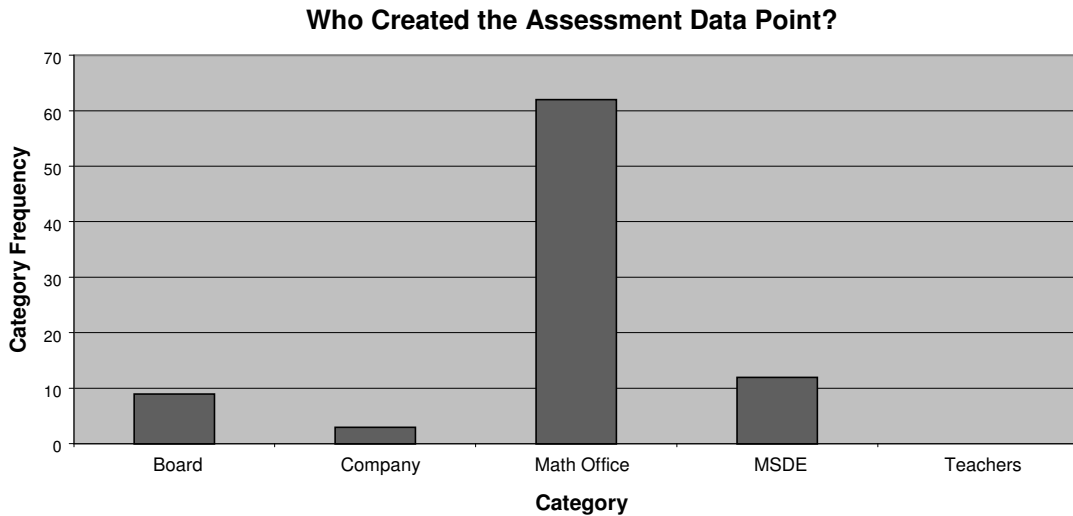
flyers and memos, but no assessment documents were agendas or notes (see Figure 4.7).

Figure 4.7 Description of the District Assessment Artifacts



The math office was the primary generator of assessment documents. The Board of Education, private companies, and MSDE contributed a few artifacts. Individual teachers did not create any district assessment artifacts (see Figure 4.8).

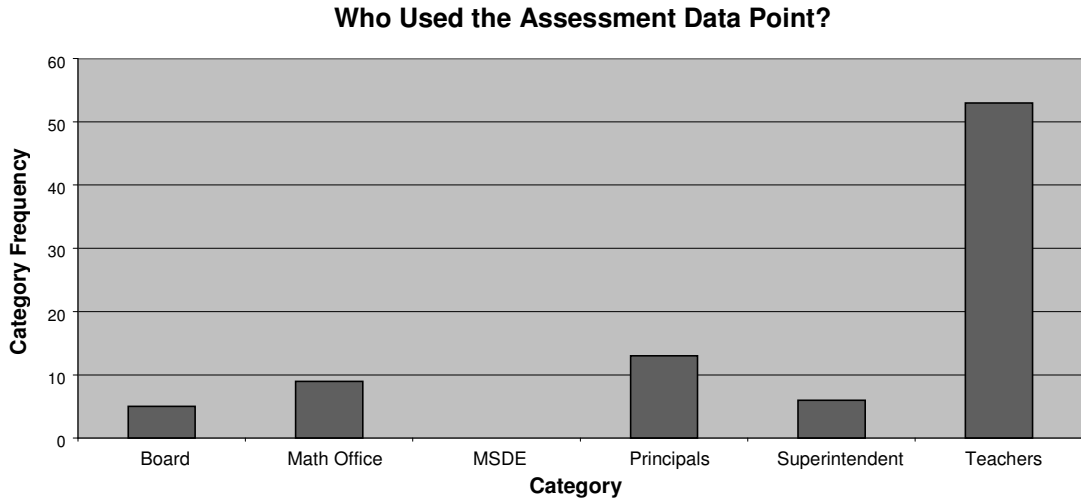
Figure 4.8 Creators of the District Assessment Artifacts



Teachers, however, used the greatest amount of district assessment artifacts. Principals, the math office, the superintendent, and the Board of Education used a few

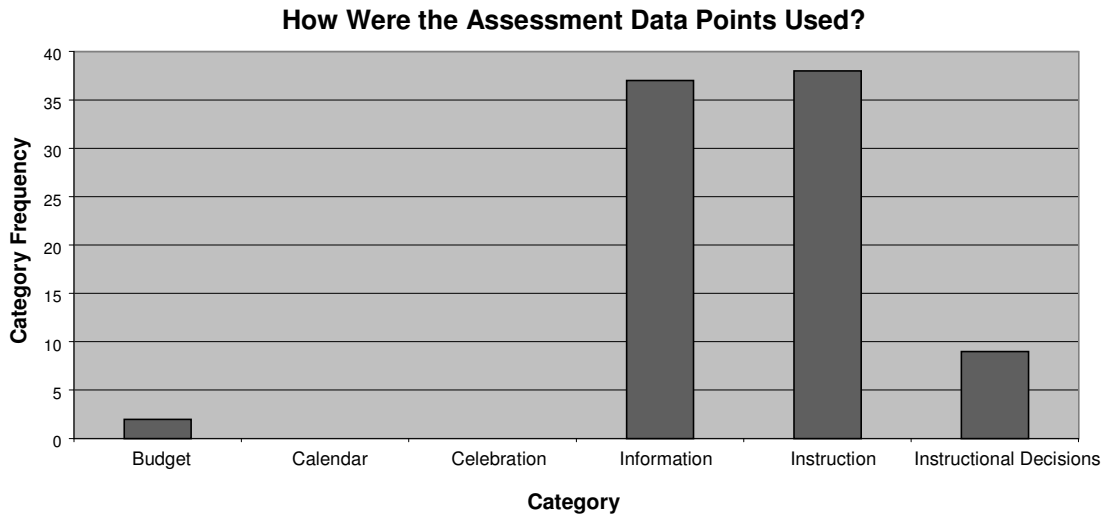
artifacts. Understandably, MSDE did not use any of the district assessment artifacts (see Figure 4.9).

Figure 4.9 Users of the District Assessment Artifacts



The artifacts were used almost exclusively for information and instruction. Only two related to budget issues. None of the artifacts was used for celebration or calendar issues (see Figure 4.10).

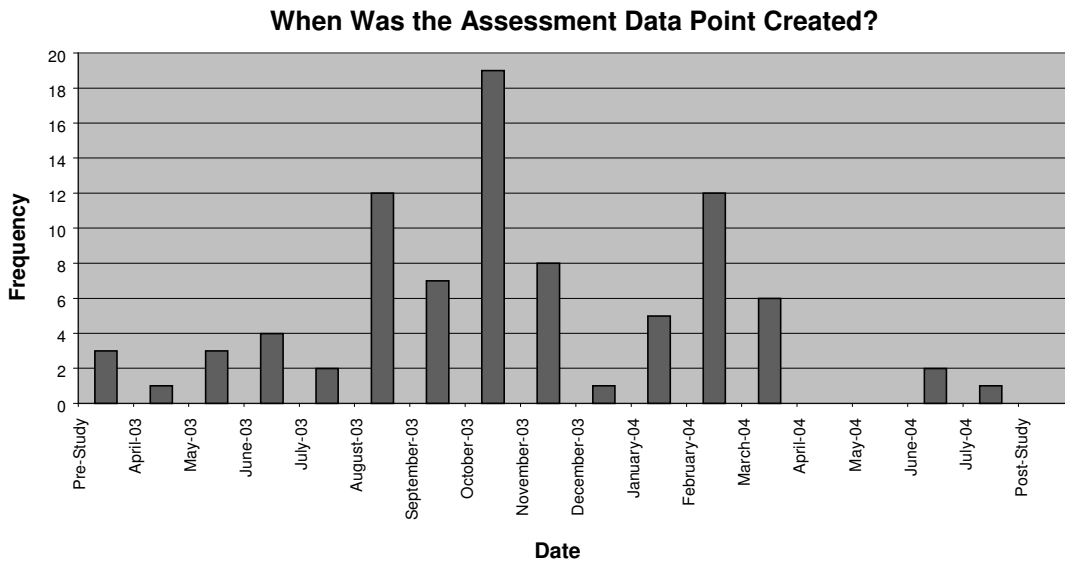
Figure 4.10 Purpose of the District Assessment Artifact



Finally, the district generated the majority of the assessment artifacts during October 2003. August of that year and February of the same school year followed

closely in quantity. The remainder of the months generated approximately two–eight artifacts each except April and May, in which nothing was produced (see Figure 4.11). These months followed the administration of the Maryland School Assessment.

Figure 4.11 Creation Timeline for District Assessment Artifacts



Developing, Articulating, and Communicating a Shared Vision

This section describes the district assessments through the six functions of intervention of the change facilitator. The first significant role of the change facilitator is to develop, articulate, and communicate a shared vision. MSDE imposed the assessment program in Maryland with the MSAs, yet each district had to fold its own assessments into that vision. As change facilitator, I interpreted MSDE information to make it understandable and palatable for the JCPS school-level personnel. The next artifacts demonstrate the JCPS math office efforts to build the JCPS assessment program under the MSDE vision.

A significant finding related to district assessments is the September 2002 special edition of the MSDE Bulletin, which announced the new MSA program,

outlined the phase-in schedule, and defined the VSC. The Bulletin's information detailed MSDE's assessment vision and became the catalyst for districts to examine their own assessment systems in preparation for the MSA. However, this document contained an irony. Although the VSC title suggested that adopting the curriculum might be voluntary, the mandated MSA eliminated any other option for Maryland districts. Another MSDE document quickly followed the Bulletin, this time addressed to all Maryland parents. It is an example of the frequent information provided by the state superintendent directly to the parents regarding assessments required by all Maryland students. A third MSDE document released only 2 months later announced positive outcomes of Maryland's educational efforts with recognition from agencies such as *Education Week*, The College Board, the *New York Times*, and the World Bank. The memos generated by MSDE solidified the imminent changes on the horizon for districts and their need to examine current practice to best prepare for these changes. This section detailed the characteristics of JCPS' district assessment program designed to prepare students for the MSAs in response to MSDE's vision.

JCPS was not alone in its search to respond to the new challenges posed by the MSDE testing program. An artifact consisting of a collection of brochures sent to the math office following the announcement of the MSAs contained examples of the literally hundreds of advertisements from vendors the office received. Each brochure promised outstanding results in student achievement for a small price, which caused the math office to become a critical consumer of available products. The office scanned each brochure for its possibility to enhance its program and fold into the

district vision, yet it began to create a district assessment program largely built from internal resources and those garnered from MSDE.

JCPS created a district assessment program designed to be an integral part of preparing students for the MSA and to align with their vision. The goal of the assessment program was for students to progress through it as steps to their eventual success on the MSA. The most time-intensive district assessment artifact created to support this vision was the development of a comprehensive binder for each elementary grade level and each secondary subject. Each binder contained a complete summative assessment package for classroom teachers. The math office worked in cooperation with teacher representatives from each grade and course to write assessments that modeled the content of the MSA in rigor and format. Each classroom teacher received their assessment binder complete with assessments in the appropriate format, student answer sheets, and teacher answers. At the end of each binder, the math office also included an assessment map for each assessment that detailed the lesson that matched each question and the content standard assessed by each question. A second generation of assessment binder included the level of cognitive demand for each assessment item.

The assessment binder's purpose was to prepare students for the spring MSA administration. Students in Grades 3-8 and in high school courses progressed through the year's curriculum, stopping occasionally to take common assessments regardless of which school the child attended. An elementary school example is that all third graders took a common assessment at specific school year junctions regardless of their teacher or school. A secondary school example is that all Algebra I students took

a common assessment after each instructional unit regardless of the grade in which they took the course or the school they attended. By administering the district assessments to all students at the same time, the district had the ability to benchmark individual student and school progress against the upcoming MSA expectations. By exposing students to multiple district assessments during the year, the district provided experience to students and information to teachers on their projected success and take intervention steps as necessary.

I also encouraged the development of our own JCPS vision. For example, although teachers struggled with the demands of the new assessment program, almost 300 teachers attended a summer academy designed to increase their ability to prepare students in the classroom. The artifact demonstrates the image of a cruise ship was used on a celebratory poster and flyers to advertise the event. The flyer was intended to bring a warm and inviting, almost festive, atmosphere to the academy. Although there was significant work to be accomplished, the math office tried to communicate a vision that included high energy and a positive environment.

Planning and Providing Continuous Resources

Planning and providing continuous resources is another role that the change facilitator plays in implementing a change. In the creation of the district assessment program, test preparation was a critical component. The following artifacts demonstrate how the district answered the schools' call for help to provide resources that would increase student achievement.

MSDE's decision to include written responses on the MSA changed fundamental practice in many math classrooms. As each day passed and the MSA

date loomed closer on the horizon, it became apparent that teachers and principals feared the written assessment piece the most. In response, the math office created a Brief Constructed Response (BCR) and Extended Constructed Response (ECR) 6-week review for each course and grade level. Teachers allowed students to work on these problems as a practice for the MSA. They also could use it in instruction as a model for excellent answers.

Teachers also were concerned about the significant increase in vocabulary on the MSAs. The math office created master vocabulary documents to be copied and cut by classroom teachers to review the appropriate mathematics vocabulary used on the MSA. Resource teachers created these documents from the key vocabulary words that are typically unfamiliar to students, but are used on the MSA. Teachers made a set for themselves for whole-class reviews, and some teachers made a set for each student to practice in class or at home. The teacher would state the vocabulary word on the front, and the students had to give a rich description of the word using appropriate mathematical terms. Many teachers were learning the new vocabulary with their students. It gave them an opportunity to practice the vocabulary that was often a stumbling block for a student to get the correct answer.

As change facilitator, I often had to work with other central office personnel to write memos to provide schools with information and include suggestions on the allocations of their own resources. The increased number and frequency of required assessments was placing a significant burden on school personnel. One memo recognized this trend and informed principals of their role in determining the responsibility of testing in their schools. Another memo recognized that the

collaboration of school principals was necessary to improve the testing calendar, but also recognized the stress of adjusting timelines again. This memo also offered thanks to principals in that regard. Another memo informed principals of the types of questions that could be expected to appear on each assessment, which clarified the format of assessment items for each grade level. It also showed the progressive difficulty in analysis expected by students in answering mathematical questions on concepts as they matured. This led to a dramatic increase on the amount of writing students were expected to complete in their mathematics course and supported increased time in mathematics courses. Another communication to the schools provided math teachers with information on correctly completing answers that required a student to grid their response. It helped students who could correctly solve a problem, yet were not able to grid the answer correctly. Finally, the math office had to communicate to elementary schools the appropriate method of recording the new assessment grades into the old categories of letter grades for students. The grading system in elementary mathematics was unclear and cumbersome for most teachers. Although the document helped provide clarity, it became another resource that teachers had to add to their repertoire to assess students properly. It was the catalyst for a change in the grading policy in elementary mathematics.

I also tried to ensure that teachers and students had the appropriate physical resources necessary to be successful in mathematics. One artifact that demonstrates this effort is the Middle-School Assessment Tools Inventory. A resource teacher surveyed the middle-school DCs to determine the amount of existing stock they had for mathematics tools required for the MSA. Students required access to calculators,

protractors, compasses, and rulers. These items were critical for students to have a level playing field in instruction and assessment. As a result of the survey, central office personnel had a sudden and abrupt wake-up call to the inadequacy and inequality of materials available to students depending on the school they attended. Immediate plans were made to level the playing field by making the required materials available to all students. A sample response is evidenced in the math office's request for the purchase of 1,200 calculators.

Investing in Professional Learning

The change facilitator role also includes investing in professional learning. I often had to work with the small math office team to provide district personnel new and necessary information in a variety of formats. These documents reflect the attempt to respond in a timely manner, yet be sensitive to the multiple target audiences.

The artifacts that caused the most contention in the district assessment program that required a change in professional learning stemmed from MSDE's decision to score math assessments using rubrics and the lack of foresight by the math office to predict classroom teachers' reaction. Because the MSAs contained questions that required a written response, MSDE needed a metric to fairly and accurately award a grade to each response. MSDE generated a scoring rubric for Brief and Extended Response Questions (see Appendix C) to determine a score by defining the characteristics of answers for each score. For example, an MSA Brief Constructed Response (BCR) item could receive a score from 0 to 2 pending the quality of the answer. An answer received 0 points if it was completely incorrect and up to 2 points

if it demonstrated a complete understanding of the problem. An MSA Extended Constructed Response (ECR) question received a score from 0 to 3. In high school courses, the scores ranged from 0 to 3 for BCRs and 0 to 4 for ECRs. MSDE did not initially provide districts with examples for each score to model, which left room for error in interpretation. Also, the rubric language targeted educators; although students could use the rubrics on the assessments, the educational jargon prevented many of them from understanding the intent. Finally, the holistic scoring system used in rubrics was new for most math teachers, who had not previously been exposed to such a grading method.

As a result, JCPS created several artifacts to add to their district assessments. First, the math office personnel wrote many BCR and ECR example questions with answers that modeled each of the available scores on the rubric. These artifacts were used as examples to help teachers acclimate to the new scoring system. The math office also translated the MSDE rubrics into “Kid Speak” rubrics (see Appendix D) that contained a much friendlier jargon for teachers and students. Both of these items assisted district participants’ transition to the new scoring system, but they did not forecast the near cataclysmic fallout from the use of the new scoring system when determining student grades.

The rubric is a holistic assessment of a student’s answer. An excellent high school ECR response received a 4, an above-average score received a 3, an average score received a 2, a below-average score received a 1, and a missing or inappropriate score received a 0. However, after the district administered the first benchmark assessments, the phone in the math office rang repeatedly with complaints of

exceptionally low student scores. The haste to write, edit, and distribute the assessments did not factor into the scenarios of implementation. It was not until the office received several phone calls that the math office realized that teachers calculated the BCR and ECR points directly as percentages. In other words, instead of translating a score of 2 to a C, the teachers converted each score into a percentage. For example, teachers interpreted the 2 as 50% or a letter grade “E” because it was 2 points out of 4 possible points. Consequently, scores all over the district were much lower than expected, and teachers, parents, and principals alike sounded the alarm. This concern resulted in a quick gathering of resource teachers and department chairs to quickly construct a scale that would take into account rubric scoring. This effort produced scoring scales for elementary and secondary district assessments. The math office, in cooperation with the director of curriculum, wrote a Cut Score Memo (see Appendix E) and distributed it to the principals to explain the new scale. As the Coordinator of Mathematics, I attended the next set of principal meetings to listen to their concerns and explain the scale to further clarify its necessity and purpose.

The assessment limits provided by MSDE became another critical component of JCPS’s district assessments. The assessment limits clarified the level of expectation for each content standard. For example, a content standard might be introduced in an early grade, assessed at a moderate level of rigor in the next grade, and further assessed in higher grades at increasing levels of rigor. Advanced student groups were expected to answer questions at the top end of the assessment limit, whereas teachers could narrow the focus to the lower assessment limit for struggling

students. This process guaranteed that all students had practice with a content standard, but at a level appropriate for their current ability.

The assessment map for each district assessment eventually included the level of cognitive demand for each question after the first round of assessments were administered. MSDE heard many educators who complained that the MSAs were too rigorous and provided information on levels of cognitive demand at the November 2003 briefing. After attending the briefing, the math office trained classroom teachers to not only write assessment items, but also to evaluate their level of cognitive demand to ensure that each district assessment included a variety of difficulty levels.

The constant, nonlinear flow of information regarding the assessment program is reflected in several artifacts. First, MSDE published Frequently Asked Questions (FAQs) to continuously update districts on assessment information. These FAQs were a concise source of information for the test administrators and teachers in preparing the administration and collection of materials. Combined with the math office and other administrators' reflections after the first MSA administration, the math office created a memo to numerate a summary of best practices for future preparation and administration of the MSA.

At the district level, the math office produced versions of a memo called "Things I Learned on Friday That You Can Do Tomorrow!" Math office personnel wrote these memos to school-level personnel after attending state briefings to provide timely, accurate information to the schools regarding the MSA. The math office also produced documents to capture essential assessment facts. In the new world of accountability, even the most well-intended educator became lost in the many

assessment requirements. For example, one document clearly delineated the multiple targets that schools had to hit in order to be successful as required by district and state policies. It defined the task at hand for those responsible for making decisions, such as allocations of personnel and materials. Another document that reflected the continuous attempt to share knowledge is a warm-up that the math office used with department chairs (DCs) and administrators to test their knowledge of the current accountability arena in Maryland. It let administrators and DCs gain an idea of their current knowledge and filled in any gaps. Another example of the math office being the conduit between MSDE and the schools is the sharing of rules for classroom décor during the MSA administration. This document provided clear guidelines and alleviated some of the fear that teachers had of trying to give their students all of the possible advantages without breaking any assessment administration rules.

The math office also had the responsibility of coaching school-level personnel on strategies to better our teacher and student performance. Three documents reflect this effort. First, administrators and DCs received a “Look Fors” guide that contained MSDE and JCPS suggestions for classroom instruction. Administrators who were not from a math background but wanted to have improved instruction did not always know what that goal looked like. This document clarified those expectations and gave administrators a tangible benchmark on which to evaluate their observations. Second, a “Questions for Quality Thinking” document was distributed to classroom teachers. Teachers were encouraged to engage students in active learning and to push their thinking in mathematics, but not all teachers had the training or resources to make this goal happen. This document was given to teachers to begin to change the most

common types of direct questioning habits that do not stimulate student thinking. Finally, the math office created a “Strategies to Extend” document for teachers who were encouraged to heighten student performance on written response questions, yet did not always have a model of what that appropriately looked like in the classroom. These strategies demonstrated best practices in that effort and gave teachers tangible ideas on how to improve their instruction.

Most of these communication documents were collated and stored on a CD that was distributed to all schools. The math office wanted to provide the current knowledge base of all information available to them in an easily accessible format that could be shared or edited. Teachers could access the information that was pertinent to their grade. Administrators knew what needed to be monitored. Each group was given model work to be used and evaluated in the classroom. The production of this CD verified that the math office was working to provide school-level personnel with timely and accurate information. It also proved the tenacity to utilize cutting-edge technology, such as mass producing CDs, for the task.

Checking on Progress

The change facilitator role of monitoring the district assessments was necessary to check on progress. I was able to complete this task through multiple sources of data. In fact, as the following examples illustrate, the sources of data input were so numerous that the math office became flooded in data and often fell short in the time, personnel, and skills necessary to analyze them.

The deluge of data coming into the math office caused a new alliance with the testing and technology offices to meet these challenges. Most significant, the

technology office created a new benchmark data tool in response to concerns that it was too difficult to monitor benchmark scores in so many schools and so many grades and courses in each school. Teachers administered the district assessments all over the county at appropriate intervals. When the creation of an online tool was finished, teachers attended a 2-hour training session to learn how to input their students' scores according to a packet of directions. Teachers were paid \$25/hour to attend the training. After teachers completed the data-input stage, they could view a summary of their students' results. A DC could view a grade or course summary, a principal could view any summary in the school, and district office personnel could view summaries for the district and school levels. This new tool allowed educators at various levels in the organization to make immediate instructional decisions based on the results.

