

Changes in Teachers' Instructional Use of and Beliefs about the CMSI Curricula

An Evaluation Report for the Chicago Public Schools Office of Mathematics and Science
Prepared by the PRAIRIE Group, UIC College of Education

September 10, 2008 [Revised October 7, 2008]

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Numerous PRAIRIE authors produced this report collaboratively and share responsibility for its contents. The conclusions drawn in this report reflect a systematic analysis of data by external evaluators. For further information, please contact Carol Fendt (crfendt@hotmail.com) or Janise Hurtig (jhurtig@uic.edu) at (312) 413-9221 or (312) 413-3367.

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EXECUTIVE SUMMARY

This end-of-year report is the third in a series of external evaluation studies conducted over the 2007-08 school year by the UIC PRAIRIE Group that focus on teachers' instructional activities and curriculum use. The broad aim of the external evaluation is to provide OMS and other key stakeholders with a deep, nuanced understanding of the processes and outcomes of the CMSI. The more specific purpose of these studies is to contribute to an understanding of how teachers' development as effective implementers of CMSI curricula is affected by the systemic education reform efforts of the Chicago Public Schools' Chicago Math and Science Initiative (CMSI), directed by the CPS Office of Math and Science (OMS).

Data analysis for this report draws upon an analytic framework that emphasizes the importance of understanding teachers' instructional practices in relation to their rationales for use/instruction and beliefs about the curricula more generally. This is a framework that the PRAIRIE evaluators have developed and refined over its two years of gathering classroom-level data on teachers' math instruction and curriculum use.¹ The framework is based on the assumption that OMS supports are most effective in promoting high quality math instruction and CMSI curriculum use when they are able to have a positive impact on teachers' practices as well as their beliefs and sense-making around the CMSI curricula and its relevance to their classrooms.

Findings and analysis are presented in two separate sections. In the Findings Section we report on changes in teachers' use of and sense-making about CMSI curricula and math instruction by school, over several years. This includes eight teacher vignettes set within the context of their school and support structures. In the Analysis Section, we draw on findings to address three themes: (1) whether and how changes in teachers' instruction/use relate to their beliefs/sense-making; (2) if and how the school context contributes to changes or continuities in teachers' instruction/use and beliefs, and (3) if and how different supports relate to changes in teachers' instruction/use and beliefs.

1) Whether and how changes in teachers' instruction/use relate to their beliefs/sense-making.

Teachers' trajectories of curriculum use and sense-making: When we examined the trajectories of curriculum use and sense-making for the eight teachers in our sample, we found that six teachers' curriculum use has improved, six teachers' sense-making around the curriculum has become more positive over time, and two teachers' use and sense-making have remained steady. Four teachers showed improvements in their curriculum use and increasingly positive beliefs about the curriculum; while two teachers' use improved while their sense-making has remained consistent. Three of the eight teachers had at least some positive beliefs about the CMSI curriculum when they started implementing it in their classroom. These teachers have had rather distinct trajectories over the past three to five years. The remaining five teachers had negative or mixed beliefs about the curriculum when they began using it. Of these, the two teachers developed more positive beliefs about the curriculum after attending professional development, and their use has improved as well. Two teachers have retained their predominantly negative beliefs, and demonstrated little to no change in their use.

Improvements teachers make in their use of the curricula: We observed and/or heard teachers report increases in the level of their use ("as intended") in various ways. Two teachers, who started using the curriculum with a moderate level of use as intended, continued to improve their practice, finding ways to modify lessons in accordance with their students' abilities. Two other teachers started using poorly with minimal or no supports. Both improved their use considerably after a short amount of time (in the case of one, after attending New User professional development; in the case of the other, the important support was the citywide specialist over time). However, both teachers continue to maintain a teacher-centered classroom:

¹ See in particular "A first look at teachers' descriptions of their use of CMSI curricula," November 22, 2006; and "Patterns and Prevalence in the Use of CMSI-Supported Curricula by CPS K-8 Teachers," February 5, 2007. See also Fendt's forthcoming doctoral dissertation, "Teacher Sensemaking and the Implementation of a District-Wide Curricular and Instructional Reform."

most of class time is spent teaching to the whole group, and dialogue is characterized by the teacher prompting students for questions and answers.