The most significant assessment data points, however, came in the summer after the first round of the MSA administration. District scores increased for students receiving advanced or proficient on the MSA from 73% to 81% in Grade 3, 64% to 76% in Grade 5, and 39 to 56% in Grade 8. The data clearly demonstrated growth in the district in the first year of implementation. It also showed progress as measured against other districts in the state.

Providing Continuous Assistance

Another role in the repertoire of change facilitator is the necessity to provide continuous assistance to others during implementation. Four artifacts demonstrate evidence of this role, all pertaining to the JCPS math office attempting to maintain a tight alignment with the MSAs. First, the math office produced a chart that demonstrated the chapters in which each released Algebra I item was located.

This analysis allowed the math office to determine whether the text was appropriate and to communicate to teachers where they needed to focus. This document took strands from the VSC, Data Displays, and Data Analysis, and it showed the progression in rigor from Grades 3-8. It was a visual that helped teachers understand MSDE's attempt to vertically align the curriculum. This alignment should prevent accusations of "a mile wide an inch deep." It also demonstrated to teachers of older students that students had received prior exposure to curriculum so they did not have to "start from scratch" every year. The second artifact is a folder of items for a summer enrichment program. The math office heard teachers and parents clearly indicate that students were not ready for the rigor in the new program, so the summer bridge program for students expanded significantly. This opportunity provided considerable help for struggling students. Third, a folder of statistics practice items was discovered that provided guidance to teachers and students. Because an unprecedented number of students were placed in Algebra I in lieu of lower math courses, many teachers with no prior experience were now called to teach Algebra I. Many teachers were not comfortable with the new statistics material that they had to teach or the format in which it was assessed. It is another example of the enormous amount of resources that the math office produced to mediate the fast changes. Finally, clarification was necessary for principals to direct teachers on the new proper assessment of early childhood students. As the curriculum changed, the previous assessment method, called TOOL, did not match. It had to be aligned with the expectations of the new math program. Hence, a memo was drafted to principals.

Creating a Context Supportive of Change

All of the prior change facilitator roles combine to define the last role: provide a context supportive of change. In such a large district, context is difficult to define. Communication often flows only in the direction from the central office to the schools. Success of the program, however, depended on school-level personnel knowing and understanding their vital roles. One artifact exemplifies the attempt to support change in a memo from the math office to principals that asked for their feedback on the program's major aspects. Principals could individually reflect on the year's strengths and weaknesses and offer possible course corrections for the following year.

This section described the characteristics of the JCPS district assessment program through the change facilitator's six functions of interventions. The next section also uses the change facilitator's role to describe the district pacing guides.

Pacing Guides

This section describes the district's pacing guides as part of the instructional component, followed by a description through each of the change facilitator's intervention roles. A pacing guide is an instructional tool specifically written for a teacher audience detailed to a grade or course. The document is called a pacing guide because teachers can use it to determine the amount of time allocated to each instructional unit. Therefore, after taking into account the normal variances in a school calendar, teachers can pace their way through curriculum for the school year.

Each pacing guide had three parts. The opening page is called a "Year at a Glance" because it highlights the major instructional units and approximates the

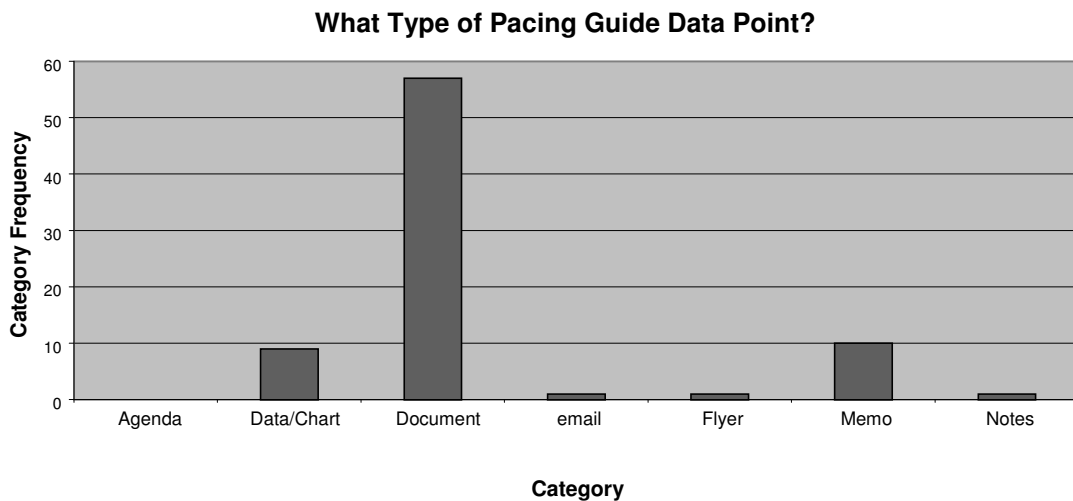
number of school days allotted to each. The actual guide is multiple pages with the same column headers: Day Number, Text/Material Reference, VSC Standard, and Sample Assessment. The day number indicates the sequential day of the school year for each lesson. The text or material reference indicated the textbook section or other material to which the lesson correlated. The VSC standard taught in each lesson appeared in the third column. A sample assessment item for that content standard, written in the appropriate format and at the appropriate level of rigor, was modeled in the last column. The last part of the pacing guide was a feedback page so that teachers could record and report their concerns to the math office. The math office recruited and trained teams of teachers to write pacing guides in the summer of 2003 for all courses from pre-K through AP Calculus. Each guide could later be reproduced and distributed to every other teacher with a similar course.

In the elementary schools, two programs existed prior to my hiring as the Math Coordinator. Consequently, the math office wrote two entire sets of pacing guides for each grade. The superintendent previously identified 19 schools to receive the Saxon mathematics program as their primary instructional resource. Dr. Matthews advocated Saxon's use with the belief that it could quickly increase the performance of underachieving schools. The remaining 58 elementary schools adopted the Scott, Foresman text as a primary resource. Each school received the appropriate pacing guide materials. All 19 middle schools had the same pacing guides: Math Six, Advanced Math Six, Math Seven, Pre-Algebra Seven, Algebra I Seven, Pre-Algebra Eight, Algebra I Eight, and Geometry. All high schools also had the same initial

acing guides: Algebra I, Geometry, Algebra II, Pre-Calculus, AP Statistics, and AP Calculus AB and BC.

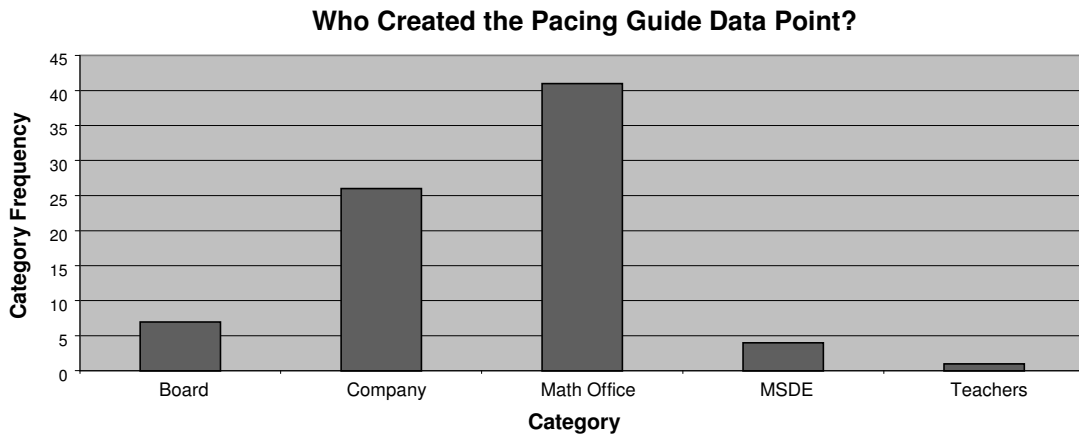
I collected and analyzed 79 artifacts related to pacing guides in JCPS. The vast majority of these artifacts were documents. The remaining artifacts fell into the chart, flyer, memo, or notes categories. No artifact related to pacing guide was a calendar item (see Figure 4.12).

Figure 4.12 Description of the Pacing Guide Artifacts



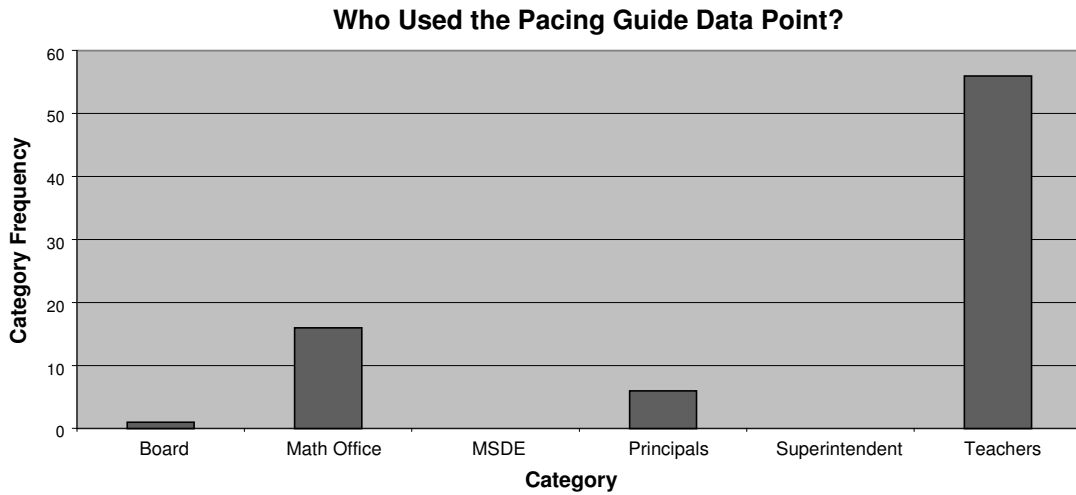
The math office and companies created most of the artifacts. Personnel at the Board of Education and MSDE created 11 artifacts, and one teacher created an individual document (see Figure 4.13).

Figure 4.13 Creators of the Pacing Guide Artifacts



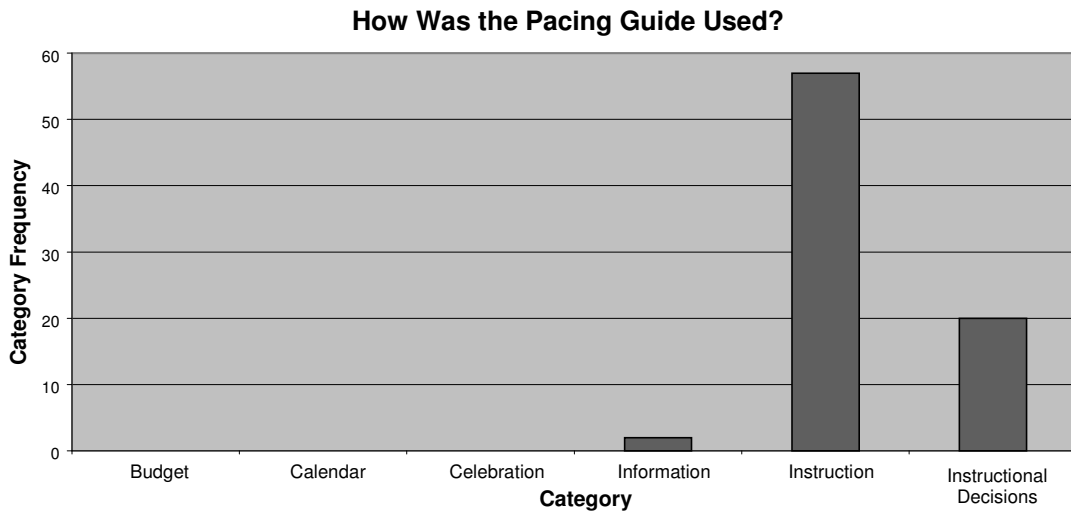
Teachers once again used almost all of the pacing guide artifacts. The math office, principals, and Board of Education members used a few. MSDE and the superintendent were not the primary users of any of the pacing guide artifacts (see Figure 4.14).

Figure 4.14 Users of the Pacing Guide Artifacts



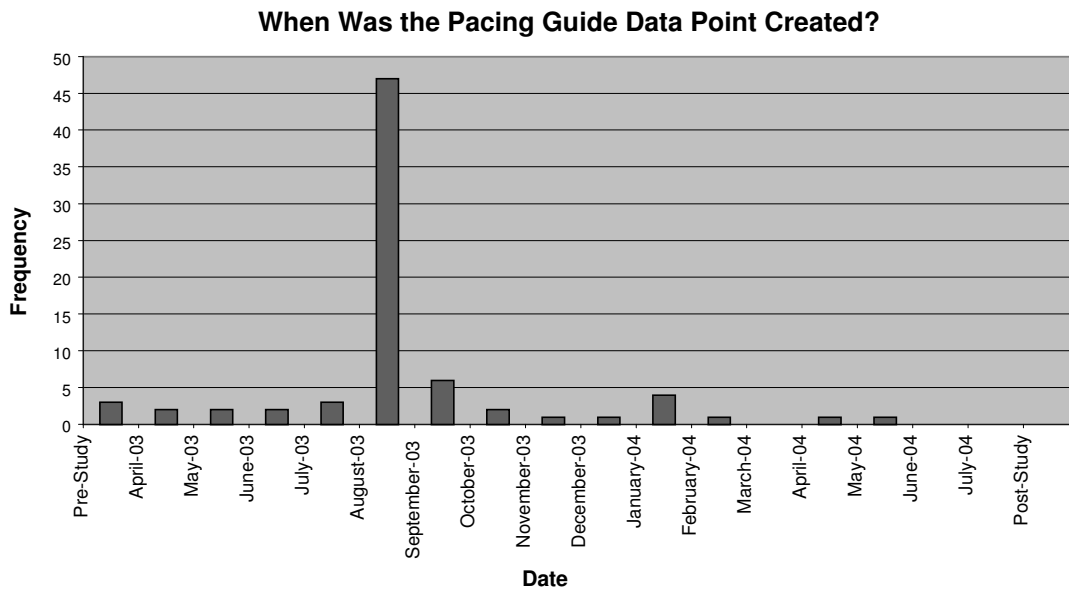
As defined, almost all of the pacing guide artifacts were used for instructional purposes (see Figure 4.15).

Figure 4.15 Purpose of the Pacing Guide Artifacts



August proved to be the main month in which the pacing guide artifacts were generated: 47 of the 79 artifacts were created in August, with the rest scattered throughout the school year (see Figure 4.16).

Figure 4.16 Timeline of the Pacing Guide Artifacts



Developing, Articulating, and Communicating a Shared Vision

For the pacing guides to be a successful part of the instructional component, the change facilitator’s role of developing, articulating, and communicating a shared vision became a primary focus. Pacing guides would drastically alter the traditional freedom enjoyed by teachers in the classroom regarding the content they covered and the amount of time they spent on each topic. Nevertheless, pacing guides ensured that a student in a particular course received the same amount of exposure to the same topics as other students in the same course regardless of whether they were in a different teacher’s classroom down the hall or in another school. By communicating pacing guides as a tool to facilitate the vision for a cohesive and rigorous math program, the math office expected an easier transition to their later implementation.

MSDE laid the foundation for the vision of building a cohesive, rigorous curricular program, as evidenced by memos and information distributed at state meeting for all the Math Coordinators in Maryland. In fact, MSDE sent out an often-referenced memo that forecast the new HSA requirements and the expectation that all students will progress through a common curriculum. MSDE then announced the elimination of the Maryland Functional Mathematics Test as a minimum graduation requirement in lieu of the upcoming MSA/HSA testing program. MSDE also advocated the Bridge to Excellence and Accuplacer, which both included methods to guide and monitor the uniform progress of students in a rigorous secondary mathematics curriculum.

In JCPS, I found it easy to weave the push for rigor and uniformity desired by MSDE with the same vision held by the superintendent, Dr. Matthews. His push for high academic expectations is evidenced in several supporting artifacts that enhanced the pacing guide initiative. In elementary school, for example, principals received a memo that described the allocation of new gifted and talented (GT) resource teachers to schools so that students who were capable of exceeding the curriculum expectations in the pacing guide could receive advanced instruction. A memo to middle-school principals detailed new guidelines to accelerate students' entry into Algebra I. Although students previously had to be primarily in the eighth grade and scored an 8 or a 9 on a diagnostic test, the superintendent opened admission into Algebra I to include eighth graders who could score as low as a 6 on the diagnostic test. In high school, the superintendent charged the math office with creating a new program pathway for students. It differed significantly in all prior program pathways.

Primarily, Algebra I became the lowest course available for ninth-grade students, which eliminated several nonacademic options. The pathway also included a Calculus III course that was not yet even written.

To communicate the full vision to so many stakeholders proved to be a difficult task. The math office attempted to recognize and solve this problem with what, at the time, was a cutting-edge technology solution: The technology office prepared a CD with all timely and relevant pacing guide documents. I wanted all schools to have access to all the documents necessary to support the program and be able to distribute that information freely.

Not all communication attempts went as smoothly. For example, in an attempt to collate the large number of documents required for a pre-K–12 program, I established naming protocols for all documents. One glitch occurred when a group of teachers working on pacing guide documents found what they thought was a better, yet different, organization system. Members of the math office spent an enormous amount of time on irregularities such as this one, trying to produce documents with clean formatting that could be reproduced for all teachers of a particular grades and courses. Another contentious communication effort is a letter from a special education teacher to his students' parents. It demonstrated the angst felt by special education teachers as they tried to support the superintendent's push for rigor, yet acknowledged the challenges of their students.

Planning and Providing Continuous Resources

Planning and providing resources is the next significant change facilitator role that I worked through in reference to the pacing guides. Instructional time rose to the

surface as the most treasured commodity in the new program, and I constantly had to situate pacing guides in a favorable light when possible. In fact, on my first day on the job in April 2003, I negotiated with Dr. Matthews that AP Calculus BC would be the only AP course that automatically received twice the normal amount of course time in the high school schedule. Soon to follow, Algebra I and Geometry soon received optional support courses for students who required twice the instructional time to be successful. These decisions allotted more time for students in mathematics courses, yet less time in other subject areas.

Investing in Professional Learning

To acquire resources for the program, I invested a considerable amount of time as the Math Coordinator in the change facilitator role of investing in professional learning. I coordinated with the math office team to design numerous activities to increase teacher, parent, principal, and board-level personnel knowledge regarding the pacing guides. This learning took the typical form of professional development days and retreats, but it also unfortunately took the frequent form of a memo. For example, a memo to principals in November 2003 detailed a significant change for special education students only because there was no time in the calendar year to wait for the next principal meeting. It detailed how those most closely affected by the change, the special education teachers, would attend a meeting to gain further information; but the principals only directly received the information in the memo. Much greater detail on professional learning is provided in that section of the instructional component.

Checking on Progress

In the change facilitator role of checking on progress, I worked with the math office team to keep a pulse on the activity in all elementary, middle, and high schools, plus the pertinent activity at the board level. The superintendent's adoption of Charter Management became one vehicle for this monitoring process. Each month, I reported to a Project Management Oversight Committee (PMOC) that was comprised of executive staff members. I used the opportunity to frequently bring to light issues that could jeopardize the success of the math program and request support for its success. My compulsory attendance at these monthly meetings to deliver a 15-minute update forced me to continuously prioritize the needs of the mathematics program, and pacing guides often appeared on my agenda. As one artifact demonstrates, in which I presented an imminent change for the second semester that required new pacing guides and texts, PMOC could be a valuable resource to harness.

Other artifacts that check on progress demonstrate that the results were not always favorable. Monthly principal and DC meetings were often filled with concerns that not enough instructional time was allotted to content in the pacing guides. At the elementary level, the math team produced a document demonstrating that they combed each lesson and eliminated any unnecessary material. At the high school level, the pacing guide for Algebra required numerous revisions. Each revision required a back-to-the-drawing-board approach for that pacing guide from writing, formatting, and distribution.

Proving Continuous Assistance

The pacing guides required numerous changes in the mathematics program. Consequently, as the change facilitator, I frequently facilitated the provision of continuous assistance. For example, members of the GT team advocated for extensions to the pacing guides to serve their students. This considerable undertaking consisted of grade-level acceleration assessments for each unit in each elementary grade. The cost to the district was significant because each hired teacher was paid \$200/day during the summer, and four teachers were needed for each grade for 10 days. The English Language Learner (ELL) student group also needed assistance. These students were often too far behind their peers to successfully begin the pacing guides. To facilitate their success, the math office found a program called “Fast Math” in Fairfax, Virginia, that successfully accelerated ELL students’ basic math skills. College-bound students also saw a change in their program. The Pre-Calculus course typically included numerous activities from College Board’s pace setter program, but a survey to Pre-Calculus teachers is evidence of the necessity to eliminate this program due to the amount of instructional time they required, which was not available in the pacing guides.

A summary of these efforts is found in an artifact produced by the curriculum office, the Program of Study. Although this document is usually somewhat stagnant from year to year, its production was significantly delayed due to the number of changes made to support the pacing guides.

Creating a Context Supportive of Change

For pacing guides, the summary change facilitator role of creating a context supportive of change is evidenced in many artifacts from all levels in the district. The elementary schools required the most time-consuming and intensive support. Pacing guides infused unprecedented rigor into the elementary program and also introduced new time constraints for each topic. To directly answer concerns from principals, teachers, and parents, I scheduled nine evening sessions around the district. These sessions allowed school-level personnel and parents the opportunity to voice their concerns, and it gave me an opportunity to detail the data and reasoning behind the necessity for pacing guides. These sessions often became contentious, but they allowed each side to voice their concerns about the program. Additionally, another artifact demonstrates my attempts to inform MSDE of the parents' and teachers' concerns. Members of the elementary math team in our office detailed the number of content indicators that students were expected to attain at each grade level. The list clearly demonstrated the crowded curriculum in the fourth and fifth grades.

At the other end of the elementary spectrum, parents of GT children complained that they feared the new program would not provide enough challenge for their children. Artifacts created from the newly enhanced 24 Game competition designed to showcase these students exemplified efforts to engage these students at the district level.

At the middle-school level, the pacing guide for the Advanced Six course was an enormous concern. The two middle-school directors' offices were flooded with phone calls from parents and teachers who complained about the rigor and pace of the

guides. The evidence from the teachers taken together illuminated how the discrepancies in the prior math program left fifth graders in the 77 elementary schools at vastly different levels of skill and content knowledge when they tried to merge into only 19 middle schools. After numerous meetings and curriculum review, I presented evidence to convince the superintendent that course would be the only one in the district that required two texts for all children to be successful.

I also spent a significant amount of time and effort at the high school level to create a context that was supportive of change. The numerous changes to the high school program of study were somewhat expected with the superintendent's new push for rigor; however, a newly discovered flaw in the program required additional and unexpected changes. I discovered this flaw when I attended an MSDE meeting for all Coordinators of Mathematics. I learned that JCPS had not made prior necessary changes to accommodate a COMAR requirement that students pass a Geometry course to receive a high school diploma. Because I had recently been a DC, I knew that each high school had 12th-grade students who had not been or were not currently enrolled in a Geometry course. This discovery caused me to spend numerous hours with the Director of High Schools and later the Deputy Superintendent and Director of Student Data to create an unpleasant, yet necessary, plan to identify and reschedule these students. The math office created a special second semester pacing guide for these students and met with principals and DCs to explain the necessary changes.

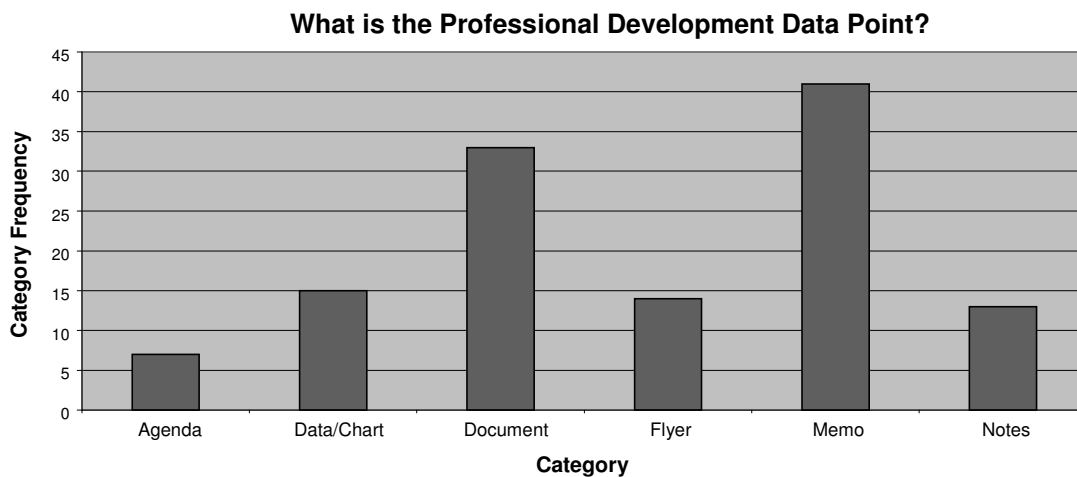
Professional Development

This section describes the characteristics of the professional development used in JCPS to support the instructional component. Professional development's purpose

in the instructional component was to increase the knowledge base and skill level of those responsible for implementing the new mathematics program. In addition to the numerous personnel levels at the Board of Education who needed to be trained on the essentials of the mathematics program, all school-level personnel and the greater school communities had to be provided information on the new mathematics program to facilitate its success. This task proved to be most burdensome for the limited personnel in the math office: one coordinator, two secondary resource teachers, six elementary resource teachers, and one secretary.

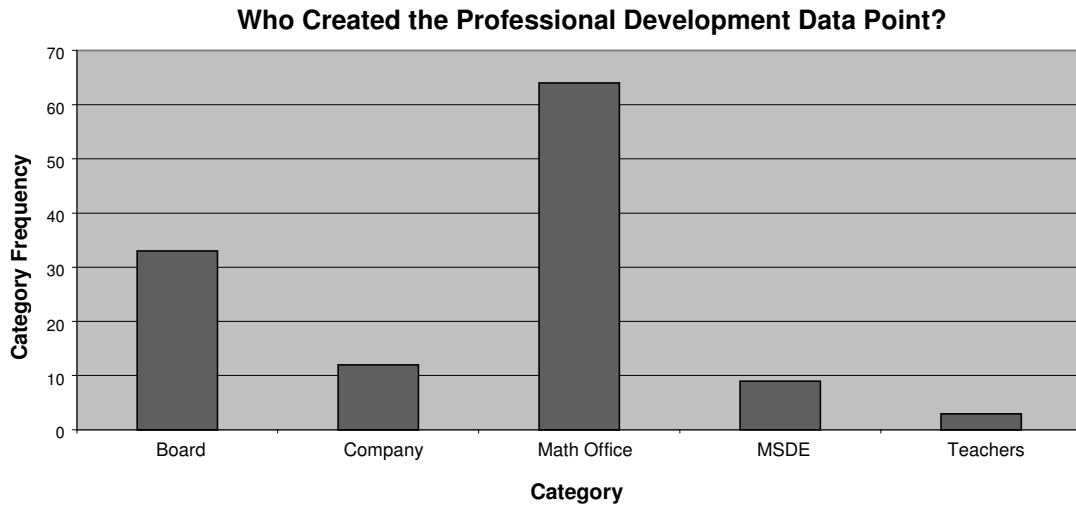
I collected and analyzed 123 artifacts related to the professional development part of the JCPS instructional component. Surprisingly, the majority of these artifacts existed in the form of a memo. The remaining artifacts were documents, charts, notes, flyers, and agendas in that order (see Figure 4.17).

Figure 4.17 Description of the Professional Development Artifacts



The math office and the Board of Education provided a significant portion of the professional development, yet private companies, MSDE, and a few teachers contributed to this effort (see Figure 4.18).

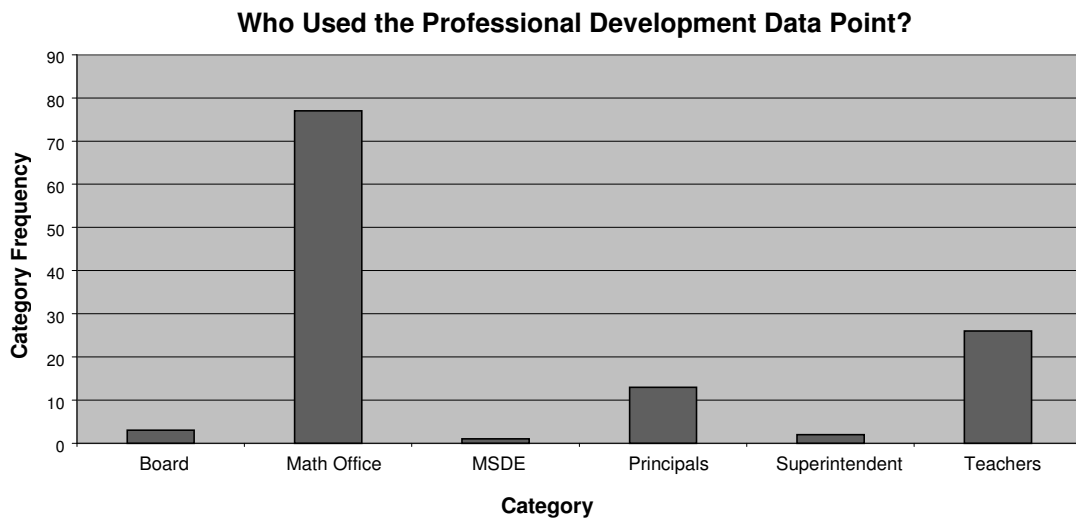
Figure 4.18 Creators of the Professional Development Artifacts



The math office used almost all of the professional development artifacts.

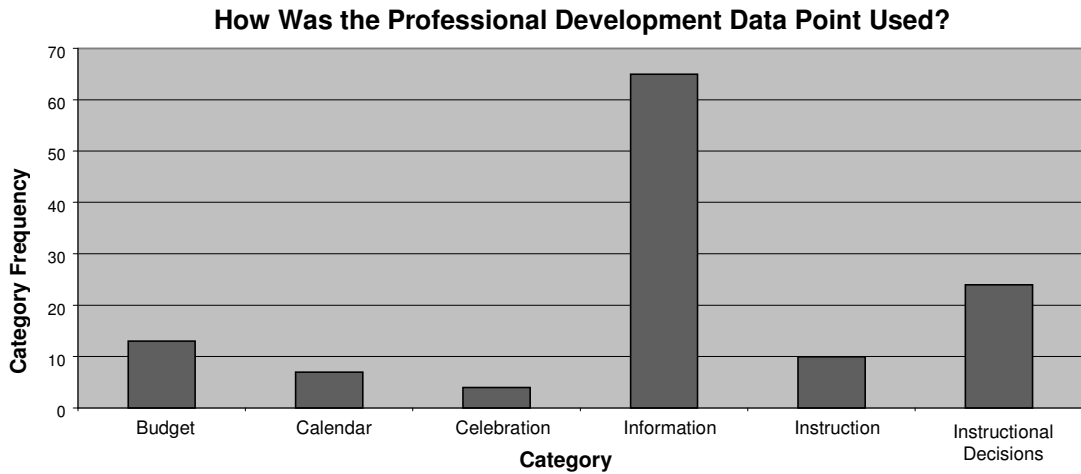
Teachers, principals, the Board of Education, the superintendent, and MSDE used 55 artifacts (see Figure 4.19).

Figure 4.19 Users of the Professional Development Artifacts



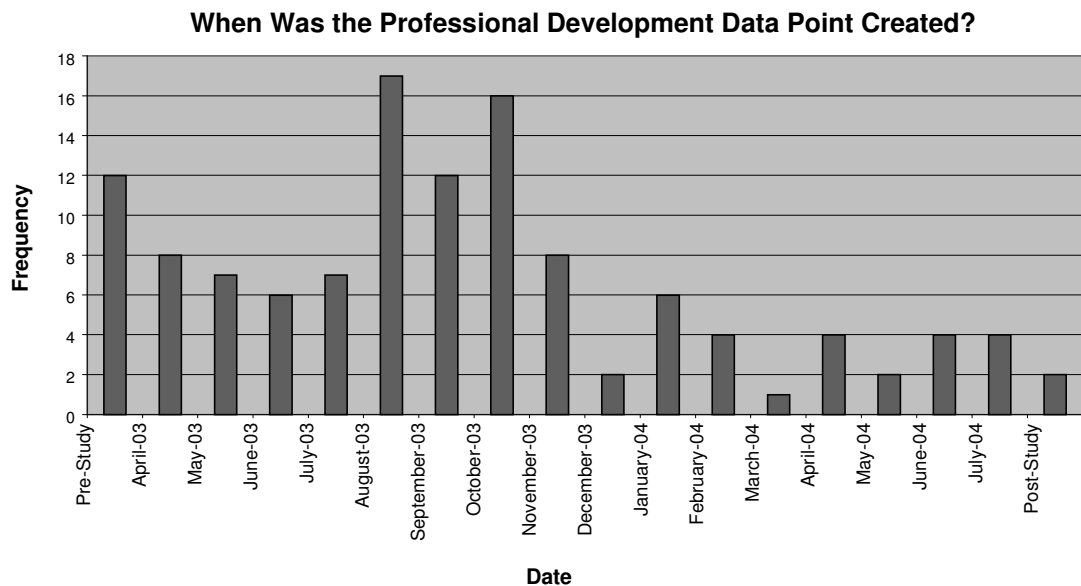
Information distribution and instruction were the primary uses for the professional development artifacts. A few were allocated to budget, calendar, and celebration (see Figure 4.20).

Figure 4.20 Purpose of the Professional Development Artifacts



It is most interesting to note that, although August was the primary month for professional development because it was before the school year began, the volume of professional development activities continued until well into the spring (see Figure 4.21).

Figure 4.21 Creation Timeline of the Professional Development Artifacts



Developing, Articulating, and Communicating a Shared Vision

Although there existed a volume of technical information that needed to be shared in the district, the most important role that I played as change facilitator was developing, articulating, and communicating a shared vision. From the moment I was assigned to the position of Coordinator of Mathematics and realized the enormity of the task at hand, I began to develop and disseminate a packet that proclaimed the new vision of the mathematics program. The math office made thousands of copies of this packet in an attempt to widely distribute the need for a new vision and the purpose of the new program. Numerous iterations of the packets came into existence depending on the target audience, but the existence of and dedication to a new vision for equity and rigor for all children became a cornerstone of the program. Soon every presentation that I gave began with the motto, “Every child has the opportunity to learn rigorous mathematics.” I also developed a logo for the mathematics program derived from the Serpenski fractal. The fractal might seem to be just an attractive display of triangles that is quite appropriate for a math program; however, it also was an attempt at humor. On the one hand, a fractal is definitely a math symbol because it represents infinity. On the other hand, fractals also are associated with an attempt to draw order out of chaos. As the following artifacts demonstrate, a fractal is a rather appropriate representation for the professional development part of the mathematics program.

Planning and Providing Continuous Resources

Due to the enormous task of educating all stakeholders in a 74,000-student district, the change facilitator role of planning and providing resources rose to a high

level of importance just to manage the task. One artifact that clearly demonstrates this responsibility is the blue sheets I had to continuously sign to pay teachers to attend the numerous professional development activities. I requested and spent approximately \$500,000 to cover professional development expenses. The vast majority of the math office budget was dedicated to professional development. The difficulty, however, stemmed from the different accounts that covered these expenses. Federal guidelines provided allowable activities for spending money, and I attended meetings to learn the accounting system. Memos exist from Title I, Title II, and other local funds that dictate the parameters for each account. These memos came in at such a volume that the work was overwhelming and left the math office very frustrated with the lack of personnel available to complete the work. Learning the appropriate substitute codes and the 18-digit accounting system proved to be a frustrating task that required an excessive amount of time. Often, meetings were placed on my calendar which resulted in me being scheduled to be in two different places at the same time.

Providing resources to schools that had previously not received this attention, however, also had a positive aspect. For example, one memo detailed the distribution of two complete class sets of whiteboards, markers, and erasures to every secondary school. I also had the opportunity to share research and current literature, particularly as it filtered from MSDE.

Investing in Professional Learning

The most obvious change facilitator role that I had in the professional development part of the instructional program was investing in professional learning.

For teachers, two factors increased the importance of professional development. First, NCLB required teachers in mathematics to be highly qualified, and MSDE produced a 100-point chart that described how Maryland teachers could meet this requirement. The math office had to work with the Human Resources office to ensure that we provided math teachers with the required support.

It also was necessary to provide teachers professional development because they required a new knowledge base and skill set to successfully implement the new mathematics program. To gain access to the teachers, however, I first had to work with the district and school leadership teams. One document demonstrates the information I shared at the annual Leadership Conference for all school leadership teams. I used this time to create the need for teacher training by laying out the difference between the prior program and the new program so that school leaders would see a need for change. The math office eventually created a matrix that identified all professional development activities planned for the year. However, the matrix was in a state of constant flux depending on the latest professional development need.

Elementary schools always required the most strategic planning due to the number of teachers in 77 elementary schools. After running short on conference materials at the first elementary conference I planned, I also realized that many elementary support staff and principals attend their conferences. The conference the math office planned for elementary schools just prior to the opening of the 2003-2004 school year is the best example. James Community College hosted the event due to the sheer number of attendees. On one day, all teachers and support personnel in the

58 schools using the Scott-Foresman program attended. The next day, all teachers and support staff in the 19 schools using the Saxon program attended. Preparing for the logistical burden of such an event often crowded the time spent on preparing the actual content for the event.

At the secondary level, two notable professional development opportunities took place. First, the math office partnered with two other districts and the Baltimore Washington Chamber of Commerce to hold a symposium at the Maritime Institute of Technology. This 1-day event featured the President of the University of Maryland Baltimore Campus as the keynote speaker and offered numerous breakout sessions according to teachers' subject and interests.

The second professional development activity for secondary teachers took the direction of a master's degree from University of Maryland, Baltimore County (UMBC) that would be paid for almost in its entirety by the JCPS math office. When the district created support courses in the high school, it also increased the number of mathematics teachers necessary in each school. JCPS simply could not recruit that number of teachers, so the math office formed a partnership with UMBC. The district had numerous elementary and middle-school teachers, so they were offered the opportunity to complete the master's program for only the cost of their registration and graduation fees. In return, they were expected to assume a high school position within the next calendar year.

Additional agendas and materials demonstrate the laser focus the math office tried to maintain on developing and polishing teachers' skills and content knowledge. The size of the district and the limited amount of time in the professional

development calendar, however, often forced the math team to find alternative methods of professional development. For example, at times, the math office distributed helpful articles and information from venues such as the National Council of Teachers of Mathematics and MSDE. One document was simply entitled “Things I Learned Today That I Can Use Tomorrow,” which was simply summary notes from each MSDE conference. DCs were often tapped to be the conduit for professional development. DCs came to monthly meetings, and the math office charged them with returning to their schools to replicate the training they received with their own staffs. For example, the math office taught a model lesson template and a “think-about” document for BCRs/ECRs to the DCs and expected them to take this knowledge to their home schools.

The cumulative event sponsored by the math office was a Summer Academy open to two elementary teachers from every elementary school and two teachers from each subject in each middle and high school. At the cost of \$240,000, the math office paid these teachers to learn the updates in their grade or subject and the latest research for classroom practice to enhance student success for 1 week in the 2004 summer. The math office advertised the event with posters that proudly displayed a cruise ship displaying the math conference information with the slogan “Welcome Aboard!”

Checking on Progress

The change facilitator role of checking on progress occurred quite frequently in the professional development part of the instructional component. Principals and teachers often voiced their requests for areas of growth where they thought the math office needed to provide further support. Additionally, the math team learned from

each event as we collected feedback forms from each teacher at the conclusion of the larger conferences. This information guided the content and format of future professional development days. In particular, the math office dedicated one session to only elementary principals at their request for specific information. Another session focused entirely on middle-school principals to teach them the new program sequence and the additional staff they would need to support it.

The numerous requests for professional development did not leave much time for members of the math team to acquire their own professional development. Rare examples include a 2-day retreat sponsored by MSDE and other day-long MSDE events designed to bring district Math Coordinators up to speed on state news. One rare example of an excellent professional development experience occurred when I was required to attend a weekend conference for the International Baccalaureate program being implemented in two high schools. This opportunity gave me exposure to an experienced international organization's methodology for working with educators that I could replicate in JCPS.

Providing Continuous Assistance

The professional development part of the instructional component also provided me with numerous opportunities in the change facilitator's role of providing continuous assistance. For the program to be successful, I had to keep a constant pulse on the central office and school-level progress. At times, that meant creating solutions to unforeseen problems.

Our small math team united at this time to best support the professional development of school-based personnel. Additionally, the local DCs proved to be an

invaluable school-based resource. One artifact is an often-used contact list for these people who were called on to be the filters and buffers from the math office to the school. Another example is the creation of a math vocabulary list that enhanced the VSC. This list provided common language definitions for teachers who struggled to learn the new curriculum. Other examples include research articles on timely topics for the schools.

The math office also participated in a larger attempt by the school system to assist teachers. After fielding so many school-based complaints regarding the frequency and timeliness of the professional development events, the district purchased a new online professional development registration system. This system's purpose was to advertise, register, and record all professional development in the district. Because the math office generated a significant portion of the professional development activity, we were often called on to provide input into its development.

Creating a Context Supportive of Change

The change facilitator's role of creating a context supportive of change fell nicely into the professional development part of the instructional component in JCPS during the time of this case, although not always with favorable results. The immediate problem was not being able to "touch" every math teacher despite the fact that they were spread over a large district in 108 schools. I had to find alternative ways to constantly inform, receive feedback from, and thank the math teachers in JCPS.

One of the first artifacts of the study, however, illustrated the wide range of freedom I had in which to operate and unite the math program and its teachers in the

way I best saw fit. The artifact is an agenda from the first meeting the Director of Curriculum had with the Coordinators soon after she and I were both hired. The loose framework of the agenda and the meeting it organized set a tone for independence in the department. I used this opportunity to create and organize the math program in a way that I thought would best strengthen and unite those responsible for its implementation.

An agenda for the first-ever retreat for DCs is an example of an event I planned at the secondary level to develop school-based leadership and then tap them as a conduit to the other teachers in our schools. A chart showed the numbers of shirts we purchased for them to wear at their home schools to illustrate their leadership position when they finished the retreat. I also hosted a dinner for all elementary lead teachers to thank them for their work and to lay out the plans for the next school year. I tapped these school-based leaders to be the voice and ears of the math office. In this way, I was able to send and gather information to the schools in a more personal manner.

However, not all stakeholders in the school system utilized the math DCs and lead teachers as vehicles for communication. Four artifacts—a letter written by a parent of one of our 74,000 students, a phone message from an administrator, an e-mail from MSDE, and a letter from a teacher—illustrate the literally thousands of correspondences that ran through the math office during the time of the study. The volume of incoming messages became so heavy in the fall of 2003, in fact, that it swamped the tiny math office staff. I began the practice of only returning phone calls to superintendents and principals, which resulted in a backlash of complaints. The

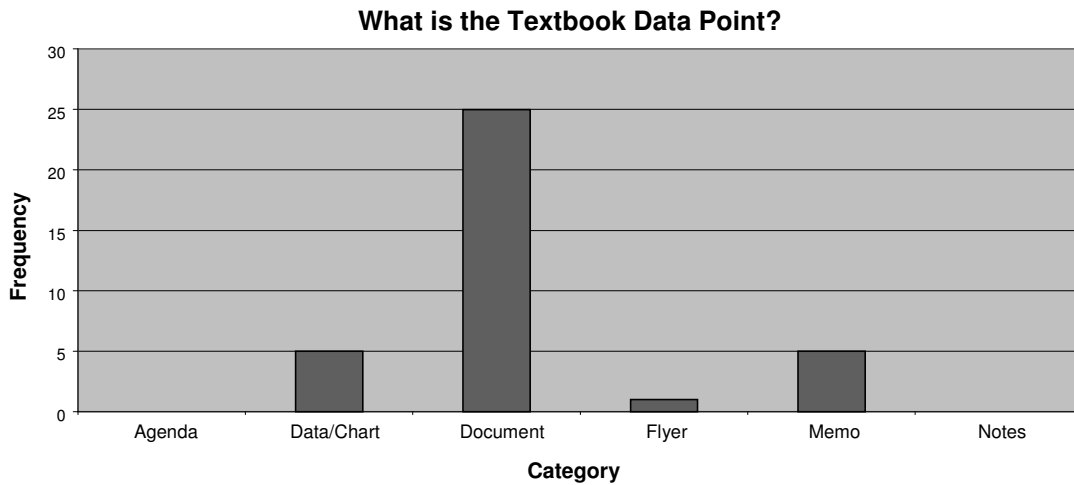
resolution arrived in the winter of that year when the central office realized the severity of the situation and approved a new staff position.

Single Text Adoption

The last part of the instructional component designed by JCPS was a STA program. These artifacts describe the district’s plan to purchase and use one text for each grade or course regardless of any prior mathematics instructional materials used by individual schools and teachers.