Kinds of beliefs/sense-making that seem to most impact use: For six of the eight teachers, their sense-making (whether positive, negative or skeptical) around the CMSI curricula was directly related to their use (the two co-varied). However, we cannot claim that there has been a causal relationship between the two. Six of the eight teachers constructed their intrinsic beliefs about the curriculum at least in part in terms of the issue of “mastery.” These teachers’ concerns about and commitment to mastery was a key rationale they offered for supplementing the curriculum with basic skills problems. Of the three teachers who were positively disposed to the curriculum from the outset, the positive qualities they identified were its emphasis on exploration, the fact that it taught math concepts, the extensive use of manipulatives, and/or its encouragement of multiple ways to solve problems. The ISAT affected some teachers’ sense-making around the curricula. Two teachers’ sense-making around the curricula became more positive when they saw students’ ISAT scores improve; and for two other teachers, increases in test scores validated their already positive views of the curricula.

All eight teachers’ sense-making about the curriculum was influenced by their beliefs about “their” students. Most teachers who had negative beliefs about the curriculum explained their concerns at least in part in terms of their perceptions of their students’ needs, abilities, and aptitudes. Two teachers justified their deviations from the curriculum (skipping and supplementing) in terms of the importance of meeting their students’ “needs”; and two others expressed ambivalence about the curriculum because they feared using it “as intended” might not fully meet their students needs.

Teachers ranged in the ways and extent to which they modified the curriculum to accommodate perceived lacks in their students’ aptitudes, community, or homes. Several supplemented with outside materials, and other skipped parts of the lessons they felt their students could not do. Two others made modifications within the spirit of the curriculum. Only one teacher expressed a positive belief that the CMSI curriculum was important for his students, because it encouraged the kind of critical thinking skills and valuing of individual differences, that students in underprivileged communities needed.

2) If and how the school context contributes to changes or continuities in teachers’ instruction/use and beliefs.

In analyzing and comparing the teachers within two schools within school and across schools, we find that school context and supports matters. Two teachers in one school with a culture of teacher-teacher trust and talk about instruction seem to make more positive gains in sense-making and use as intended than two teachers in a school without this kind of engagement. Even within our school with high collegial supports we find differences. One teacher had multiple colleagues at the grade-level. These colleagues had at least five years teaching experience and began implementing the CMSI at their school together as a team. The other teacher joined after the CMSI was well underway and worked with another new to teaching/new to the school/new to CMSI colleague. The depth of discussion and ability to support one another in sense-making and curriculum use is tempered by this context.

3) If and how different supports relate to changes in teachers’ instruction/use and beliefs

We looked at professional development attendance, access to a specialist, collegial conversations related to math instruction, and Area policies/personnel as potential supports to teachers’ use and sense-making. What we found was that professional development mattered in most cases to familiarize teachers with the CMSI materials. For some, it seemed to move beyond familiarity with materials and texts to pushing teachers to really create a student-centered, constructivist style classroom. Others found nothing of value.

All but one of our schools had access to a specialist. In one school, the specialist was the face of CMSI and kept teachers focused on implementation. Another school had a shift in specialist after two years. Both teachers found the first specialist helpful in orienting them to the curriculum or securing supplies, while only one benefited from the replacement specialist. Another school had access to a citywide specialist. Again, only one of the two teachers benefited from this support. The roles of specialists varied across and within

schools, depending on the needs of the school or the teacher. The teachers at the school without access to a specialist believe that it would have helped their implementation to have access to such a person.