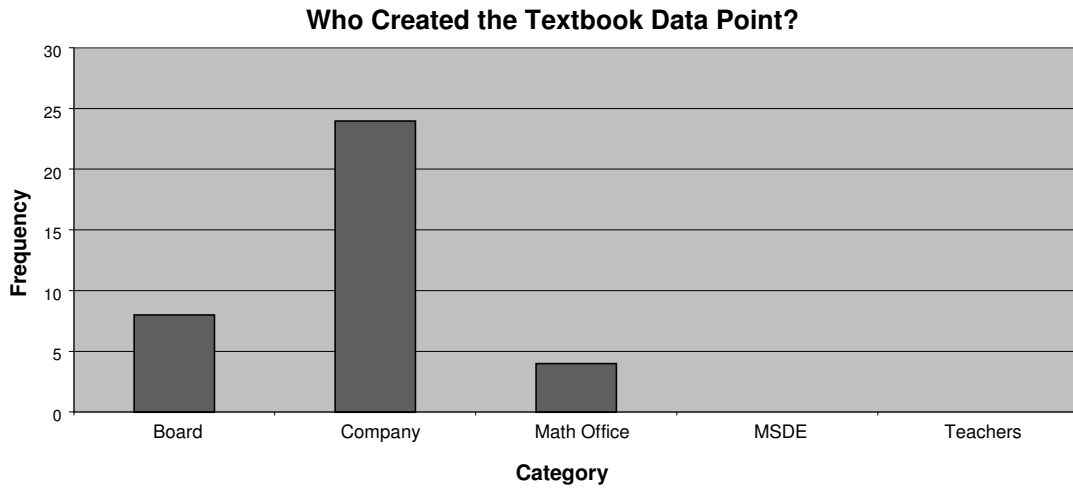
I collected 61 artifacts related to the STA program. Almost all of the artifacts were documents. A few were charts, memos, or flyers (see Figure 4.22).

Figure 4.22 Description of the Single Text Artifacts



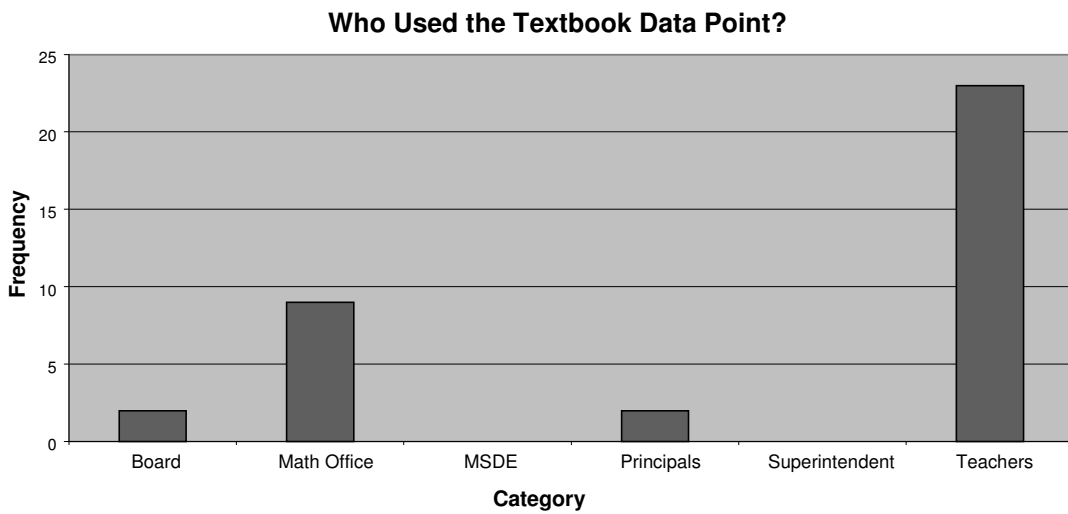
Private companies generated the majority of artifacts in the form of actual texts. The Board of Education and the math office were the only other sources of text artifacts (see Figure 4.23).

Figure 4.23 Creators of the Single Text Artifacts



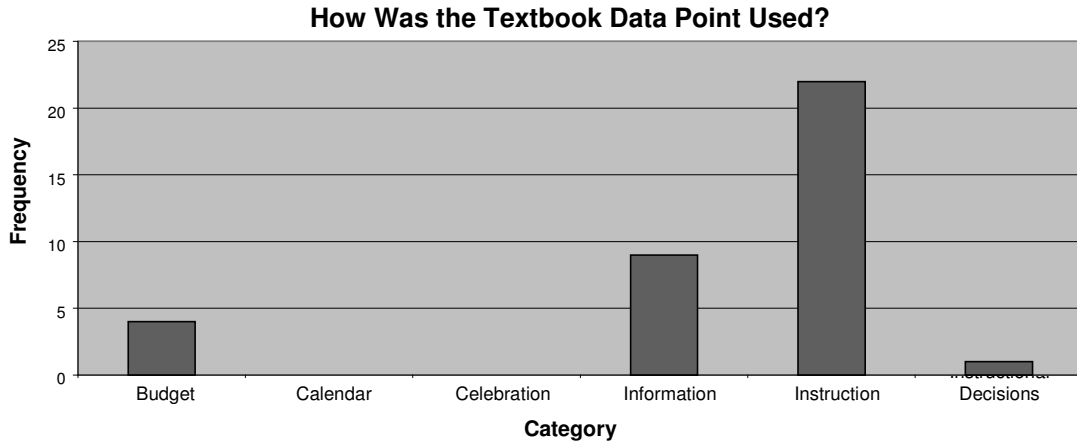
Teacher used these artifacts the most. The math office was the next primary user, while principals and the Board of Education used a few text artifacts (see Figure 4.24).

Figure 4.24 Users of the Single Text Artifacts



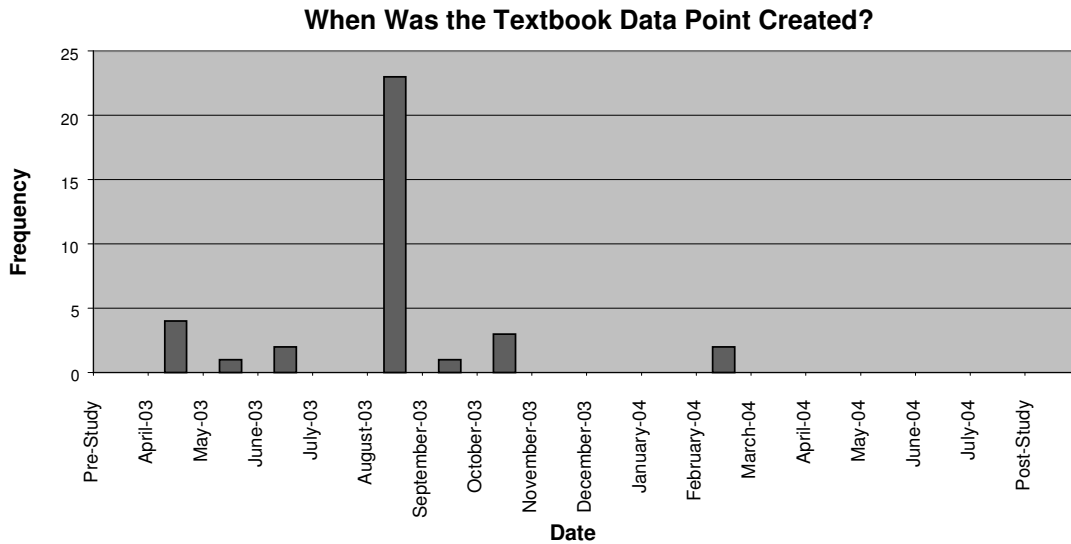
Not surprisingly, most of the single textbook artifacts were used for instruction and information. The only other category for texts was budget (see Figure 4.25).

Figure 4.25 Purpose of the Single Text Artifacts



Finally, the majority of activity necessary to support the implementation of the STA occurred just prior to the opening of school. As seen in memos, central office needed to communicate the arrival and inventory process for schools to receive the text and supporting materials.

Figure 4.26 Creation Timeline of the Single Text Artifacts



Developing, Articulating, and Communicating a Shared Vision

The purpose of an STA program correlates with the change facilitator’s role of developing, articulating, and communicating a shared vision. Dr. Matthews repeatedly proclaimed that JCPS was a school system, not a system of schools. I

supported that philosophy because it manifested in the STA program. The STA eventually yielded over 1 million new texts purchased for students in all subject areas; therefore, the quantity and quality of instructional materials did not depend on the schools' financial strength. Each new text came accompanied by a full range of support materials. Consequently, this program coincided with the math office's vision that "Every child should have the opportunity to learn rigorous mathematics." A brochure described the STA to Board members, principals, teachers, and the public, citing these reasons for the STA and justifying the price tag associated with the purchase.

The STA attempted to unify the district's vision, but allowed for significant input from those affected by it. For example, the superintendent recently purchased the Saxon mathematics program for 19 elementary schools. When it became clear that Scott-Foresman would win the bid for the elementary texts, I hosted a meeting for the 19 Saxon principals; 18 of them attended, and 1 sent a representative. Each clearly voiced his or her desire to remain with the Saxon program. As a result, I shared their request with the superintendent, and they became the first exception to the STA.

Several other artifacts demonstrate the ability of the community's input to sway decisions in the STA. The texts chosen for Algebra I, Geometry, and Pre-Calculus all reflected a traditional mathematics pedagogy approach. These texts differed from the prior packets used in the math office that reflected a more constructivist approach, which was generally not embraced by teachers or students.

Planning and Providing Continuous Resources

The STA is the most obvious part of the instructional component for which the change facilitator's role of planning and providing physical resources is most apparent. Almost comically, one artifact shows my signature for the purchase of \$620,904 in Algebra I texts when I had the Coordinator of Mathematics position less than 1 hour. That purchase foreshadowed a relentless pace seeking and acquiring the resources that teachers need to successfully implement the mathematics program. For example, another artifact identifies approximately \$700,000 spent on TI calculators for financially challenged students and schools.

Investing in Professional Learning

I also spent a significant amount of resources in the change facilitator's role of investing in professional learning. Prior sections detailed the professional development for elementary, middle, and high school teachers to learn the new mathematics program. Additionally, the STA allowed for new conversations in courses such as AP Calculus. Calculus teachers had few prior opportunities to collaborate because they used a bevy of texts and instructional materials, despite the fact that they were all preparing students for the same national exam. Although the professional learning seems purely benevolent at first glance, one artifact for Saxon program training demonstrates the overwhelming volume of associated work. A member of the math office completed an EXCEL worksheet with numerous details in an obviously tremendous amount of time, yet in haste the worksheet was not labeled and, therefore, was not able to be used again once it was closed.

Checking on Progress

The purchase of so many texts necessitated that I complete the next change facilitator role—checking on progress. I completed this task in close association with the other members of the math office and the STA coordinator. One memo from that office illustrated the requirements for receiving and labeling the texts being shipped all over the district. Processes for such issues as lost and damaged texts had to be resolved. Another chart illustrated the priority order in which texts would be reviewed for the STA program, and the mathematics program profited from early rotations in the cycle.

One artifact, however, illustrates a significant flaw that the math office found in the new STA for the Advanced Math Six course. A text chosen for this course met with great resistance when it was shipped to the middle schools. Upon further checking, students, teachers, parents, and principals expressed distaste for this text so loudly that I called for a meeting of all Advanced Math Six teachers. Their concerns stemmed from student readiness to work successfully in the text. At this juncture, our office made plans to attempt to mediate some of the concerns. When those plans failed, Advanced Math Six became the only course in the district to have another text adopted for students to use during the year.

Providing Continuous Assistance

The purchase and distribution of so many texts also provided several opportunities for me to enact the change facilitator's role of providing continuous assistance. I am most proud of the extra sets of texts we were able to purchase for classrooms. JCPS purchased so many texts that many companies offered an extra

class set of texts for secondary teachers. Due to their significant size and weight, students could keep their own text at home because the teacher had a copy at school. The company physically cut a triangle from the upper right-hand corner of these texts to distinguish them as part of a class set. Also, the STA provided so many supportive instructional materials that most DCs did not complain when they received less instructional funds because the task of ordering these supplies was now assumed at the district level.

Many aspects went well in the STA program primarily due to the capabilities of the STA office as demonstrated by the number of artifacts associated with that office. Despite the volume of work being completed in the district, one artifact displays a rare reflective tool utilized by that office to gather feedback on the program so it was strengthened in the next iteration. On the other hand, yet another document, this one associated with the International Baccalaureate program, illustrates the math office struggling to complete the assigned workload. The IB texts also went through the STA program, yet I delegated all the work required to complete this task to classroom teachers because the math office had no available resources.

Creating a Context Supportive of Change

I found it easy to facilitate the final change facilitator role of creating a context supportive of change for the STA program. Although many stakeholders in the district at times disagreed over the final text chosen for a course or grade, the STA was well-received by teachers and parents as verified by a critical friend.

The concept that one text was appropriate for every child in a course despite his or her math ability, however, was a concept not so readily accepted. Whereas

students had previously used up to four different texts for the same course depending on their ability level and grouping, the STA program purchased one text for all students in the same grade or course. Dr. Matthews's reasoning was to purchase the best text available for the course and all children deserve the opportunity to use that text. This philosophy met with resistance in traditional gatekeeping courses such as Math Six, Pre-Algebra Eight, and Algebra I. Students had traditionally been tracked into a wide variety of levels in middle school that predetermined the highest course they could complete in high school. The STA program, in contrast, raised the bar for all students, including students receiving special education services. Schools assigned them the same texts as their general education peers because they were required to pass the same assessment.

Conclusions

I collected and analyzed 325 artifacts to answer the first research question: What are the characteristics of the instructional component that JCPS chose for its aligned mathematics program? The district chose district assessments, pacing guides, professional development, and an STA program. I viewed each of these parts through the six functions of the change facilitator: Developing, Articulating, and Communicating a Shared Vision; Planning and Providing Resources; Investing in Professional Learning; Checking on Progress; Providing Continuous Assistance; and Creating a Context Supportive of Change. The next chapter describes the findings necessary to answer the second and third research questions.

Chapter 5: Findings—Research Questions 2 and 3

Introduction

This chapter is the second of two chapters that present the findings of the research. In the previous chapter, I answered the research question: What are the characteristics of the instructional component that JCPS chose to implement in its pre-K–12 mathematics program? The analysis of the district artifacts yielded descriptions of the district assessments, pacing guides, professional development, and STA. In this chapter, I used that foundational knowledge of the instructional component to help answer the second research question: What are the dynamics the district encountered when it implemented the mathematics program? I also answer the third research question: What change facilitator activity supported the district’s implementation?

Chapter Overview

The sections in this chapter describe the findings of the case study related to the instructional component’s implementation in the district. The findings answer the second research question: What are the dynamics the district encountered when it implemented the aligned mathematics program? The findings also answer the third research question: What change facilitator activity supported the district’s implementation?

These research questions were answered from an analysis of the district data from multiple NVivo queries and searches. Positive results from the district’s implementation of the pre-K – 12 aligned mathematics program stemmed from the solutions to problems that rose during the implementation and is entitled, “New

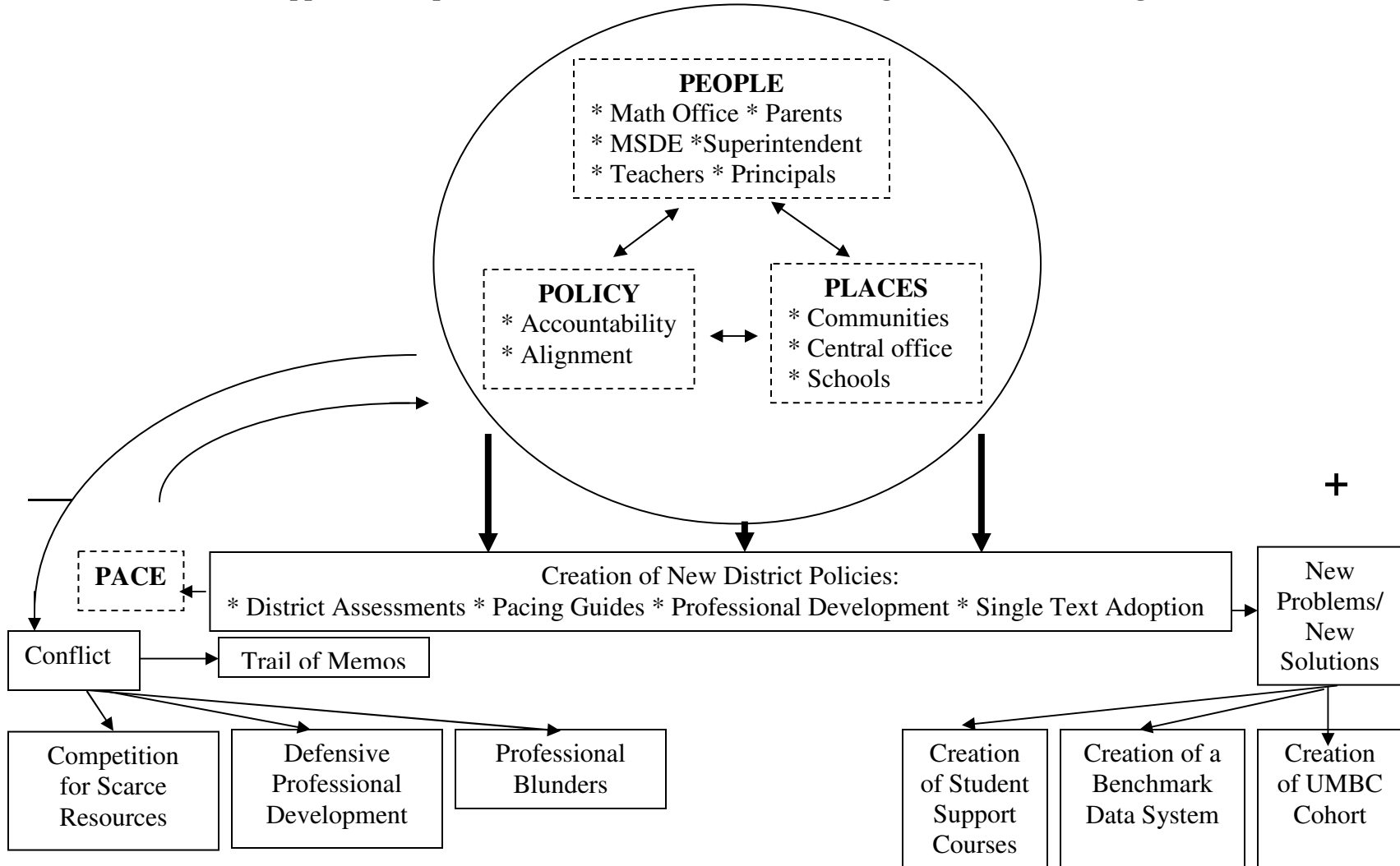
Problems/New Solutions.” This category includes sections on each of the following: Creation of a Benchmark Data System, Creation of Student Support Courses, and Creation of a Cohort with UMBC (see Figure 5.1).

The analysis of the data also brought the implementation pace to light as a variable that played a significant, yet unpredicted, role in district’s implementation of the pre-K -12 aligned mathematics program. The concept of pace is discussed in one section, which is followed by a section describing the negative results on the implementation that surrounded it. This category is called “Conflict” and includes sections on each of the following: Competition for Scarce Resources, Defensive Professional Development, Professional Blunders, and Trail of Memos (see Figure 5.1).

I reviewed both the positive and negative results of the instructional component’s implementation and cited each one in the text by its relationship to the corresponding change facilitator’s six functions of interventions: Developing, Articulating, and Communicating a Shared Vision (CSV); Planning and Providing Resources (PPR); Investing in Professional Learning (IPL); Checking on Progress (CP); Providing Continuous Assistance (PCA); and Creating a Context Supportive of Change (CCSC). The references illustrate the issues the district faced when implementing the pre-K – 12 aligned mathematics program and corresponding activity that I took in the change facilitator role in response.

Figure 5.1 Findings

**Findings: Change Facilitator Activity
to Support the Implementation of a District's PreK-12 Aligned Mathematics Program**



New Problems/New Solutions

The 325 reviewed documents in chapter 4 demonstrate that JCPS simultaneously implemented four major initiatives of the mathematics instructional component: district assessments, pacing guides, professional development, and an STA program. Examining the change facilitator's role in the problems that arose during the implementation and the solutions identified to resolve those problems are valuable to policy implementation theory and the education leaders' practice. Honig (2006) stated that educational leaders might not benefit from prescriptive directions to implementation; rather school leaders should question under what conditions their own organization might yield positive results for their particular students?

As the change facilitator, I continually checked on implementation progress (CP) and recognized that problems arose in varying levels of intensity. For example, I facilitated the stakeholders in the district as they hurdled a variety of numerous, yet relatively minor, obstacles during the implementation of the aligned mathematics program (PCA). Students adjusted to new texts with online resources, a new vocabulary in their math classrooms, and an unprecedented demand for writing on their mathematics assessments. Teachers juggled the integration of new instructional materials and assessments, a new grading system, and an unprecedented intrusion of central office staff in their classrooms. School-based administrators reacted to a new course trajectory to accelerate students, demands to reschedule students at nontraditional times, and pressure to increase student performance. Finally, the central office overcame the lack of adequate staffing and a deluge of work assigned to the office. The following sections, however, highlight three areas in which potentially

devastating problems arose during the implementation of the program and the activities in which I participated as the change facilitator to create new solutions to solve those problems. These sections demonstrate a cascade effect of problems and solutions. Once the math office worked with central office personnel to solve one problem, the solution to that problem caused an unanticipated new problem to solve.

Creation of Student Support Courses

When Dr. Matthews took over as superintendent for JCPS, he gathered the high school principals together to discuss the master schedule. Prior to the superintendent's arrival, each high school principal determined the schedule used in his or her own building. As a result, the 12 high schools had several schedule varieties in practice. Advocating as always that "We are a school system, not a system of schools," Dr. Matthews convinced the principals that it would be in the students' and districts' best interest if every high school operated under the same schedule. He reasoned that a district with such a mobile student population would be better able to serve its students and that all teachers in the district would now have a common framework for their courses. Dr. Matthews had similar discussions with the 19 middle-school principals.

As a result of these scheduling meetings, all middle schools adopted an A/B day schedule with a 3-day rotation for elective courses, and all high schools adopted an A/B day schedule. High school teachers who taught assessed courses stated that, although the new schedule did unify the district and did allow for easy student transition, it did not facilitate their work in the classroom. They gave an immediate and loud push back to the new schedule in regards to the amount of instructional time

available for the curriculum. They argued that the A/B day schedule lost significant instructional time in class; therefore, students would not be adequately prepared for MSAs and AP exams.

The math office heard these complaints clearly and determined that the teachers had valid reasons for concern (CCSC). Specifically, a student who previously attended a school that ran six classes per day received 165 instructional hours. The A/B day schedule, in contrast, provided the student with only 127.5 instructional hours. This instructional time deficit particularly concerned me in the AP Calculus course. Students in that class covered the equivalent of two college semesters, yet would receive less instructional time than their college student counterparts. For that reason, when called to the superintendent's office on my first day of the position, I spoke on behalf of the curriculum demands and asked permission for AP Calculus to be taught daily (PPR). When Dr. Matthews agreed, AP Calculus became the first course in JCPS to have a support course for students. A support course ran on the opposite day of the original course which doubled the amount of instructional time students received. This decision was reflected in an artifact that described the courses available the following year.

For many other courses, however, the next year proved to be stressful and difficult. Students, teachers, and parents gave a common cry of concern regarding the rushed curriculum. One artifact described the 9 forums I attended which were held at night to hear their concerns (CP). The pacing guides covered the VSC during the allotted time in the school year, but often compressed more than one topic in a daily lesson to cover the entire curriculum. Teachers of the assessed and sequential

courses frequently and loudly complained that students were not given enough time to master concepts. Teachers specifically stated that they felt the pressure to increase test scores, but not the scheduling structural support necessary to accomplish the task.

This problem cast a dark cloud over other successful aspects of the new mathematics program and demanded a solution. At a PMOC meeting, I volunteered to pilot an Algebra I course at Elizabethtown High School to help determine the root causes for concern (CP) using one of the pacing guide artifacts. The first week of my assignment provided an opportunity to understand several competing nuances of the problem. First, students' lack of prior knowledge and skills verified the inadequacies of the previous math program and justified the new alignment to the VSC. Second, the amount of time allocated to each topic in the pacing guides allowed adequate time for an average or accelerated student, but in no way allowed time for the differentiation strategies necessary for below average or special education students to be successful.

As a result of teaching this pilot course, I could say with confidence that teachers had valid complaints against the new schedule. The math office and other assessed departments began to design support courses for struggling students (PCA). Support courses ran on the opposite day of the assessed course to provide additional time on topics. In the original design, a school might run 14 Algebra I sections, but have less Algebra I support courses for the percentage of students who needed additional assistance. This structure caused havoc in schools because the regrouping of students in the support courses each day meant that the teachers of the Algebra I course had to be almost on the same pacing guide page at the same time—a feat

difficult to accomplish with the normal flux in a high school schedule. The same scenario held true for other assessed courses. When teachers noted this difficulty in the fall, central office staff met to discuss options. We decided to link each assessed course to its own support course so that the students had the same teacher for both courses (PPR). This decision also is reflected in scheduling artifacts.

Although mathematics support courses did not exist in the original scheduling plan and took numerous iterations to finalize their structure and content, they eventually served a significant part of the student population (PPR). Each school determined the number of support courses they offer based on students' needs, and each support course's curriculum complemented the original course to which it was linked. Students used the option of allotting twice as much instructional time in areas in which they required assistance, and teachers spent twice as much with the same students developing their skills. Therefore, the support courses became a significant support system for the superintendent's vision to accelerate students (DACSVCS).

Creation of UMBC Cohort

After the problems over the evolution of new mathematics support courses were finally resolved, the focus turned to the problem of finding enough math teachers to fill all the new vacancies. Because mathematics had the most new support courses— Algebra I, Geometry, and Calculus—most high school DCs and principals realized that their current math departments could not physically cover all of the new courses. Because this information bubbled up to the central office level, we realized there was an immediate demand for math teachers the following year in a subject that was already experiencing a deficit supply (CP).

The creation of the student support courses created a significant demand for new math teachers. Approximately 35 additional positions over the previous year were required to fill all the district positions. Maintaining even the ability to hire the previous demand had been a difficult task; therefore meeting this new requirement appeared to be a daunting task. Even after combining the number of career changer candidates with the number of college graduates, there was an insufficient number of candidates. It became clear that we would have to seek alternative sources for math teachers (PPR).

Several artifacts from the district demonstrated that UMBC repeatedly tried to contact the math office in the hopes of starting a cohort for teachers to earn a master's degree in secondary mathematics education that would make them math certified. These artifacts also demonstrate that I repeatedly did not engage in that conversation due to time commitments to other initiatives. Ironically, what once was a back-burner item became a high-priority target.

I met with UMBC staff to explain our district's new predicament and found a staff eager and willing to help provide a solution. They described their master's degree model for secondary mathematics teacher education. Their model consisted of a 2-year program, after which the student was certified to teach at the secondary level. It was obvious that their structure did not meet the immediate needs of the JCPS district. Artifacts then tell the accelerated discussion timeline in which UMBC worked with our math office to re-create their program in a specific manner to solve the problem.

UMBC helped me prepare a plan to present to our district's PMOC to identify the teacher shortage problem and predict the pending hiring crisis (CCSC). The PMOC, in return, agreed to fund a 28-member student cohort from JCPS to attend UMBC using primarily Title II funds (IPL). The "students" came from our surplus pool of existing elementary and middle-school teachers who had already demonstrated success in the classroom and only lacked the mathematics background to be successful in a high school classroom. UMBC front loaded their program courses so the students completed a study of Algebraic and Geometric topics the first summer and fall of the first year. In conjunction with staff development provided by the math office on specific MSA topics, teachers gained a thorough review of mathematic concepts. In that way, the students could begin a high school assignment immediately.

UMBC staff members worked diligently and patiently as the district overcame the paper work required by financing tuition, registration, and books for our new students which is documented through a record of artifacts. They reordered their course sequence and allowed for discussion on topics in the course sequence. In return, JCPS allotted classroom space and instructional materials, and it became the conduit of information between the college and the students (PCA).

Several artifacts describe the process the district then took to inform principals and teachers of the proposed idea (DAC SVC). Memos went to principals and flyers went to teachers advertising the possibility for a free master's degree in return for a new assignment to a high school. The initial meeting for candidates yielded more than enough students for the program. The DCs from all 12 high schools attended to

provide a brief glimpse of their school, and several interviews unexpectedly took place right after that meeting.

The application process eventually yielded 26 teachers. Their only costs for the degree were their registration and graduation fees (IPL). Some students immediately took high school assignments, and the rest remained in their current positions pending the upcoming hiring season. UMBC began the first courses in Algebra and Geometry taught in a JCPS facility, and the district avoided a potentially disastrous hiring season.

Creation of Benchmark Data System

JCPS also faced a pending crisis due to MSDE AYP sanctions for unsuccessful school performance on the MSAs. JCPS reacted in one way by creating the district assessment system described in chapter 4. Every mathematics teacher administered a benchmark assessment to every student in their class at predetermined intervals in the elementary schools and at the conclusion of units in the secondary schools as verified by binders of assessment artifacts. These benchmarks mirrored the rigor and format of the MSAs administered at the end of the year. Although the student data for the MSA could be dissected after the MSAs, the information gained from this analysis was referred to as “autopsy data.” Even if the district learned extremely helpful information from the data analysis, the students had already completed the assessment, and it was too late to change their preparation or their results. In other words, the damage was already done to that round of students, and changes could only be made to benefit the next round of students.

The purpose of the district assessment system, however, was to diagnose impact during the actual school year before the MSA administration and to make course corrections to improve the results (CP). The district wanted to dissect the data at three levels. First, the math office wanted a district analysis completed to predict how strong the student preparation was in each topic and to determine which curriculum had to be spiraled back in for review. At the next level, the superintendent and principals wanted a school-level analysis to determine which schools might require additional support before the MSA administration. At the student level, principals and teachers wanted to know which students required individual support to be successful so that they could reallocate resources within their building.

Although the district benchmark administration and data analysis of the results seemed like a sound concept, the practical completion of this task proved disastrous after the first administration. Problems became immediately apparent as data from every teacher in the three grades in 77 elementary schools, eight courses in 19 middle schools, and two courses in 12 high schools flooded into the math office. High schools proved particularly difficult with the sudden rise in assigned teachers as stated in the previous section. The unexpected volume of work in collecting and sorting the information before it could be analyzed delayed even the initial analysis. The math office found that some information was incomplete or missing, poorly labeled, or improperly completed. The next issue was the structurally impossible number of man hours required to crunch the numbers once a staff member properly sorted the data.

I presented the magnitude of the problem at the next PMOC meeting (CCSC). Enough district leadership was present to understand the severity of the problem, especially as time passed and the school-level personnel started requesting results. The committee listened to concerns, but I was unprepared for the intensity of time and resources that the district would dedicate to the resolution.

The technology department soon requested me to attend a meeting to represent other Coordinators in the curriculum department that would soon have similar issues as they too developed benchmarks. The technology representatives sent several high level people to listen to the concerns, and they worked quickly toward creative and elegant solutions.

Although I sketched the initial problem on a piece of yellow legal pad saved as an artifact, the technology department soon led the district through a professional learning curve of problem analysis, competitive bidding, and personnel training that left many of us in awe of their abilities. First, technology department members interviewed several school system employees at a variety of instructional levels to determine the problems we recognized in data collection, sorting, and analysis. Employees described every aspect of assessment from test administration, grading, reporting, and dissecting data. They then conducted bids to companies for competitive products.

Eventually, however, the JCPS technology department worked with the curriculum Coordinators to create our own Benchmark Data System that allowed every user the ability to immediately gain access to the data and use it in a variety of methods (IPL). This system was web-based designed and completely electronic.

Teachers entered their own data into templates to avoid data-entry errors. The computer generated the analysis and collated the data at student, course, and district levels immediately after each teacher entered new data.

Central office staff acquired access to all school, course, and student data, which provided the office with the ability to frequently determine the strength of the curricular program. Principals acquired access to each grade- or course-level data sorted by teacher and further by student. Principals could prioritize the needs of their own schools and analyze the strengths and weaknesses in each classroom. Teachers acquired access to their own class results. They could monitor the progress of their class as a whole and the progress of each individual student. This new tool allowed educators at various levels in the organization to view the student results and make immediate instructional decisions based on those results (PCA).

Pace

The previous sections detailed reactions within the math office to solutions to problems as they arose. Although delegating responsibility to resolve issues as they arose might seem a viable option for any change facilitator, the math office was very limited in staff, and each member of the team was already assigned a large number of tasks. Additionally, new solutions often presented new and different problems to solve. Therefore, a fair question to ask is: Why had so many staff members in one district not taken the time to think through the implications of solutions through to their potential consequences?

In the review of the artifacts, the pace of the implementation repeatedly was referenced and appeared as the unifying variable in the artifacts that caused

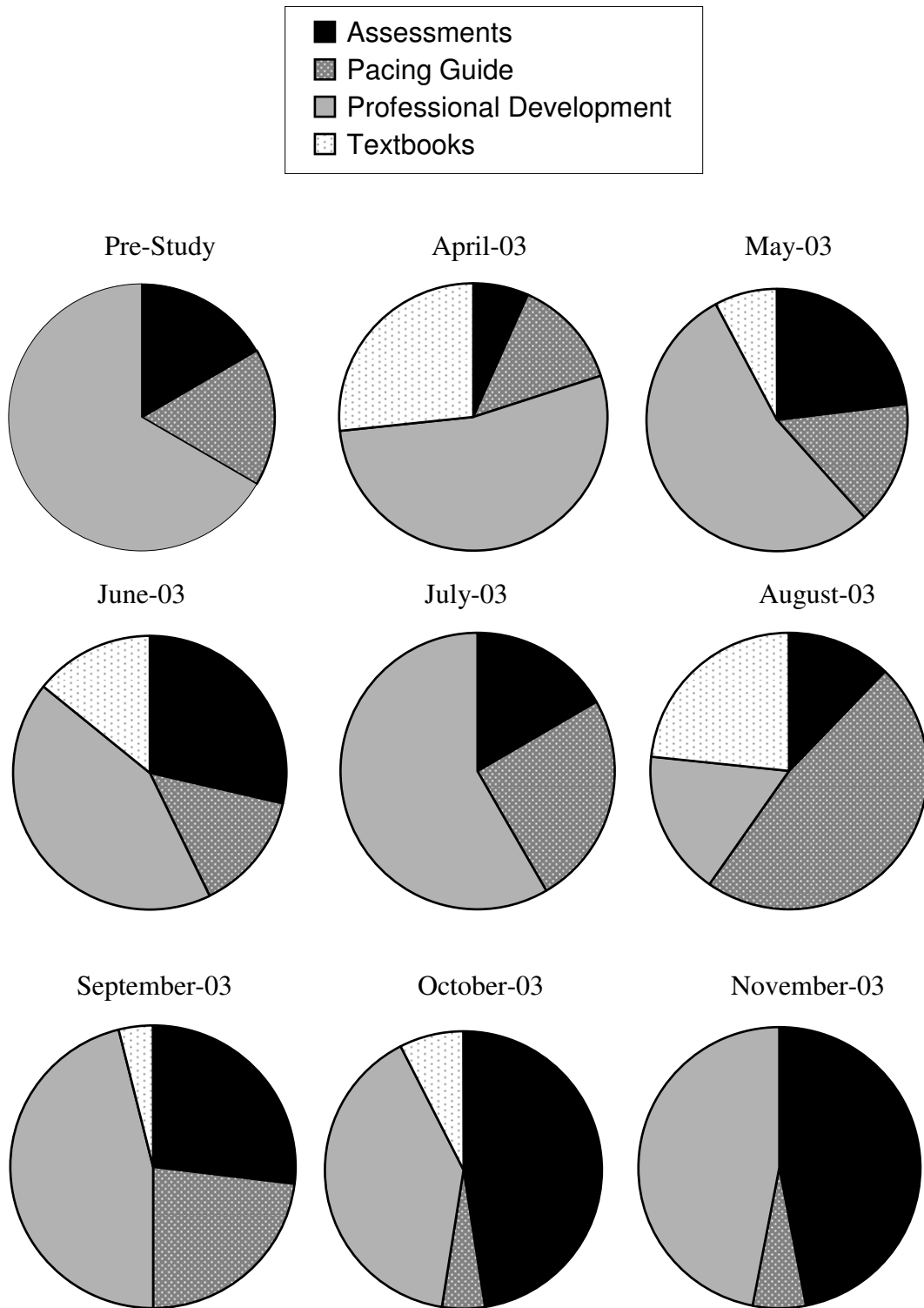
dissonance in the program's implementation. For example, although the literature suggests a 3- to 5-year implementation cycle, JCPS implemented the initial phase of district assessments, pacing guides, professional development, and STA program in less than 1 year.

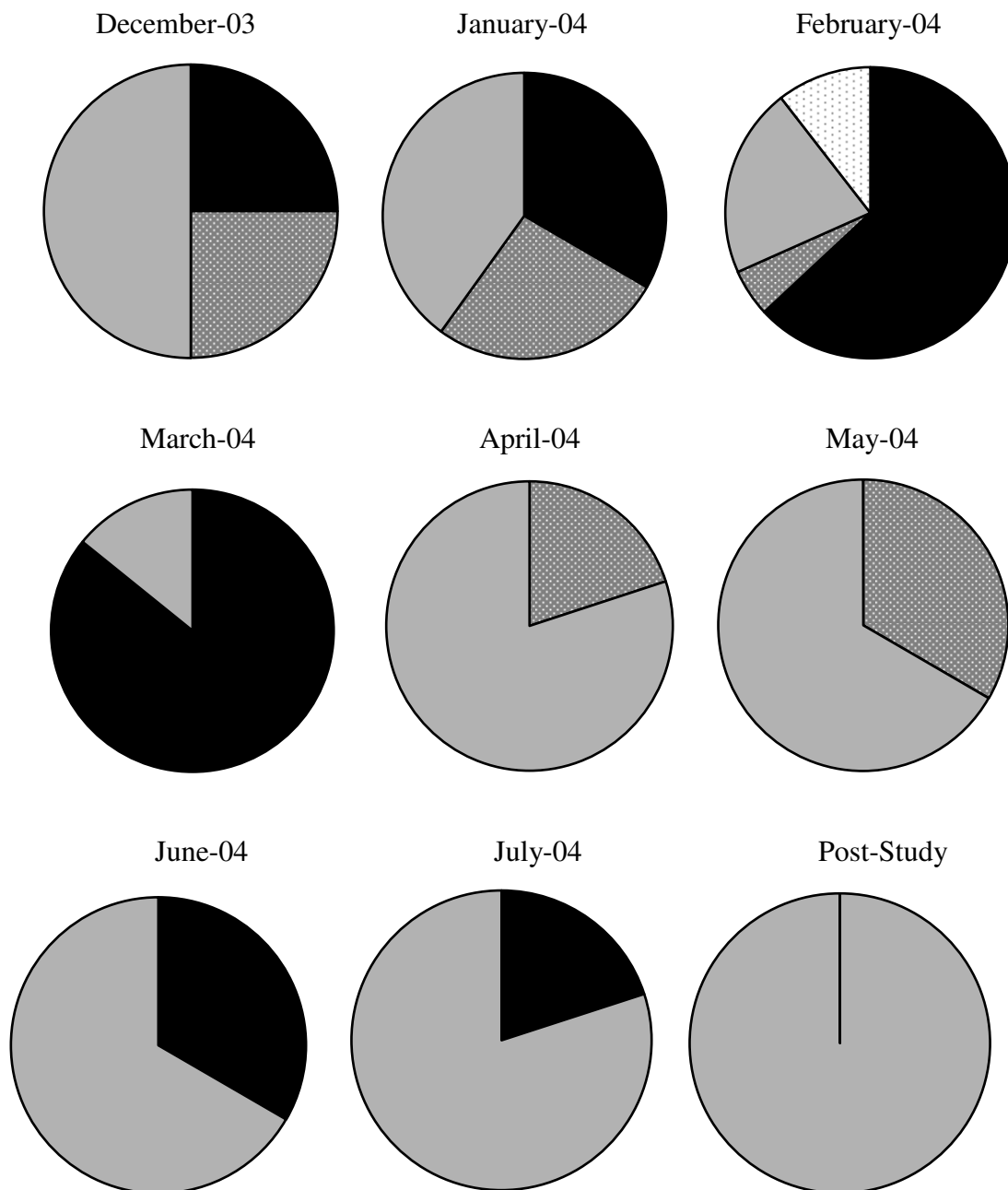
The references to pace prompted a further analysis of Figure 4.6 which illustrated the timeline of the study and the number of artifacts recovered from each month. Note the spike in activity for August, October, and February. Although August typically represents the last restful days before the school year begins, this graph clearly indicates a rush of activity in the math office preparing for the opening of the school year (CCSC). District assessments were still being written (PPR). Pacing guides were written, but not printed (PPR). Professional development took place for every math teacher in the district (IPL). Texts were ordered, but were missing (PPR). The opening of the school year proved anticlimactic compared with the late summer rush. Additionally, the fall usually bears an increasing lull as the year settles into a comfort zone, but the activity spike in October demonstrates the reaction to the district's first district assessment administration (CCSC). Also, the unexpected spike in activity in February coincides with the last rush of activity prior to the MSA administration.

These findings prompted a further analysis of the data as time progressed through each month of the implementation. Figure 5.2 depicts the percentage of artifacts for each of the four parts in the instructional component in each month. Even the first glance at the data clearly indicates that a significant amount of resources were dedicated to professional development; however, a later section details that the

nature of items deemed professional development might be better categorized as an attempt to keep the stakeholders aware and informed of changes.

Figure 5.2 Instructional Component Implementation Phases





The concept of implementation pace, then, rose to the center stage of importance. The remaining sections portray pace as the common thread running through the problems associated with the math program's implementation. As the Math Coordinator, at times I had to delay work forging ahead to mediate issues of confusion from past work (DAC SVC). For example, principals monitored the local implementation of the curriculum and an artifact describes their request for me to

evaluate those teachers who could not keep up with the new changes. This request forced me to rate the very personnel whose knowledge and skill level I was trying to accelerate (IPL). Algebra I teachers acquired a new support course in which they had plenty of time to work on MSA statistics topics, yet few of them were savvy in that content so an artifact described the refresher course that was offered (IPL). The new math sequence accelerated many students' course registration, yet counselors had to ensure that the support courses would not affect students' graduation (CP). The information flew in and out of the math office so quickly that a common topic for discussion and recurring artifact was "things I learned today that I can use tomorrow." Finally, one artifact from a mid-year implementation meeting with elementary lead teachers used a song with the words "One midnight gone!" to communicate the rush to accomplish all required tasks before the spring MSA administration (PPR).

Conflict

Regardless of the intrinsic or measurable benefits to students and staff associated with the new program, the opportunity costs associated with its fast implementation resulted in significant conflicts within the math office, among the math teachers, and in the school communities. Honig (2006) recognized the value of analyzing such scenarios by noting that,

education policy implementation leaders should look to research not for prescription...rather, they should mine the research for ideas, evidence, and other guides to inform their deliberations and decisions about how ideas from implementation research may apply to their own policies, people, and places. (p. 23).

The following examples begin to testify to the findings that provide such valuable lessons.

Employees were primarily concerned with the significant workload increase associated with implementing the new mathematics program. A budget artifact captured the volume of extra work teachers completed. It summarized the numerous accounts the math office managed in order to pay teachers for overtime on extra tasks, and it contained so many entries that the math office staff had difficulty keeping up with the paperwork (PPR). The district also implemented the new professional development tool to organize, publicize, and tally staff development in the district; but the math office personnel were so consumed with other responsibilities that we never used this feature (IPL). Another workload example came from the STA program. Although everyone agreed with this aspect of the new program, artifacts describe the trouble schools had with receiving, storing, and cataloging the incoming texts and the struggle the math office faced with troubleshooting the inventory of texts all over the district (PCA).

Such a high volume of work resulted in an often less than standard quality of work produced (PCA). One artifact was an agenda for an elementary lead teacher meeting was scribbled on a scratch piece of paper. One math sequence document was so hastily prepared that the formatting errors are obvious. The book that contains the entire district's course selection and sequence was revised so many times prior to printing that its distribution happened after some schools actually scheduled their students. Although the student support courses were invented, creating the material for them placed such an additional burden on the math office that staff members were literally creating pacing guides and instructional materials just days ahead of the teachers using them in their classrooms.

Such a drastic change in course from the normal operating procedure in the district caused tremendous push back from every level. One phone message artifact represented the literally hundreds that went unanswered due to the lack of staff available to return calls (CCSC). This failure in communication was often perceived as the math office's unwillingness to help. Similarly, a memo represents the frequent times that I was double-booked for meetings and inadvertently made one group of people unhappy. This volume of work certainly prevented individual visits to schools for the majority of the year, which might have prevented one high school's math department from attempting a full revolt against the district assessment grading system. Even when the elementary math teachers asked for and received guidance on recording grades for their new assessments, every employee realized that the solution worked, but caused a burdensome amount of time to complete.

JCPS employees also joined the chorus of educators across the country who complained that we spent too much class time assessing children and that the pressure associated with the assessments stifled them. Principals argued that they did not have enough support staff to administer and analyze the tests. Teachers asked for clarity on allowable décor in their classrooms during testing. Many teachers also voiced their concern that, although the new data reporting system was elegant, their individual student scores were now publicly available to every administrator and central office personnel. They argued that they were still adjusting to the new holistic scoring on the written sections of the MSA, yet being evaluated on their students' progress. Additionally, the support courses were designed to help students, yet they required

teachers to assign and grade at least nine assessed items to be considered a credited course by district policy.