Two teachers spoke specifically of the support they gained from talking with their colleagues. This support ranged from giving each other tips on how to do a lesson, to critically thinking and planning the pacing of lessons and units together across the course of a school year. Two other teachers spoke of past conversations with colleagues. One of these also talked about being the veteran teacher at the grade level whom colleagues come to for support. Four other teachers spoke of the absence of conversations with colleagues about math instruction.

Few teachers spoke of the Area as a source of support. Two teachers at one school talked of how in the past the Area coach had been a support to them personally, bring them supplies or materials. All spoke of the Area's focus on ISAT and test prep/extended response/math journal as at odds with their implementation of CMSI since they needed to give up their resource of time to this agenda, thus affecting their ability to keep pace according to the CMSI guide.

1. REPORT BACKGROUND AND OVERVIEW

This end-of-year report is the third in a series of external evaluation studies conducted over the 2007-08 school year by the UIC PRAIRIE Group that focus on teachers' instructional activities and curriculum use. The broad aim of the external evaluation is to provide OMS and other key stakeholders with a deep, nuanced understanding of the processes and outcomes of the CMSI. The more specific purpose of these studies is to contribute to an understanding of how teachers' development as effective implementers of CMSI curricula is affected by the systemic education reform efforts of the Chicago Public Schools' Chicago Math and Science Initiative (CMSI), directed by the CPS Office of Math and Science (OMS).

The 2007-08 evaluation studies build upon the PRAIRIE Group's external evaluation of various facets of the CMSI from 2003 to 2006.² As with past evaluations, these studies are based on rigorous data collection and analysis that are conducted in such a way as to provide timely and useful feedback to the audiences including the leadership team of the OMS, the Chief Educational Officer of CPS, and the CPS Department of Program Evaluation (DOPE) as decisions are made about the allocation of resources in the effort to continually improve mathematics teaching and learning.

This report builds on and complements findings and analysis from the first two studies, reported in two data briefs that included data collected for the Cluster 4 Middle Grades Project (C4MGP). The first data brief (January 2008) focused on the *nature* of middle grades teachers' math and science instruction and curriculum use, as well as key supports affecting instruction and use.³ In a second, April 2008 report,⁴ we addressed factors contributing to *variability or continuity* in math and science teachers' curriculum use and instruction over the course of the school year, paying particular attention to the influence of ISAT preparation. Based on classroom observations and teacher self-reports, we found that preparation for the ISAT was a significant factor influencing math and science teachers' instruction and use of CMSI-supported curricula. Specifically, 75% of teachers referred to the ISATs during observations or interviews. Of that 75%, 43% reported modifying, skipping or supplementing the curriculum to prepare their students for the ISATs.

In attempting to shed light on factors contributing to the influence of ISAT preparation on teachers' implementation of the curricula, we compared the impact of ISAT preparation to several other teacher-level factors, including: number of years using the CMSI curricula; stated beliefs about the CMSI curricula; and

² The numerous reports of findings from this external evaluation are available on the CPS Department of Program Evaluation website at http://research.cps.k12.il.us/cps/accountweb/Evaluation/View_Evaluation_Reports/View_Evaluatons_by_Date/

³ "Middle Grades Math and Science Instruction and Supports in Cluster 4 Project Schools," January 11, 2008.

⁴ "A First Look at Variability in Teachers' Math and Science Instruction and Curriculum Use," April 14, 2008.

quality of math instruction, as indicated by the nature and ratio of teacher/student dialogue during observed lessons. However, we found no significant correlations between these factors and the ways teachers varied their curriculum use/instruction in response to ISAT preparation. Nor did we find evidence that teachers' attendance at the appropriate professional development sessions related to whether or how they altered their curriculum use/instruction for ISAT preparation.