Other stakeholders in the district pushed back on the philosophy and subsequent practices to accelerate students. Dr. Matthews frequently asserted that more students could complete AP courses, and he made this initiative a cornerstone of his tenure. In the sequential mathematics curriculum, this decision implied that students had to be exposed to rigorous course work throughout elementary school and placed in an Algebra I course by no later than eighth grade.

The elementary schools, unexpectedly, were the most affected by the new curriculum and push to accelerate students. Although JCPS aligned with the new VSC that targeted all learners, many teachers and parents argued that the curriculum was too rigorous. I had several night meetings with principals, teachers, and parents to demonstrate that the new curriculum was actually a standard level (DAC SVC). The previous curriculum with which they had been accustomed lacked rigor and consequently presented a dramatic increase in expectations. Other parents deemed the new curriculum too easy, which resulted in the math office completing enrichment units for each grade (PPR).

I also had to facilitate middle school personnel's philosophical shift in student placement (DAC SVC). Although Algebra I was traditionally reserved for an elite student group, the superintendent opened the course by using a less stringent student requirement on the diagnostic test as demonstrated in a memo artifact to principals. As a result, the high school teachers had to accept that Algebra I became the lowest course available to students. This move eliminated several prior nonacademic math

courses. The superintendent was able to push student acceleration by eliminating course approval and recommendations by the classroom teachers. This decision resulted in another meeting with AP teachers to calm their concerns.

These factors, taken together, caused me and the few other members of the math office to reflect on the serious and eminent issues that we faced (CP). We feared these issues could jeopardize the integrity of the math program. Therefore, we enumerated our concerns and presented them in a clear and concise format that the executive staff and superintendent could grasp to realize the severity of the situation (CCSC). After analyzing the district artifacts, however, I can now best summarize the negative result of the frenzied implementation pace of the program into four categories: Competition for Scarce Resources, Defensive Professional Development, Trail of Memos, and Professional Blunders.

Competition for Scarce Resources

The JCPS math office acquired and implemented resources to complete the instructional component of the aligned mathematics program (PPR). The costs associated with the program, however, were often literally and figuratively a high price to pay. This section describes the findings associated with the implementation costs of the program and the difficult process required to fund those resources.

The STA was easily the most expensive part of the instructional component. In fact, the first STA artifact is a purchase agreement for \$620,904 in a deal that I negotiated in the first hour that I held the position of Mathematics Coordinator (PPR). That transaction completed the sale of Algebra I and Math Seven texts with all of their associated instructional supplements. Similar transactions immediately followed

for the sale of all new math texts for every student in grades kindergarten through fifth, all middle-school courses, and all high school courses.

The completion of each textbook agreement was a reason to celebrate, but not without recognizing the political, capital, and personnel costs associated with each sale. The district had to first prioritize the courses to receive new texts that left contention among the Coordinators who each fought for their own subject. The International Baccalaureate Program also fought for and won the right to acquire new texts. A chart displayed the rotation cycle for text adoption, and it contained an obvious bend toward reading and mathematics courses. Once a course entered the rotation, a bid went to all companies. The math office became a magnet for textbook companies and received hundreds of calls and advertisements soliciting texts. I then gathered teachers, parents, and central office staff together so a text resource specialist could train them in the text review process (CCSC). The work then began to review and evaluate each potential text. The text specialist did not even entertain the issue of cost with the committee. However, their directions focused on finding the best text resource package for each course. For example, one artifact described the exceedingly generous amount of instructional resources that each Algebra I teacher received with their new texts. Other courses even received such resources as corner-cut class sets of texts. The publisher physically cut a triangle from the corner of the text to distinguish it as part of the class set so that students could leave their personal text at home all year and use the corner-cut version in the classroom.

The superintendent pushed the notion of acquiring new texts at the same time so that every child, despite the financial circumstances of the school, had access to the

highest level of instructional materials. Most text adoptions also worked with the math office to provide professional development for the teachers on the new resources provided by the company (IPL). These purchases, however, caused contention in the school community. Principals and schools appreciated the new materials, but recognized that they lost local control over the ability to purchase their own materials. Other stakeholders in the school system lost funding as monies were reallocated toward the text program. Board members and the public demanded a review of the purchases. As a result, the superintendent hosted a night for the public to review all of the recently purchased texts at which I was able to demonstrate the high quality of the purchased texts and articulate our intention to distribute one to every child at every school (DAC SVC).

As the details of the text purchases became increasing public, the associated costs became a lever for constituents to demand that the program be run effectively. For example, the process required to purchase, inventory, ship, and catalogue the texts received significant scrutiny and careful evaluation. When the text selected for the Advanced Mathematics Six course received terrible reviews during the first few weeks of school as illustrated in text artifacts, the teachers demanded that I find a solution considering the price paid for the text (CP). These examples detail how the ability to purchase such a high quality and quantity of instructional materials resulted in an unprecedented wealth allocated to schools, but that wealth was intricately woven into an unprecedented accountability for the math office (CP).

The math office also had to fight the battles necessary to acquire all the materials of instruction necessary for students to work through the VSC and take the

MSA (PPR). According to MSDE, students could use rulers, protractor, compasses, graph paper, and calculators on certain sections of the MSA. It seemed somewhat unethical, then, that only some of our schools had stocked these materials. One artifact is was a survey sent to all middle-school DCs, for example, that gave central office staff a sudden and abrupt wake-up call to the inadequacy of materials available to students depending on the school they attended. The math office worked with the directors and the executive staff to fully stock every school with rulers, protractors, compasses, and graph paper so that students could be successful on the MSA.

Providing enough calculators for every student, however, was a challenge to the math office. Two factors made the purchase difficult. First, the type of calculator varied from simple, four-function calculators in elementary school to the elaborate graphing calculator required in high school. Second, as students progressed through school, some were able to purchase their own supplies, whereas others always relied on the school's supply. This fact, combined with losses and damages, made it difficult to inventory the stock.

The central office staff rallied for the cause, however, and \$700,000 was allocated for the purchase of calculators for the schools (PPR). For example, one artifact represented a Middle School Director's donation of remaining grant funds. Other accounts also were redirected to the cause. This windfall of money created its own problems, in that the calculators began arriving before appropriate inventory, shipping, and renting forms were created. The calculator boxes began to stack up in the shipping and receiving hallway in central office, and passage through the hall became almost impossible. The problem became so severe that the receiving

department finally summoned me to the hall to display the problems they faced due to my stock (CP). I had to reorganize my team's responsibilities to move the calculators to the schools faster. Theft and poor organization dampened the victory of purchasing so many calculators.

Although texts and math supplies certainly required the most financial resources, the time and angst spent on money used to reimburse teachers for the extra time they spent helping our office or on professional development proved to be the most draining resource (PCA). An artifact that represented the "blue sheets" used for record keeping and disbursement to teachers, and at times the volume of these sheets that poured in overwhelmed our small office. Ironically, the math office was so small it could not handle the work necessary to implement the program, and yet it also had difficulty even keeping track of the paperwork necessary to hire all of the teachers necessary to complete the work.

Funding so many resources would have been simply impossible if I had not tapped significant grant money (PPR) such as the artifacts that describe our participation in the Challenge grant. These monies were used to strengthen schools in the Elizabethtown area, which received services that would have otherwise been impossible to attain (PCA). The math office also used the Eisenhower grant, Title I, and Title II monies for professional development purposes in all schools (IPL). However, each resource came with its own stipulations and guidelines for purchases and expenditures. The math office struggled to learn and properly tap each resource. One artifact details one of the many meetings I had to attend to learn about a grant

before I could even use the money (IPL). I also spent time at meetings trying to acquire and write grants that were never awarded (PPR).

Although the math office tried to forecast and organize the anticipated expenditures for professional assistance and development, problems that arose during the implementation of the program made the budget a moving target (PPR). For example, many parents of GT elementary students claimed that the new math program lacked rigor and requested assistance from the superintendent. The math office, in turn, developed extension activities for each grade at the cost of \$150/day for each teacher, and each grade required four teachers for 10 days (PCA) as detailed in a budget artifact. As a result, the budget office began to circulate memos that detailed expenditures and monies left in each account. Another example is how the math office began to reallocate the work among the limited personnel when two additional resource teachers were slated for hire, but only one position was actually approved (PPR).

Consequently, numerous resources were acquired for the implementation of the new math program. Their acquisition, however, provided constant obstacles for me to overcome as I worked with my staff to listen to the schools yet balance their need with the realities of the support available from central office staff who, in turn, had to balance my office's needs with the other curriculum areas'. I had to constantly sweep the landscape for the most pressing issue and shift resources as necessary to solve each problem as it arose and gave way to the next issue (CP).

Defensive Professional Development

The analysis of the study's artifacts revealed the vast majority dedicated to professional development; however, a deeper read of those artifacts demonstrates the lack of depth and timeliness associated with those activities. This section describes the problems that occurred as the math office worked with other district personnel to keep the administrators and teaching force in pace with the knowledge and skills necessary to fully implement the mathematics program (IPL). Although the literature strongly recommends staff development to be job-embedded and ongoing, most of the artifacts in the professional development category were not of that quality.

Several factors affected the ability to provide a comprehensive professional development experience. The pace at which all four parts of the instructional component were developed was the primary barrier. The constant demand to acquire and produce materials took precedence over the reflective time necessary to evaluate and synthesize the needs of the district (CP). The large number of administrators and teachers who were the targeted audience also added a layer of complexity. Specifically, it was difficult to attain venues that housed the large populations I kept trying to bring together. For example, pulling together all Algebra II teachers might only involve a group of 24 teachers, but pulling all Grade 5 teachers together meant finding a place that could hold 250 teachers. The problem became even more complex because so many departments tried to pull teachers together that the district began to fall short in the number of substitutes available to cover the vacancies. As a result, the executive staff limited the number of days that any teacher could leave the building to six, and it removed Mondays and Fridays as available options.

To manage the vast array of professional development, the district purchased a new web-based professional development management system as mentioned in numerous artifacts (IPL). Its introduction saw resistance as teachers and principals regretted having to register for every meeting they attended.

The math office had many target audiences for professional development (IPL). Although the principals were the smallest group, they often proved the hardest to reach. Principals only gathered as a group once a month, and it was often difficult to acquire a spot on their agenda. Even when that was possible, the small time allotted made it difficult to fully convey a message. I relied heavily on handouts to move through presentations. Also, the day of their meeting might fall right before the next event for which I was preparing them, so I had to make my materials easy to reproduce when they returned to their home schools. Some examples from these meetings illustrate the terse characteristic of the professional development: Top 10 HSA Strategies, MSA versus HSA, and MSA Targets. I also used a brief MSA assessment with the principals to test their knowledge, yet provide a nice review that they could use with their own staff.

I also used formal memos to communicate brief information updates; however, the process required to move a memo out of central office with all appropriate signatures was one that I did not begin unless absolutely necessary. I also tried e-mail to move Word documents to the schools through the principals, but I found that not all administrators were savvy with e-mail attachments, and eventually e-mail went through the same scrutiny process as memos. When it seemed like the math office had sent so many small pieces of information to the schools, we

eventually produced a CD artifact with all of our known artifacts so that schools had a single-source artifact.

Teachers were the largest target audience requiring professional development, and filtering current assessment information to them from MSDE was a difficult task (IPL). The math office regularly made documents with names such as “Things I Learned Today That You Can Use Tomorrow.” Quick facts often fell into these memos, such as the student tools and wall décor allowed during the MSA administration. Also, helpful hints such as MSDE’s use of a small text box to represent a missing number were distributed.

The math office realized that we were providing information to teachers that would not only increase student knowledge, but also increase teacher capacity as well (IPL). Many teachers successfully completed years of teaching mathematics, but were not accustomed to the new testing formats required by MSDE. The math office had to assist high school teachers in the grid-in sections of the HSA and all teachers in the written sections of the assessments. The math office also produced vocabulary flash cards to assist international students, yet it also distributed them to teachers so that they and their students could increase their mathematics vocabulary when it became apparent that MSDE’s wide use of mathematical terms was a challenge.

Most notably in assessments, however, was the lack of prior experience that teachers had with grading BCR and ECR answers. Most math teachers never required written answers in their mathematics classes, especially ones graded against a rubric. The math office produced many model problem-and-answer sets for teachers to use at every grade and course level to increase their knowledge and confidence of quality

written responses in mathematics assessments. These models helped clarify expectations, but did not explain a rubric grade. Unfortunately, I realized too late that the majority of teachers did not know to not convert rubric grades to percentages until after the first assessment was administered and the scores were reported so low (CP). I had to quickly teach all principals and teachers that grading on a rubric required a new alignment to the grade similar to the scoring of an AP exam (CCSC). The damage, however, was already done, and many people perceived the new grading scales as an attempt to pad student grades.

Teachers also required professional development in the use of the pacing guides (IPL). During August 2003, almost every elementary teacher, all middle-school teachers, and all high school math teachers received some form of professional development in mathematics instruction using the pacing guides. The audiences were so large that we required numerous presenters who varied in their own knowledge and confidence. This task took so long to organize that it was delivered only days before teachers actually used the materials in the classrooms.

Other reactive professional development occurred whenever we realized that one changed caused a shortage of knowledge in another area. For example, when we instituted the support courses, the district hired many new math teachers, yet they and most of our prior staff were not familiar with the graphing calculator. Consequently, we offered many night sessions to teachers (IPL). Also, when the district decided to use a Pre-Algebra course for special education students who failed the first semester of Algebra I, those teachers required a quick review of the course and received their materials only days ahead of their use in the classroom (IPL). Another artifact is a

scribbled agenda for an elementary meeting of lead teachers that was necessary for me to provide the most recent information yet not scheduled with enough time to properly prepare for it (CCSC).

The math office also provided professional development activities as a result of the superintendent's push to accelerate students. More students entered into higher level courses; therefore, teachers had to be trained in the content and rigor, especially AP Calculus and Statistics. Considering the large number of teachers who fell into these categories, the math office often relied on training DCs and tapping them to return to their home schools to model the information. The math office created models on a best lesson plan, higher level of cognitive demand questioning, and reading in mathematics (IPL).

Despite the volume of activities classified as professional development, the math office missed many opportunities. The TEACH Institute asked for assistance to help teachers become highly qualified, the Benjamin Banneker Association sent an invitation to attend a conference on minority achievement, the International Baccalaureate Program constantly asked for a representative, and many other brochures arrived in the math office, but we simply did not have the staff available or the time on our calendars to attend every one, despite the more professional quality of their offerings compared with our own.

Trail of Memos

The new mathematics program was marked with many events and milestones caused by the rapid implementation pace, but none was as interesting as the trail of memos that were woven through the artifacts. These memos represent the learning

curve that I experienced as the new Coordinator of Mathematics trying to navigate the central office political structure, the often frantic effort at getting information to schools, and the poor substitute for professional development (IPL).

Memos often served logistical purposes, such as one that announced my expected presence at a meeting. It coincided with another mandatory meeting, so I often had to rely on the next memo that detailed the minutes of the meeting I missed (CP). Several memos went out in sequence to continuously provide the most recent information available to schools. One detailed the new calendar for professional development meetings, and the next provided the substitute codes for these meetings. Sending a memo out to schools also proved to be a lesson in tenacity. I often had to rewrite memos to include the present protocol, formatting, and proper signatures.

Memos also became a vehicle to provide new and necessary information to schools because e-mail had yet to become accepted as a common communication method (PCA). I sent memos to principals detailing how they could inform parents of schedule changes for the new program, the procedures to properly assess early childhood students, as well as information from MSDE to the schools, such as changes in graduation requirements for each class. We also argued often over the contents of memos, such as those that emanated from MSDE to explain the correct testing group for the HSAs. Such back-and-forth communication resulted in one memo that was actually the third in a series from the textbook manager providing a revision of the original revision.

Memos, however, were often the best option in lieu of constantly bringing groups of principals and teachers out of their buildings (PCA). For example, I

cooperated with the Special Education office to craft one memo that described upcoming changes for special education students. I used memos to describe professional development activities, notify Title I principals of opportunities, and continuously update the schools on the STA program.

The superintendent, Dr. Matthews, also used memos as a pulpit to communicate to various groups in the district. One memo carried his vision of accelerating students into more rigorous math courses by opening the requirement to placement into Algebra I. Another memo described how some schools would receive GT resource teachers to provide enrichment opportunities to accelerated students. The superintendent also used memos to pass information from MSDE to the schools, such as the various groups of students and their changing graduation requirements.

Some memos, however, also recounted the most contentious aspects of the mathematics program (CP). For example, I sent one memo to principals detailing the new cut scores that would be used to grade the district math assessments, knowing that the principals would need this information to help calm the waters when teachers realized they were no longer grading math tests using the long-coveted percentage system (see Appendix E). I also used a positive memo to inform principals of the best practices of MSA administration that the math office team observed during the administration. The assistant superintendent also used a memo to convey to principals her understanding that the increased frequency of assessments was placing an unprecedented burden on school staff, yet informed each principal that they had a role in the testing that occurred in their schools. She also sent a memo describing the

testing calendar and another memo to quickly explain the confusion caused by the first memo and to thank principals for their input.

No memo, however, compares to one of the most debated memos in the district sent out by the deputy superintendent. Although various needs of the district often resulted in the deputy releasing a memo to clarify situations and provide direction, one contentious moment in the district caused a much anticipated memo. The moment began when the superintendent gave a regular address to the principals at a meeting in the Board of Education room. Dr. Matthews repeated his call to principals to lead the schools through the implementation of pacing guides and other preparation for the upcoming MSAs. The principals, however, were acting as filters to the push back they were experiencing from their staffs regarding the increased amount of time it took to administer and grade the district assessments. Aware that the teachers union also had raised workload issues, the superintendent replied with a dismissal of the need to administer or report anymore district assessments if the principal deemed it burdensome to their staff. The enactment of this comment would cripple the progress made by the math office and other curriculum areas. The deputy superintendent realized the impact to the curriculum offices. He later listened to my clarification that the superintendent's comment was harmful to our recent progress (DAC SVC), and he promised to investigate its impact on the district. With rumors of a response memo, no principals reacted to the superintendent's comment in their home schools. I attended several meetings and helped write numerous versions of a memo that clarified principal expectations in schools to continue with the district

assessment program (CCSC). The memo encouraged the principals to continue in their work to improve student preparation for the MSAs through the district work.

Professional Blunders

No analysis of the new mathematics program's implementation would be complete without recognizing the numerous professional blunders that occurred (CP). Although document errors and calendar mistakes might typically describe program errors or mislabeled and unlabeled files might describe minor errors, the pace at which the district implemented the program bred errors on a much larger scale.

The most costly error actually stemmed from one of the most beneficial aspects of the new mathematics program, the UMBC cohort. When JCPS partnered with UMBC to provide a free master's degree in secondary mathematics education to elementary and middle-school teachers, I did so with the expectation that those teachers would gain the content knowledge necessary to move successfully into a high school position to fulfill a shortage of teachers in that level (IPL). Each flyer and memo announced the invitation to earn a free degree to any elementary or middle-school math teacher who was interested in a high school position. Each teacher who attended the organizational meeting heard me state that we expected those teachers to move into high school positions, and all 12 high school math DCs attended the meeting to begin interviewing candidates. However, I never put into writing the necessity to move to a high school position if the district paid for the degree, and a few teachers accepted the free program with no inclination of ever moving into a high school position. Although the high school principals repeatedly called these candidates, they remained firm that they were not obligated to move because I never

put that requirement into any document. Our legal department reviewed the entire case and determined that those few teachers did not have to move. However, the legal department also found that I never put into writing that I would pay for every text and material expense except their registration and graduation expense. The math office discontinued paying for those items. Consequently, the math office paid for a master's degree for several teachers who never benefited the system, and those positions had to be filled with uncertified teachers.

Another error came from a professional development activity (IPL). The math office met for a quick meeting to plan a day-long event for all teachers in the 19 elementary schools using the Saxon mathematics program. The agenda moved so quickly that, despite the fact that I repeatedly referred to the parallelogram group of teachers as rhombuses, no member of the math team stopped to correct my error. When I realized the mistake toward the end of the meeting, I questioned their silence. The middle-school resource teacher commented that we had to move through organizational details so quickly and did not have time for small errors like that one (CP). The misnaming of the group was an insight, however, of the larger error that followed for the same activity. I had grouped the teachers and placed them into rotations so fast that I had not checked that the rotation simply did not work. Our team did not discover the error until the actual day when sets of two groups showed up in the same room and sets of other rooms were empty. The immediate restructuring of the schedule proved disastrous, in that we could not use the PA system in the school we were borrowing for the event and had to run to each room to

move teachers. The confusion of reshuffling people and furniture hampered any benefit of the event (CP).

Other errors occurred in the district assessment part of the instructional component. For example, formatting answer keys and creating diagrams tested everyone's computer knowledge, sometimes with errors despite our efforts (PCA). No error took the math office by surprise, however, as much as the realization that, although we created numerous support courses to increase student success, I completely forgot to write exams for these courses until we received the artifact describing how a teacher called just prior to the exam administration and asked when one would arrive. Considering that these courses were designed to increase students' success, we did not want a traditional exam. Rather, we chose a portfolio model, which meant we had to quickly design a grading scheme and inform teachers of portfolio expectations (CCSC).

The construction of so many pacing guides in such a short amount of time also caused numerous errors. Although we gathered the teachers together in teams to write the documents, different teams interpreted our directions in different fashions. Numbering systems had to be re-created for the documents, and I spent hours reformatting pages, columns, and references. Most notably at the elementary level, we were developing courses at the same time as the pacing guides were written and did not realize until right before the opening of school that we did not produce a pacing guide for the pre-kindergarten half-day students (CP). At the high school level, we were inundated with complaints regarding the pace of the Advanced Math Six

pacing guide, which caused a complete restructuring of the course only a few weeks into the year (CP).

At all levels, the math office simply did not prepare its teachers and administrators for the necessity of implementing the full program (IPL). Although everyone understood poor student performance, I did not provide enough background knowledge to teachers and administrators on alignment to the VSC and the changing MSA mandates. As a result, when the teachers, parents, and administrators were overwhelmed by the new program, they did not understand why it had so many parts. I spent countless hours at meetings and events with numerous handouts trying to re-create the urgency for change, but my efforts were already after the beginning of the implementation and less effective had they been more proactive (DAC SVC).

Esprit de Corps

As an unexpected finding in both the positive and negative result case, however, I found significant evidence of an underlying “esprit de corps” during the district’s implementation (PCA). Although the chosen programs required significant capital and structural demands, the math office retained a focus on an investment in the people affected by the implementation. For example, students were celebrated in prestigious and public events. One artifact detailed a 24 Game competition for accelerated math students held right in the Board of Education meeting room. Another packet of artifacts details the budget for significant expenditures on students who required summer intervention and the numerous prizes and incentives they received for completing the program.

To unite the categorically diverse and geographically distant teaching pool, the math office often tried shallow, yet appreciated, methods to create a sense of community in the teachers and keep the mission central to their work (DAC SVC). For example, artifacts related to professional development showed teachers often separated into groups by math symbols. If a teacher was labeled a *parallelogram*, he or she could progress through that event in the company of other parallelograms. Another example came from the summer professional development that used a large cruise ship to signify that the teachers were all on a mathematical voyage together.