Analysis of observational and interview data collected after the ISAT testing period (after completion of the April 2008 report) did not reveal new information regarding factors contributing to change and variation of instruction during the course of the school year. Thus, in this report we *do not* report anew on the topic of variation in use/instruction *during* the school year. What the additional data reinforced, however, was an absence of any strong patterns between the ways teachers do or don't vary their curriculum use over the year and their beliefs about and sense-making around CMSI curricula and its use. Nor did variability in teachers' instruction during the school year correlate with the kind or amount of CMSI supports they have (or have not) received. This apparent lack of correlation is significant, given that the CMSI's consistent messages about and modeling of curricular use discourage the practice of modifying, skipping, or supplementing lessons in order to teach basic skills or prepare students for the ISAT. These findings thus raised questions about which of the various messages teachers receive about the goals of math instruction and the use of CMSI curricula—from CMSI supports, Area supports, school-based supports, and other school contexts—influence teachers' use of and beliefs about the CMSI curricula. It also raises questions about whether there is a relationship between how teachers use the CMSI curricula and their sense-making about it.

In this report we draw on longitudinal data collected over the past five years⁵ on teachers' instructional practices and sense-making about CMSI curricula—in relation to their school context and the range of supports they do and don't receive—to try to understand what factors influence teachers' math instruction, in particular as they develop as users of CMSI curricula.

Specifically, this data brief addresses the following evaluation questions pertaining to teachers' math instruction and curriculum use:

1. Do teachers' math instruction curriculum use develop (change and/or improve) over time? If so, how?
 - a. Does teachers' sense-making about the curricula change over time? If so, how?
 - b. Do changes/continuities in teachers' instruction and use seem to relate to changes/continuities in their sense-making about the curricula? If so, how?
2. Do CMSI supports play a role in the nature and extent of the changes in teachers' curriculum use and instruction?
3. In what ways does the school context contribute to changes in teachers' math/science instruction, use, and sense-making around the curricula?
4. Do colleagues support each others use of the curricula? If so, how?
 - a. Is there a formal/informal structure to how this happens?
 - b. What do teachers say they have gained from these supports over time? How do they relate these supports to their decision-making around instruction and curriculum use?

2. METHODOLOGY AND ANALYTIC FRAMEWORK

Data Sample and Collection: The data sample for this report consists of eight teachers in the four “case” schools selected for the 2007-08 CMSI instruction study. The four schools were deliberately selected based on the following criteria: (1) to represent the variation in how CMSI began at schools, and (2) to include schools for which PRAIRIE had multiple years of data, including classroom observation and teacher interview data. Two of the schools in our sample (Harrison and McCartney) have been part of the CMSI

⁵ We identify the data collection time periods for specific schools and teachers in the next section.

study for five years. Both applied for participation in the CMSI and were accepted as either a Readiness school (McCartney) or an Intensive Support school (Harrison) in 2003-04. The other two schools (Lennon and Starr) have been part of the CMSI study for four years, beginning their implementation as schools on probation that were mandated to adopt CMSI approved curricula.

Table 1 contains characteristics of each school relevant to this study: the terms under which the school adopted the CMSI; the years the school has been using CMSI curricular materials; the nature and amount of in-school support offered at the school; and key demographic information (school population and percentage of the student body that is low income).

Table 1: School-level Characteristics

| School Name | School Population | % Low Income | Terms of CMSI adoption | Years of Implementation | In-school Support |
|-------------|-------------------|--------------|--------------------------|-------------------------|--|
| Harrison | 1000 | 95% | Intensive Support school | 2003-2008 | Full time specialist, 2yrs; part time specialist, 3yrs |
| McCartney | 600 | 96% | Readiness school | 2004-2008 | no specialist, 5 yrs |
| Lennon | 450 | 98% | Probation school | 2004-2008 | Full time specialist, 4yrs |
| Starr | 300 | 96% | Probation school | 2004-2008 | CWSP, 3yrs |

In each of the four schools, we selected two teachers to observe and interview on two occasions during the school year: once prior to ISAT testing and once following ISAT testing. Following the same protocol we had adopted for our 2007-08 “field study,”⁶ the interview was intended to function as a “debrief” in which we asked the teacher about such topics as: the teacher’s assessment of the lesson she had just delivered; her rationale for instructional and assessment practices, use of materials, and the like; her views about the CMSI curriculum she was using; and the kinds of supports she received and how they did or didn’t influence her math instruction. We also observed each teacher engaged in one form of support she identified during the interview as meaningful.

Teachers for this study were chosen based on several factors. First, they were individuals whom we have had the privilege of following closely over the course of our CMSI data collection for the last three to five years and whom we had observed teaching at least one lesson in 2006-2007. Thus, they provided a meaningful lens onto the important issue of whether and how teachers who have been using CMSI-supported curricula for years develop as teachers of math. Second, these are teachers who have demonstrated either constancy or improvement in their math instruction, constancy or improvement in their beliefs about the CMSI curricula, and have participated in or received CMSI supports with varying degrees of regularity. Thus, these teachers can be considered representative of a larger pool of teachers whose instructional practices and curriculum use have developed—or have the potential to develop. In this sense, their cases are particularly relevant to decision-making regarding the nature and allocation of support resources by OMS.

In order to understand changes in teachers’ implementation of and sense-making around the CMSI curricula—and the factors influencing those changes—for this report we draw on multiple years of data that PRAIRIE evaluators have collected at the four sample case schools over the past four to five years. These data include observations followed by debrief interviews⁷ with the two teachers at each school, and focus groups⁸ with these teachers about their use of, views about, and supports received for CMSI curricula over

⁶“Curriculum Use in the Classroom Context: A Field Study of Teachers’ Math Instructional Practices and Rationales,” August 29, 2007.

⁷ In most cases, data are from at least two observations in 2007-2008 and at least one observation in 2006-2007.

⁸ In most cases, each teacher was included in a focus group each of their years of CMSI implementation at the school.

the course of this study. We also draw on data from in-depth interviews⁹ conducted with each teacher in the sample at the end of the 2007-08 school year.

Table 2 below presents an overview of the teachers at these schools: the grades they teach; number of years teaching at the school; number of years teaching; and their attendance at professional development.

Table 2: Teacher-level Characteristics

| School | Teacher | Grade level | Years at school; Years teaching. | CMSI curriculum professional development programs ¹⁰ attended <i>(If attendance rate ≥ 75% of the program days)</i> |
|-----------|-----------|---|-------------------------------------|---|
| Harrison | Angelou | 3 rd | 10; 10 | New User Summer 2004 |
| Harrison | Whitman | 6 th , self-contained | 3; 3 | New User Summer 2005 Experienced User Summer 2006 |
| McCartney | Browning | 4 th , “departmentalized,” loops (was 3 rd 2006-07) | 5; 6 ½ | Experienced User Summer 2005 |
| McCartney | Frost | 5 th , departmentalized, loops (was 6 th 2006-2007) | 8; 8 | New User Summer 2004 Experienced User Summer 2005 |
| Lennon | Hughes | 6 th -8 th , departmentalized | 3; 11 | New User Summer 2006 ¹¹ |
| Lennon | Dickinson | 1 st | 4; 4 | New User Summer 2004 |
| Starr | Poe | 1 st | 11; 24 | New User Summer 2005 New User School Year 2005-2006 Experienced User Summer 2006 |
| Starr | Plath | 6 th -8 th , departmentalized | 3; 7 | New User Summer 2005 |

Data Analysis: Data analysis for this report draws upon an analytic framework that emphasizes the importance of understanding teachers’ instructional practices in relation to their rationales for use/instruction and beliefs about the curricula more generally. This is a framework that the PRAIRIE evaluators have developed and refined over its two years of gathering classroom-level data on teachers’ math instruction and curriculum use.¹² The framework is based on the assumption that OMS supports are most effective in promoting high quality math instruction and CMSI curriculum use when they are able to have a positive impact on teachers’ practices as well as their beliefs and sense-making around the CMSI curricula and its relevance to their classrooms.