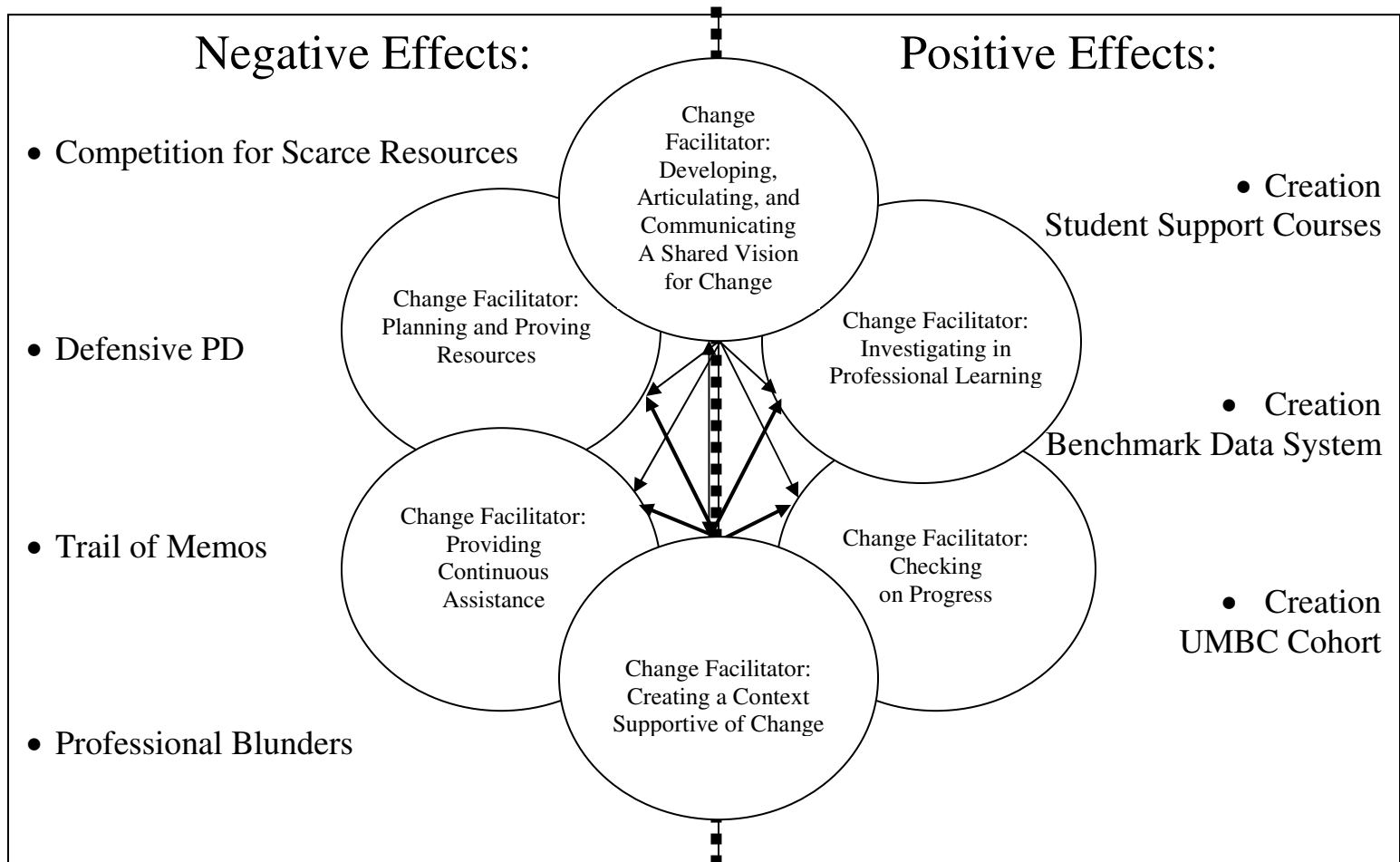
The math office also worked with the greater community to promote mathematics (DAC SVC). For example, one artifact described our partnership with the Baltimore Chamber of Commerce to sponsor a professional development activity for math teachers in three districts and later attended a national Chamber of Commerce banquet in the Hall of Flags to celebrate its success. In our local community, the math office tried to build camaraderie through school-based leaders. DCs acquired an elevated role of communication from the schools to central office. The math office offered the DCs one small token of thanks by purchasing each of them a shirt embroidered with our math logo. A final example demonstrating the sense of camaraderie was the use of the Serpenski fractal as the math office logo. Although the meaning and irony of a fractal and its association with chaos theory as a mascot was clear to the math teachers, it eluded others, which gave the math teachers a sense of a shared community.

The Role Of the Change Facilitator

When I matched the change facilitator's six functions of interventions with the findings of the study, I created a new model that illustrates the importance of developing, articulating, and communicating a shared vision in policy implementation (see Figure 5.2). Repeatedly, the pace of the policy's implementation was targeted as the cause for the lack of a clear vision for policy stakeholders. Consequently, conflict arose in the implementation, and new problems and their new solutions had to be created. This new model captures the importance of the vision for the policy as it drives the change facilitator activity in the other functions of intervention.

Figure 5.2

Findings:
Change Facilitator Activities to Support a District's Implementation of a Pre-K – 12 Aligned Mathematics Program



This new model also illustrates interaction between change facilitator functions and how they can be associated with activities that impede implementation and with activities that support implementation. For example, in the function described as Investing in Professional Learning, I had to both address the poor professional development provided and had the opportunity to work on the UMBC cohort initiative.

The model also illustrates how if vision drives a policy's success, then the change facilitator's function to create a context supportive of change is the base for ensuring the policy's actual implementation. All functions of the change facilitator continually pushed on the district's context, and I had to repeatedly prevent professional blunders from collapsing the policy's full implementation.

Conclusions

I collected and analyzed 325 artifacts using queries and searches in NVivo 7 software to answer the second research question: What were the dynamics the district encountered when it implemented the pre-K – 12 aligned mathematics program? I also answered the third research question: What change facilitator activity supported the district's implementation?

I called positive results from the implementation “New Problems/New Solutions.” The solutions stemmed from problems that rose during the implementation. This category includes sections on each of the following: Creation of a Benchmark Data System, Creation of Student Support Courses, and Creation of a Cohort with UMBC.

I then found pace to be a significant, yet unexpected, variable affecting the mathematics program's implementation. I described the negative results that manifested from the implementation pace in a category is called "Conflict." I supported the relationship between pace and conflict in sections on each of the following: Competition for Scarce Resources, Defensive Professional Development, Trail of Memos, and Professional Blunders.

To illustrate the change facilitator activity in which I engaged during the implementation, I cited the corresponding change facilitator's six functions of interventions: Developing, Articulating, and Communicating a Shared Vision (CSV); Planning and Providing Resources (PPR); Investing in Professional Learning (IPL); Checking on Progress (CP); Providing Continuous Assistance (PCA); and Creating a Context Supportive of Change (CCSC).

Chapter 6: Discussion

Review of the Problem and the Study

Chapter 1 described the district context of this qualitative case study. Districts across the country were learning to operate in the new accountability environment defined by *NCLB* (Hamilton & Stecher, 2004). Many school districts investigated the implementation of an aligned mathematics program to tie together curriculum, assessments, and instruction as the vehicle to move student learning in a reform effort (Love, 2002). In Maryland, MSDE heavily imposed the curriculum for its schools in the VSC by defining what students should know and be able to do at the end of each grade or course (Maryland State Department of Education, 2004). MSDE also created and scored the MSA, which was taken by every eligible student in the state. The student results on this assessment determined the rewards or sanctions for schools in each district (Glazer, 2004). The instructional component of an aligned mathematics program in Maryland, however, was left up to the districts.

JCPS was a 74,000-student school district comprised of 12 high schools, 19 middle schools, and 77 elementary schools. The district was 1 of the 24 school districts in Maryland responding to increased demands from the federal legislation, *NCLB*. The district's math office personnel created and implemented a mathematics program in an attempt to significantly and continuously increase student achievement on the state-mandated MSA. Increased student performance would alleviate the sanctions already administered to its schools that had not previously made AYP and prevent other schools from a similar fate.

The problem of the case study was defined. Despite the proponents of system-wide alignment, there is little empirical research on challenges districts face when implementing programs. Researchers have yet to provide detailed descriptions of the key instructional components of district-wide aligned mathematics programs. Nor have studies explored the issues that change facilitators face when implementing these components in a district.

The purpose of this case study was to explore the characteristics of the instructional component chosen by JCPS for its aligned mathematics program and to describe the dynamics of its implementation by examining the activities that I undertook in my role as the change facilitator.

The significance of the case study was that the answer to the research questions contributed to the limited body of current research on a pre-K–12 aligned mathematics program and the critical role the change facilitator plays in the dynamics of implementing it in a district. The findings of the case added to implementation theory, literature, policy, and practice. The process of studying individual districts in their own context also is important because it may positively and immediately assist other school districts across the nation as they try to respond to the demands of *NCLB*. The Trends in International Mathematics and Science Study (National Center for Education Statistics, 2000) validated the need for further research by noting a decline in mathematics achievement by U.S. students as they progressed through school as compared with foreign counterparts.

From a personal perspective, the desire to complete the study was motivated by the ability to add to the research on district programs that will advance the

achievement of students in mathematics. I was the Coordinator of Mathematics for JCPS during the program implementation, and this position enabled me to have a broad view of the district as well as insider knowledge of the intricacies and nuances of implementing the program. I viewed the study through the role of change facilitator as defined by Hall and Hord (2006) to frame my involvement in the case.

Finally, although the study is historical and limited to one school district, it has the potential for merit. Variability within districts must be harnessed and understood (Honig, 2006) because variations in norms of the site may affect an implementing site's response to policy goals and instruments (McLaughlin, 2006).

Chapter 2 reviewed the literature available that related to this case study. School-level accountability was discussed from a historical perspective, with the demands of *NCLB* setting the current educational arena. I discussed alignment as a potential tool available for districts to increase student achievement, along with its three components—curriculum, assessment, and instruction. Next, I discussed the implementation of a program along with the potential for conflict during implementation. I teased pace out as a variable that has received some attention in the literature, but its importance in *NCLB* calls for further study. Finally, I presented a conceptual model of the case at the end of chapter 2 THAT integrated Anderson's research on curriculum alignment, Honig's research on an implementation model, and Hall and Hoard's research on Change Facilitators.

Chapter 3 described the case methodology. I used a qualitative case study design to capture the district artifacts in their context. I used NVivo software to

classify, sort, and code the 325 artifacts I collected to analyze. I then used NVivo coding and queries to study the relationships of people and events in the study.

Chapter 4 answered the first research question by describing the characteristics of the instructional component that JCPS designed for its aligned mathematics program. JCPS chose district assessments, pacing guides, professional development, and an STA program. I viewed each part through the six functions of the change facilitator: Developing, Articulating, and Communicating a Shared Vision; Planning and Providing Resources; Investing in Professional Learning; Checking on Progress; Providing Continuous Assistance; and Creating a Context Supportive of Change.

Chapter 5 used the rich descriptions provided in chapter 4 as a knowledge base to assist in answering the second research question: What are the dynamics the district encountered when it implemented the aligned mathematics program? Chapter 5 also answered the third research question: What change facilitator activity supported the district's implementation? As positive implementation results, the district faced several new challenges and in response created new Students Support Courses, a Benchmark Data System, and a UMBC Cohort. When the study took into account pace as a variable and the resulting conflict that ensued, the negative implementation results were Competition for Scarce Resources, Defensive Professional Development, a Trail of Memos, and Professional Blunders.

Overview

Policy implementation is a well-traversed arena and consequently has been studied and mapped from many vantage points; however, this case weaves the lens of

the change facilitator (Hall & Hord, 2006) into the discussion. From this view, I described the study of one district's implementation of policy unfolded from the perspective of looking up into the decision-making arena and down into the implementation arena.

This chapter further describes the verification of the findings through the use of a critical friends review. It then discusses the findings of the case study against the known theory, literature, policy, and practice. I then draw implications for change facilitators by categorizing the findings into appropriate change facilitator functions of interventions. I also suggest recommendations for further research.

Critical Friend Review

To verify the findings of the case, I embedded three critical friends in the methodology as a strategy to ensure reliability. These three individuals each added a new perspective to the implementation activities and provided feedback on the findings from their perspective.

The first critical friend was a principal in the district during the time of the case study. This principal reviewed the findings and the memos written on artifacts regarding principals. He agreed with the conclusions drawn in the findings citing that he would have come to similar conclusions regarding the implementation. However, he pushed for further exploration on many issues described in the memos. He suggested additional reflection on practice from the math office when one high school almost revolted against the new cut scores, the exploration of impact on teacher practice when the math office provided discrete directions regarding MSA instruction, and clarification of school responses to math offices initiatives that were

deemed to facilitate their implementation. His suggestions further support the need for greater communication between the math office and the schools during the implementation.

The second critical friend is a principal in another district and also is a parent in JCPS. This viewpoint allowed him to understand the administrative necessity for such changes yet provide the perspective of a parent whose child was affected by the implementation. He repeatedly noted the lack of proper communication provided to the parents during the implementation and cited this poor communication as the reason for the parents' frustration reported in the findings. He stated that neither the central office, the school, nor the teacher provided him with information or enough assistance to help him help his child adjust to the new program. He added that even the school personnel did not seem clear as to why the program was changing and could not even provide such details as an explanation on the new cut scores used for assessments or how they affected his child's grade. He advocated for more parental involvement to prevent push-back from the parents. He suggested a yearly calendar, examples of expected student work, and opportunities for parents to visit the schools. These examples further support the findings that the change facilitator function of clearly communicating the vision should drive the implementation so that parents clearly understand the need for change, how it will affect their child, and how they can assist in the change.

The third critical friend is a Coordinator in another district who could comment on the aspect of implementing a district initiative. He agreed that pacing guides help facilitate professional development, but also recognized that teachers are

very concerned about the use of pacing guides and their effect on instruction because not all children learn at the same rate. He also commented on the importance of clear expectations when a district partners with a university for a cohort, particularly how the lack of a technical detail prevented full implementation of the cohort.

Contributions to Theory and the Literature

Wixon, Dutro, and Athan (2003) laid the groundwork for this study when they noted that, although the logic of a district initiative might seem clear and powerful, the actual design and implementation of that policy might not follow suit. This lack of translation from theory into practice justifies the use of Honig's (2006) model of policy implementation as the framework for this study. Honig proposed that researchers should examine not only the interactions that exist among people, policy, and places, but also how and why these interactions shape policy implementation.

A New Permutation

The answer to the first research question suggests new directions for research and contributes to implementation theory by delineating the parts of the instructional component a district chose to design in its pre-K–12 aligned mathematics program—district assessments, pacing guides, professional development, and STA. The analysis provided a summary of the resources dedicated to each part of the instructional component. Studying policy implementation at the district level supports Massell's (2000) recognition that districts are the legal and fiscal agents overseeing schools and a major source of capacity-building. Kilpatrick (2001) recognized that districts are motivated to use an aligned instructional program so that teachers, parents, and others

can work together to help all children achieve, and Webb (2003) argued that an premise that an aligned mathematics program could improve student outcomes.

Increased Boundary of Study

Although the formation of new alignment policies to increase student achievement has benefits, Hannaway and Woodruffe (2203) noted that the federal and state mandates driving these initiatives are new criteria to which districts must respond. Although school district administrators had previously been active in deciding logistical support classroom instruction, their involvement was typically indirect. Hence, this study is one of the first to examine policies whose boundaries not only cover an entire district pre-kindergarten through 12th grade, but also encompass many aspects of instruction. The new mix of these policies and the actors who implement them as I have presented in this case contribute to current research.

The answer to the first research question illustrated how the four policy initiatives—district assessments, pacing guides, professional development, and an STA program—were implemented simultaneously. The complexity of each part of the instructional component was complicated by the fact that it potentially interacted with one or more of the other parts, all of which were new to school personnel and students. The confusion caused by the implementation of four initiatives simultaneously set the stage for the findings that responded to the second and third research questions.

Pace

The answer to the second and third research questions also contributes to theory and literature. Because district stakeholders had to learn four initiatives at the same time, the short amount of time available hampered a full understanding of each. Consequently, the pace of the implementation became a critical variable to its implementation. Although this study incorporated Honig's model of policy implementation, a significant contribution to Honig's model of policy implementation is the concept of pace I identified in this case. Pace is an aspect of implementation that is not well researched; yet as this case suggests, it is important in light of the *NCLB* mandates. *NCLB* requires districts to demonstrate increasing student achievement in yearly intervals, leaving little time to research, implement, and analyze the effectiveness of chosen strategies. This rapid pace forces policy implementers to move quickly, which contradicts the literature that suggests it takes 3 to 5 years to effectively implement a new policy (Hall & Hord, 2006).

Conflict

The quick pace found in JCPS' policy implementation yielded conflict. This conflict threatened the full successful implementation of the pre-K–12 aligned mathematics program because it affected the course of action (Malen, 2006) taken by central office staff, principals, and teachers. Each group had to negotiate the changing requirements of the program, particularly as new problems were discovered and new solutions were created.

The Role of the Change Facilitator

This case described change facilitator activity that supports the role found in Hall and Hord's (2006) description of the change facilitator. A significant contribution of this case is the pairing of the six functions of intervention in the change facilitator role with the three positive and four negative implementation results in the findings of the study. When the change facilitator role was paired with the study's findings, I created a model (see Figure 5.2) that illustrated the importance of a clear vision for the policy as it drove the other change facilitator activities. The model I developed also illustrated how one function of the change facilitator, such as Investing in Professional Learning, can have activity that both enables the policy's implementation (Creation of the UMBC Cohort) and prevents the policy's implementation (Defensive Professional Development). Finally, the model identified the change facilitator function of creating a context supportive of change as the base for a successful policy implementation. In this function, the change facilitator prevented professional blunders from halting the policy's implementation.

Contributions to Policy and Practice

This study has important implications for district policymakers and practitioners. The first research question examined how JCPS recognized the curriculum and assessment for its aligned mathematics program that came from MSDE and chose several parts for the development of its own instructional component: district assessments, pacing guides, professional development, and an STA program. The description of each part presents possible new information for

other districts searching for instructional components to incorporate into alignment efforts.

The fiscal and personnel costs associated with creating an instructional component provides a framework for other districts interested in making the same investments. The analysis regarding the time associated with and dedicated to each part of the instructional component also might help districts understand the implementation cycle, particularly the unprecedented need for allocation of resources in order to complete many items before the opening of the school year and later to respond to push back after the initial implementation stages.

Hannaway and Woodroffe (2003) realized that districts have many new policy tools at their disposal, but Hamilton (2003) realized that districts also work within strict resource constraints that force them to prioritize their actions. Coburn and Stein (2006) provide one example from the literature that regards policy implementation as a learning process that involves the gradual transformation of practice. In contrast, I found the district undertook efforts to implement its policy change targeting transformation of instructional practice in a short amount of time. The extensive push-back from schools might have been avoided had enough been provided for stakeholders to accept each aspect of the change. The inclusion of a timeline into the actual policy and its communication to the stakeholders to check on its progress might have prevented the reactions and push-back that occurred from many different groups.

Pace became a significant implementation variable and is of particular interest to practitioners as they respond to the ever-increasing demands of *NCLB*. Districts and

their schools must constantly meet new levels of achievement each year. The findings of this study underscore the potentially crippling effect that implementing a new policy at such a rapid pace can have on practitioners at all levels. Therefore, pace is an important aspect of implementation of accountability-driven policies that is not yet widely understood. When pace was considered in this case, several negative results were evident: Competition for Scarce Resources, Defensive Professional Development, a Trail of Memos, and Professional Blunders. Such negative fallout directs the discussion into the acceptance of pace as a new and necessary element of policy implementation.

The allocation of personnel to fully staff the office required to implement the policy is another consideration that this case suggests for policymakers and practitioners to take into account. A continued lack of personnel in the math office caused a lack of timely and proper communication with the schools and concerned parents. Insufficient staffing also required the math office to provide large-group professional development sessions in lieu of smaller options where the participants might have had more opportunity for input and feedback. This missed opportunity might have prevented push-back from the schools and parents.

Alignment

With the tightening demands of *NCLB*, districts are forced to choose their response to the federal legislation. Alignment calls for a clear curriculum structure that scaffolds students' content knowledge and skills. The assessment system, in turn, must appropriately discern students' level of proficiency in that defined curriculum. The instructional program that best accelerates students from the curriculum

component to successful performance on the assessment component is the third component of an aligned mathematics program.

However, each part of the instructional component added lessons to be learned for other districts. A brief discussion of the benefits and disadvantages for each follows.

STA

The decision to buy a new, high quality text for every student in the district was an exceptionally expensive option, but one on which the success of the remaining parts of the instructional component rested. For elementary students, 58 schools adopted the Scott–Foresman mathematics series while the remaining 19 schools had already adopted the Saxon program the previous year. In either case, every student in those buildings progressed through the same text series from pre-kindergarten through fifth grade. This continuity had exceptional benefit for teachers and parents who could build a common vocabulary, structure, and resources within the program. Students received the greatest benefit as they easily adjusted each year within the same text series, which also made transfers between schools easier. The texts were each selected by course in the secondary schools. Overall, the STA was the single greatest contributing factor to uniting the instructional program, thereby eliminating the fragment state of the prior instructional program.

The most negative aspect of the STA was easily identified by its price tag. Although numerous textbook companies made offers in an attempt to be selected, the members of the selection committees were prevented from hearing the associated

costs so that their decisions were made solely on quality. The formation of these selection committees provided school-level input, but they also caused additional costs to the district because substitutes had to be provided for teachers who attended the meetings. Additionally, massive spreadsheets of accurate school-level information had to be constantly updated to provide accurate quantity to schools. The amount of work required to ship, receive, and inventory texts caused whole new processes to be developed and staff to be hired at the central office and at the schools.

Pacing Guides

The adoption of a single text did not necessarily guarantee that every student would receive instruction on the appropriate content. Whereas teachers who strictly maintained a focus on teaching only the content standards defined in the could be accused of “teaching to the test,” those who chose to ignore the VSC had a radically different problem. However, the selection of the text used in each class affected both ends of the pendulum.

Some teachers traditionally began every year in a math text in the first section and proceeded diligently through the text section after section. In this manner, it was not uncommon for math teachers to never finish the text. Little thought was ever given to skipping the first few chapters which were often repetitive of prior material. However, some teachers skipped sections or entire chapters which they did not think applied well to the course. This cherry-picking of content prevented any consistency from classroom to classroom or school to school. The STA program did not prevent some of this occurrence; it was only with the addition of pacing guides that the precise content appropriate for each course was designed to be included in that year.