Multiple researchers systematically read the multi-year corpus of observational, interview, and focus group data for the teachers and schools in the sample in light of the research questions and overarching issues of *changes in teachers’ use of, supports for, and beliefs about CMSI curricula and math instruction*. Based on this reading of longitudinal data we tracked continuities and/or changes in their curriculum use and math instruction and sense-making around the curricula. Drawing on the CMSI theory for action (and the COG) regarding “intended use” (or “fidelity of implementation”), we developed a set of criteria for assessing

⁹ These in-depth interviews were not included in the work scope with CPS, but were conducted, analyzed, and shared here in connection with Fendt’s forthcoming doctoral dissertation.

¹⁰ CMSI provides two types of professional development: one for teachers new to the curricula (“new user”); the other for those with prior experience using the curricula (“experienced user”).

¹¹ This teacher originally attended a number of sessions of the alternate curriculum for 6-8.

¹² See in particular “A first look at teachers’ descriptions of their use of CMSI curricula,” November 22, 2006; and “Patterns and Prevalence in the Use of CMSI-Supported Curricula by CPS K-8 Teachers,” February 5, 2007. See also Fendt’s forthcoming doctoral dissertation, “Teacher Sensemaking and the Implementation of a District-Wide Curricular and Instructional Reform.”

use/instruction. We used these criteria to map not only the existence of change in teachers' use/ instruction, but also whether or not the change was moving in a positive direction (increasingly approximating use as intended), a negative direction (decreasingly approximating use as intended), or staying the same in terms of quality. Criteria we used to assess curriculum use and math instruction were as follows:

Indicators of high level of use as intended:

- High ratio of student talk to teacher talk
- Lesson includes group and/or individual work
- Students explore and represent concepts and processes, and help each other solve problems
- Students encouraged to struggle with concepts and processes
- Multiple approaches to problem solving are encouraged
- Appropriate and meaningful use of manipulatives and representations
- Teacher includes key parts of lesson, as determined by curriculum
- Teacher keeps to pacing guide (scope and sequence)
- Teacher engages in regular informal assessment of students and uses that to plan and deliver lesson
- When teacher modifies, it is in line with the spirit/intentions of the curriculum

Indicators of low level of use as intended:

- The inverse or absence of high-implementing criteria (above)
- Skips parts of the lesson or entire lessons
- Supplements lesson with other materials, for instances basic skills exercises
- When modifies, does not do so based on what curriculum intends

We then created a set of parameters for assessing teachers' beliefs and sense-making around the CMSI curriculum, its use, and math instruction. We identified positive and negative beliefs about the CMSI curricula that teachers had expressed in various contexts—sometimes but not always in the process of explaining their instructional practices. Positive and negative beliefs we tracked included the following:

Examples of positive beliefs expressed by teachers:

*(All these are **intrinsic beliefs**; that is, they are beliefs about the curricula in general)*

- Meets standards
- Is in line with ISATs/raises scores
- Is good for students (or “my students”)
- It works—students learn
- “This is how we should teach math”; “it fits with my vision of math instruction”

Examples of negative beliefs about the curricula:

Intrinsic negative beliefs about the curricula

- Doesn't teach mastery
- It is not organized well
- It presents too much stuff
- It is not effective

Relative/situational negative beliefs/understandings:

- Too much reading “for my kids” or “for the amount of time we have”
- Too high level of reading “for my kids”
- Students are at too low a level (“it could work with other kids”)
- Students are too unfamiliar with the curricula, terminology, etc.—didn't have curriculum before
- ELL student—so takes too much time to read, or have to do translating, etc.
- No parent support (can't help or won't help with homework); parents don't understand or don't buy into the curriculum.