Teams of district staff and teachers wrote a mathematics pacing guide for each grade or course in the district. Working together in teams at the same time in common locations, these teams were able to build a vertical trajectory of curriculum to accelerate students from pre-kindergarten through secondary school. Pacing guides maneuvered the classroom teacher through the text, allocating the appropriate amount of instructional time to those sections that supported the VSC. Some sections were skipped when appropriate, and extra lessons were added at the back of the guides for topics that were included in the VSC but either missing or not fully developed in the text. The necessity for these supplemental lessons was a constant reminder that no text perfectly aligned with the VSC. Pacing guides were designed to provide the “what and when” of teaching, and the classroom teachers were left to determine “how” to provide the appropriate instruction for their students.

However, the majority of the push-back in the district was a result of teachers becoming acclimated to the purpose and use of pacing guides. Students were rightfully struggling with the curriculum in the new program because many had previously not been exposed to rigorous mathematics. As a result, teachers felt torn by the call to follow the guide and the reality that many of their students had not yet mastered previous material. One answer lay in spiraling the previously covered material as much as possible in each new lesson as a scaffold for the required new learning. This concept contradicted many previous math teachers’ notions that mathematics units were taught in isolation.

District Assessments

Even with the STA and corresponding pacing guide, physically monitoring the implementation of the curriculum in such a large district was impossible. However, benchmark assessments provided an opportunity to determine periodic progress at the student, teacher, school, and district levels. Additionally, because the district assessments were written in the format and at the rigor of the MSA, they provided teachers a glimpse of the target assessment.

I encouraged teachers to use the assessment results as an instructional tool. In other words, they not only allowed the teacher to benchmark progress against various groups, they also diagnosed content areas that required further remediation. The district assessment reports also told teachers their students' progress on the various assessment item formats so they could determine if their students required practice in a specific format.

However, the additional teacher workload required to print, score, and enter data for each district assessment also added to the push-back of teachers toward the math office. A new Benchmark Data System was created to alleviate some of the work and facilitate data analysis, but the creation of this system only added to some teachers' fears that central office was monitoring their students' progress even in the first implementation year.

Professional Development

The professional development part of the instructional component was designed to support the implementation of the other parts. Yet although the data

showed that a significant number of artifacts were related to professional development, a deeper analysis of its content-revealed that it was poor in quality and defensive in nature. The task of providing content relevant and timely information and skill development for teachers in all grades in 108 schools completely engulfed the small math office staff at times. As a result, the professional development often took the form of large conferences at remote locations with little opportunity for personal interaction with classroom teachers. Additionally, the math office relied on memos and e-mail to provide timely information. For example, a name used on some memos sent to schools was “What I learned today that can be used tomorrow.”

When I recognized the enormity of the professional development deficit in the curriculum component, I worked with the small math office team to more fully develop our lead teachers in the elementary schools and DCs in the secondary schools. These teachers became ambassadors from the central office to the schools in lieu of the math office personally interacting with every school. This option placed another level of management in the program, but developed local leaders in the schools.

One victory did occur in professional development for the district. First, a strong partnership formed with UMBC to create a master’s degree cohort. This cohort quickly accelerated already certified elementary and middle-school teachers through courses in Algebra and Geometry so they could move into much needed high school position vacancies. This partnership was strengthened by the university’s willingness to resequence courses and change class locations and the district’s willingness to completely fund the program for 28 teachers.

Although the math office received criticism for entirely funding a masters degree for 26 teachers, there were simply no other viable alternatives to filling the excessive number of vacancies in high schools with certified teachers. For example, although the district could have taught the individual courses in Algebra I and Geometry to the same cohort of teachers, we could not have continued the course sequence necessary for them to attain their high school certification. Eventually, the district became so short in mathematics teachers and other content areas that a recruiting team was sent from the Human Resources office to the Philippines to recruit an excess number of teachers in that country. When the financial costs of the UMBC cohort are taken into perspective against the financial and personal costs associated with the Philippine cohort, the dollar value of a partnership with the local university is much more apparent.

Implications for Change Facilitators

This qualitative case study has several implications for the work of change facilitators who are responsible for paving the way to successful implementation of educational policies such as the one I studied. In the findings, I revealed both positive and negative results of the efforts of the district to implement an aligned mathematics program and the activities I performed in response in my role as the change facilitator. These findings offer lessons for other school districts' change facilitators who undertake similar implementation initiatives. For each of the six functions of intervention in the change facilitator role, I describe key findings that district leaders can use to enhance their practice during policy implementation.

Developing, Articulating, and Communicating a Shared Vision of Change

This study reaffirmed the need to build initial investment into the stakeholders' understanding of the initiative. As the findings detail, a lack of a clearly stated vision prior to the actual policy implementation resulted in a significant push-back from all levels in the district. Many meetings were held, and memos were sent to add clarity to the justification for such a sweeping initiative, but their late timing frequently became a matter of damage control, rather than a key part of the actual implementation design.

However, once push-back was addressed, the vision was constantly referenced as the motivation for change. All members of the district had a difficult time arguing with the desire to increase student achievement and promote equity among schools; however, the frustration of implementation was already set in their experience.

Planning and Providing Resources

Hamilton (2003) recognized that any institution responsible for a significant policy implementation, such as a district assessment program, will face resource constraints. This district allocated significant resources to the new mathematics program in the form of money and time. However, even resource-rich, the mathematics program encountered numerous difficulties due to the pace at which the program was implemented.

One new policy that the district instituted was the creation of student support courses, which were created to better prepare struggling students for state-mandated assessments and accelerated students for AP exams. By doubling the number of seat

hours that students took a particular course, teachers had the opportunity to spiral into their lessons prior knowledge that students might have missed in the prior mathematics program. As the change facilitator, I had to use data to justify the increased amount of instructional time that students needed in mathematics courses for them to be successful. I also had to recognize that the time pulled to allocate to additional time in mathematics courses had to be taken from other courses or activities during the school day.

Investing in Professional Learning

The will and capacity of local actors to successfully implement a change in practice has led researchers to suggest that professional development is a critically important part of successful implementation (Smylie & Evans, 2006). Whereas the research demonstrates that embedded, ongoing professional development is most effective, I found few examples of professional development in my study. Rather, the artifacts labeled as *professional development* reflected events or memos that were more of an information-sharing nature. Their reactionary nature exemplifies a defensive stance, rather than a well-planned and developed evaluation of employee strengths and weaknesses and a professional development program tailored to those findings. Other districts and change facilitators could learn from this case by embedding the professional development necessary for school-level personnel to implement the policy into the actual policy design. This preplanning would properly allocate the resources necessary to build the skills and knowledge necessary to successfully implement the policy.

One positive professional development effort was evident in this case. The district recognized the need for a cadre of high school teachers to teach mathematics using the curriculum alignment approach. The negotiations that ensued with UMBC, resulting in a tailored professional development program, began to produce a group of elementary and middle-school teachers ready to move into high school positions. Although providing these teachers with the opportunity to obtain without cost a master's degree in secondary mathematics education was a costly financial burden, it solved what seemed like an unavoidable problem of having uncertified teachers in some of the most demanding courses and classrooms in the district. This significant allocation of financial resources prevented serious disruptions to students' education and demonstrated the districts' commitment to providing students with a quality education.

Ironically, there were few examples for professional development for myself or the members of my math team. We relied most frequently on journal articles and professional sharing with other members of the district. We were able to occasionally interact with colleagues from across the state. The district did not offer many activities dedicated to the professional enhancement of central office employees.

Checking on Progress

In this case, I also noted the need for monitoring the implementation, but recognized the lack of human and physical capacity to properly monitor and assist schools and their personnel. The district assessments, which involved all schools, were an example of the math office's inability to properly respond. Although the assessments were meant to inform the district math office, school principals, and

individual teachers of student progress, the volume at which the data were generated swamped the math office. This volume caused the eventual development of a new electronic benchmark data system. The district assessments were a significant expenditure in personnel and fiscal resources. Consequently, central office staff, along with school-based personnel, wanted immediate feedback on their students' progress.

Providing Continuous Assistance

In this case, I found a trail of memos that indicated the necessity for change facilitators to consistently and clearly communicate all aspects of the policy implementation. Many stakeholders in the district at times needed assistance to facilitate the implementation of part of the aligned mathematics program. However, the lack of clear initial communication often caused a follow-up memo for clarification. Additionally, although memos are a viable tool for communication, they are not timely unless transmitted by e-mail or able to convey the same sentiment as a personal interaction.

Creating a Context Supportive of Change

The findings support Mc Laughlin's (2006) assertion that the next generation of implementation researchers could integrate findings with learning theory to understand how other systems can learn from their experiences. Honig (2006) further supported the examination of under what conditions various education policies get implemented and actually work. Researchers must be able to uncover the policy implementation conditions so that it is clear if the program's outcome was due to the program's design or the conditions in the district under which it was implemented.

These assertions have particular credence in the change facilitator function to create a context supportive of change. District-level policy implementation has numerous stakeholders and other variables that can prevent full or proper implementation. Mistakes are inevitable, yet the context that the change facilitator creates can impact the perception and impact of those mistakes. I found several professional blunders during the policy implementation, yet an established esprit de corps facilitated the recognition of and solution to those blunders. The established culture of the math office, from posters to shirts, was continuously adjusted to the mistakes, and there was a continual focus on celebrating the mathematics program's accomplishments.

Recommendations for Further Research

The findings in this qualitative case study raise questions for further research in a district's pre-K–12 aligned mathematics programs and the role of the change facilitator in policy implementation.

I examined four parts of the instructional component but did not address other potential parts that a district might choose to implement. The various parts of an instructional component and the order in which they are implemented affect the ability of schools to react and the problems that arise during implementation.

I examined the role of the change facilitator in a central office position, but the findings could be enriched with the exploration of the change activities that facilitators at the school level undertake as they responded to district initiatives. Whereas I described the activity of a central office Coordinator of Mathematics buffering and filtering the initiative to the school, another study could describe how a

school-level change facilitator buffers and filters an initiative from the central office. Findings of such studies could enrich the relationship between central offices and the schools they lead.

This case also offers questions for researchers who work with districts that create new programs in response to equity issues they face among their schools. By providing each school with the same instructional resources, placing them on a similar implementation timeline, and training all teachers with the same professional development opportunities, the district was able to level the playing field on several key variables affecting a child's education. This study then offers the potential to further investigate the effects of the equal allocations of those resources.

Reflections

The final reflection lies in the lessons learned from the district's current state as a result of implementing a pre-K–12 aligned mathematics program. The events of this case happened largely during the 2003/2004 school year, and the passing of time has allowed for a more analytic analysis of its impact.

Overall, the new program has become the norm in the district and an accepted and better understood part of schools. Some adjustments have been made to procedures over the years, but the STA, pacing guides, district assessments, and professional development remain the four main parts of the instructional component although much better developed than in the initial year. The Coordinator of Mathematics position was eventually split into an elementary and secondary position and other additional personnel were eventually added to the math office.

The primary lesson learned is the necessity to better communicate the vision for the new program and the district data that supports radical changes to the existing program in order to achieve that vision. This conclusion is drawn from the case in that significant resources were allocated not only to the physical resources and processes required to implement the program but also to mitigate the push-back from the school community.

The numerous parts to the instructional component significantly changed the everyday practice for all mathematics teachers, but the normative shift required by teachers was made even more complex due to the pace at which the program was implemented. To recognize the necessity for a fast implementation so that students receive a better educational opportunity does not excuse the omission of a master implementation calendar for the district. The addition of this one document would have better displayed the events for all district personnel and in the discussions necessary to create a master calendar also might have anticipated some of the otherwise unforeseen problems.

However, the real impact of the implementation is a positive one and lies in the district's current student data. The vertical trajectory of curriculum in elementary schools supported by new texts, pacing guides, district assessments, and professional development has resulted in several positive data points. For the MSA scores, from the 2003 administration to the 2007 administration, scores increased from the percent proficient and advanced in third grade from 73 to 87, in fifth grade from 65 to 87, and in eighth grade from 39 to 69. For Algebra I, which is considered a mathematics gate-keeper course, the elimination of prerequisites to the course significantly increased

the number of students entering more rigorous mathematics courses at an earlier age. As a result, 80% of students successfully completed Algebra I by the end of eighth grade in 2007, whereas Algebra I had previously been reserved as a class only for exceptional students. This pattern of increased student achievement continues into the upper level mathematics courses. The 12 high schools are now experiencing those students remaining in the mathematics course sequence which has led to an increase in the number of students taking and succeeding in an AP Calculus course and the corresponding national exam.

Conclusions

Accountability in some form has become a permanent fixture in educational programs as schools respond to the national concern for student achievement. Districts will continue to react to this concern by implementing new programs, and change facilitators will time and again be in the position of a conduit for implementation. They must communicate the necessity for change, plan for its implementation, negotiate the impact of change, and react to the ensued dissonance. Changes facilitators make these decisions based on their contextual environment and available resources. This study began an examination of that work by uncovering change facilitator activity that supported a district's implementation of a pre-K-12 aligned mathematics program.

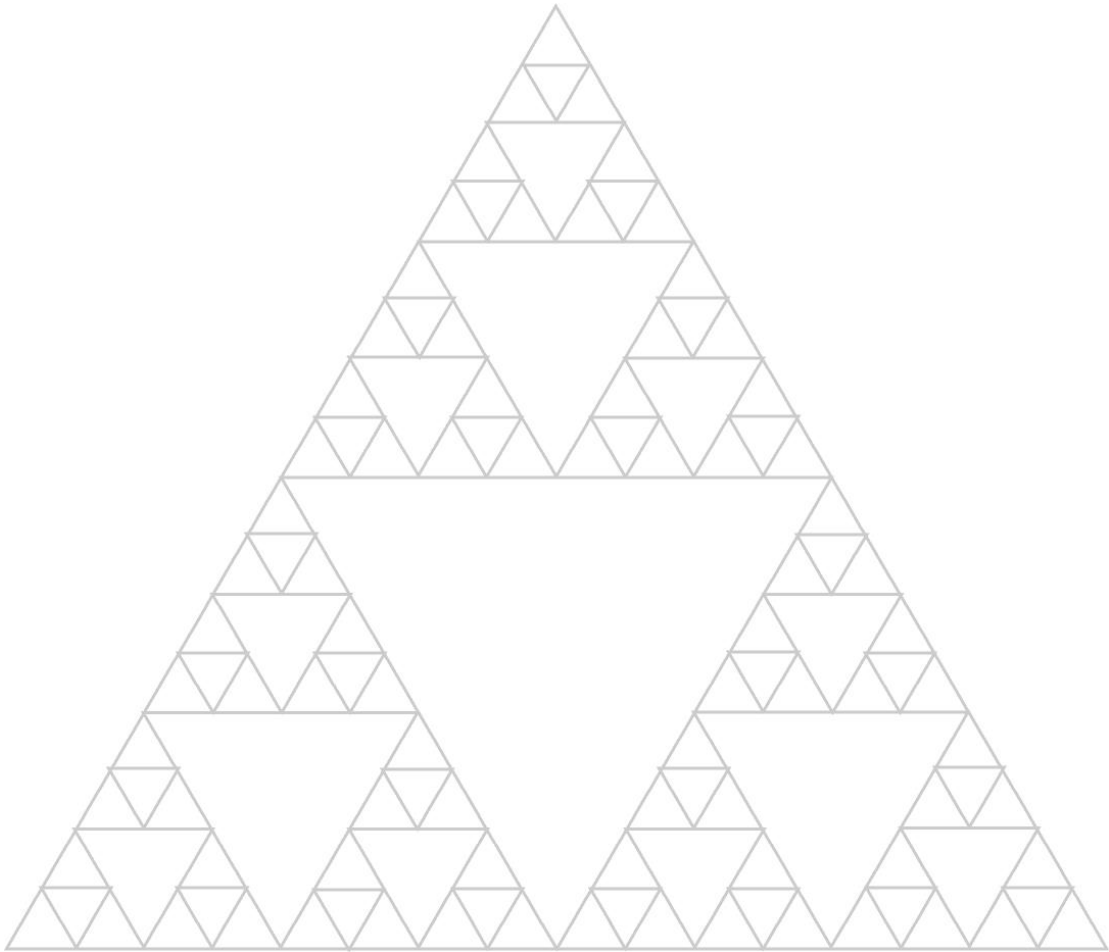
Appendixes

Appendix A

Qualitative Data-Collection Tool: Guiding Questions

1. What type of artifact?
2. When was it created?
3. Who created the artifact?
4. Who used the artifact?
5. How was the artifact used?
6. Describe the artifact and its context within the district.

Appendix B



James County Public Schools Mathematics PreK-12

Every child should have the opportunity to learn rigorous mathematics.

Kathy Kubic

Coordinator of Mathematics

410.222.5464

I. My Philosophy

“The nation can adopt rigorous standards, set forth a visionary scenario, compile the best research about how students learn, change the nature of textbooks and assessment, promote teaching strategies that have been successful with a wide range of students, and change all the other elements involved in systemic reform. But unless the classroom teacher understands and is committed to the plan and knows how to make it happen, the dream will come to naught.”

Hawley and Valli
American Federation of Teachers, 1995

- ◆ Our teachers are our greatest resource.
- ◆ The only way to the kids is through the teachers.
- ◆ A program is not textbooks nor curriculum nor even test scores. A program is the people in it. Take care of the people, and the rest will follow.

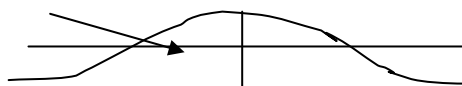
II. The Problems

1. Educational Philosophy
2. Curriculum
3. Structure

III. My Goals

1. Create transparency
curriculum - teaching – assessment
2. Streamline and focus.
 - a) vertical teaming – alignment with HSA, PSAT, and AP
 - b) horizontal teaming – pacing guides
3. Provide every resource needed to our math teachers.
 - a) texts
 - b) pacing guides
 - c) staff development
4. Put an end to the bell curve grade distribution.

A-3 B-5 C-11 D-4 E- 6



5. Raise every test score for every child.

IV. My Requests

1. Share the Vision
2. Support our vertical team efforts.
3. Monitor use of the pacing guides.
4. Monitor our county produced comprehensive review for CTBS, MSA, HSA, and PSAT tests.
5. Communicate the data from these tests.
6. Solve the problem(s) along the way.

IV. My Questions

1. PACING GUIDES
2. Algebra I
3. Teacher Quality
4. Active Learning Strategies
5. Consistency in support courses
6. Calculus

MSA Mathematics BCR Rubric
Grades 3-8

2 The response demonstrates a complete understanding and analysis of a problem.

- Application of a reasonable strategy in the context of the problem is indicated.
- Explanation¹ of and/or justification² for the mathematical process(es) used to solve a problem is clear, developed, and logical.
- Connections and/or extensions made within mathematics or outside of mathematics are clear.
- Supportive information and/or numbers are provided as appropriate.³

1 The response demonstrates a minimal understanding and analysis of a problem.

- Partial application of a strategy in the context of the problem is indicated.
- Explanation¹ of and/or justification² for the mathematical process(es) used to solve a problem is partially developed, logically flawed, or missing.
- Connections and/or extensions made within mathematics or outside of mathematics are partial or overly general, or flawed.
- Supportive information and/or numbers may or may not be provided as appropriate.³

0 The response is completely incorrect, irrelevant to the problem, or missing.⁴

Notes:

¹ **Explanation** refers to students' ability to communicate **how** they arrived at the solution for an item using the language of mathematics.

² **Justification** refers to students' ability to support the reasoning used to solve a problem or to demonstrate **why** the solution is correct using mathematical concepts and principles.

³ Students need to complete rubric criteria for *explanation, justification, connections,* and/or *extensions* as cued for in a given problem.

⁴ Merely an exact copy or paraphrase of the problem will receive a score of "0".

Show What You Know! BCR Mathematics Rubric

Score	
2	<p>My answer shows I completely understand the problem and how to solve it:</p> <ul style="list-style-type: none"> • I use a very good strategy to correctly solve the problem. • I use my best math words, numbers, or pictures to clearly explain what I did to solve the problem. • My explanation is complete, well organized, and logical. • I apply what I know about math to correctly solve the problem.
1	<p>My answer shows I understand most of the problem and how to solve it:</p> <ul style="list-style-type: none"> • I use a good strategy to solve the problem. • I use some math words, numbers, or pictures to explain what I did to solve the problem. • My explanation is incomplete, unorganized, or illogical. • I only apply enough math to partially solve the problem.
0	<p>My answer shows I didn't understand the problem and how to solve it:</p> <ul style="list-style-type: none"> • I did not use a good strategy to solve the problem. • I'm not sure that my answer is related to the question that is asked. • My explanation is missing. • I did not apply the math necessary to solve the problem. • The answer is blank.

Appendix E



To: High School Principals From: Lynn Whittington, Director of Curriculum Kathy Kubic, Coordinator of Mathematics Subject: Algebra I and Geometry Cut Scores	Date May 4, 2008	File Code *
	Instructions: Copy to: Mary Gable, Director of High Schools Mathematics DCs	

This past summer, the mathematics office gathered teams of classroom and resource teachers to write county assessments in Algebra I and Geometry. These assessments were written at the county level to provide all students the opportunity to take assessments on the appropriate content at the appropriate level of cognitive demand. Each assessment follows the same template: 10 Selected Response (SR) items for 1 point each, 4 Student Produced Response (SPR) items for 1 point each, 2 Brief Constructed Response (BCR) items for 3 points each, and 1 Extended Constructed Response (ECR) item for 4 points.

The decision to include BCRs and ECRs allows students the opportunity to practice writing a response that will be graded with a rubric score. The Maryland State Department of Education rubrics are a holistic approach to evaluating student responses based on analysis of the problem, selection of a problem solving strategy, application of the strategy, and explanation or justification of the answer.

The rubric is not a check-list approach to grading. For example, the evaluation of someone's attire would fall into a category: stunning, very nice, fair, or poor. These categories are similar to the rubric scores: 4, 3, 2, or 1. A student may earn a 0 if the answer is missing or adds no new information. It would be inappropriate to evaluate someone's attire with a percentage. Additionally, if a student has a very good answer, the rubric score of 3 would convert to a 75% which is equivalent to a "C." For this reason, the mathematics office enlisted the help of the Department Chairs to determine Cut Scores for the county assessments (attached). These cut scores are similar to AP scoring. For example, a student may only receive 70/108 points on the AP Calculus exam and still receive a 5 out of 5 on this national test.

If you have any question about the mathematics county assessments or the use of cut scores, please contact the mathematics office at 410.222.5464.

**Algebra I Benchmark Assessment
Scale Scores**

Raw Score	Scale Score
39	100
38	98
37	98
36	95
35	95
34	90
33	90
32	88
31	88
30	85
29	85
28	80
27	78
26	78
25	75
24	75
23	70
22	68
21	68
20	65
19	65
18	60
17	58
16	58
15	55
14	55
13	50
12	50
11	50
10	50
9	45
8	45
7	45
6	45
5	40
4	40
3	40
2	40
1	40
0	40

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