3. FINDINGS, ANALYSIS, AND QUESTIONS FOR REFLECTION

Findings and analysis are presented in two separate sections. In the Findings Section we report on changes in teachers' use of and sense-making about CMSI curricula and math instruction by school, over several years. We begin by providing relevant contextual information about the school, including: its initial adoption of CMSI curricula; administrative, CMSI, and other supports that have been provided to teachers over the years; and any salient challenges the school has faced as a result of population fluctuation and the like. We then present findings about the two teachers at each school. We describe each teacher's "trajectory" of instruction/use, and "trajectory of beliefs/sense-making" around the curricula, based on a continuum of negative to positive beliefs and sense-making (described above in the Methodology section). We then summarize the teacher's views about supports they have or haven't received, and how those supports relate to changes in their curriculum use, math instruction, and sense-making over time.

In the Analysis Section we draw on findings to address three themes: (1) whether and how changes in teachers' instruction/use relate to their beliefs/sense-making; (2) if and how the school context contributes to changes or continuities in teachers' instruction/use and beliefs; and (3) if and how different supports relate to changes in teachers' instruction/use and beliefs. Each thematic discussion is followed by questions for reflection.

Findings Section

****HARRISON SCHOOL****

School Context and History of Supports

Harrison School was one of the first CPS schools to adopt the CMSI in 2003—choosing the Math Trailblazers (MTB) and Connected Math Program (CMP) curricula. Selected to be an intensive support school, Harrison school was given approximately \$10,000 for the purchase of materials, professional development for "First Wave" teachers (and approximately 10 additional teachers), and the position of a school-based specialist.

During the first year of implementation, the specialist made daily rounds to teachers' rooms to provide materials, hands-on support, or encouragement to teachers. She was also the face of CMSI to the school—presenting at faculty meetings, talking to students about math, and providing exposure to parents about the new curriculum. In the first year the OMS facilitator was another support, bringing legitimacy and attention to CMSI, and helping the specialist and/or the teachers to understand what good CMSI implementation looks like. At the same time, the principal garnered support for CMSI from the LSC, such that he was able to purchase materials for more than First Wave classrooms.

The specialist has continued to support classroom teachers after the first year, reducing her time to part-time specialist in the third year of implementation. The principal has continued to make implementation a priority and makes a point to observe teachers teaching with the CMSI curricula. Teachers have been observed using grade level meetings or informal conversations to chat with colleagues about their use of the curriculum, sharing ideas about what is working for them.

Ms. Angelou's Teacher Profile

Trajectory of Curriculum Use/Instruction: Ms. Angelou has been teaching and at Harrison School for 10 years. She has endorsements in middle school math, social studies, and language arts. In the first year of implementation, we observed Ms. Angelou (while shadowing a specialist) using the curriculum "as is" and seemingly excited by its discovery aspects. We learned later that she was also supplementing the curriculum with skill drill work.

In recent years we have observed Ms. Angelou teach more complete lessons with increasing levels of "fidelity," including more student-inquiry centered lessons with more time for students to explain to each other the multiple ways they were solving problems. After five years, Angelou has learned "how to tweak the

program” to get through more units. Together with her grade-level colleagues, she modifies some lessons and gives them as homework or skips or combines lessons.

Trajectory of Sense-making/Beliefs: In the first year, Angelou complained during focus groups that the CMSI curricula was “too advanced” for students and didn’t take into account their lack of foundational knowledge. For example, she felt the spiraling nature of the curriculum did not allow her to build students’ mastery while at the same time requiring mastery of basic skills to build on. She also expressed concern about the vocabulary used in the CMSI curricula as math concepts utilized a different vocabulary than her students—in particular her Latino ELL students—understood.

In subsequent conversations, Ms. Angelou has shared reflectively that her understanding and growth in both use and beliefs have been entwined in moments of epiphany. For instance, she came to understand that students learned to do “operational” math without her writing out number sentences and drilling them; or that students are “really okay” solving problems in multiple ways or when sitting right next to someone else who is solving the problem in a totally different way. She also identified how she had come to understand the program’s effectiveness over time: “You see how it finally covers the other grades, and you see how the kids are articulating math and how they’re viewing math in a whole other light than just operational, you know? Because a lot of people think math, and they think operational, and that’s just a piece of it. There’s all kinds of math thinking.”

Role of Supports in Teacher’s Trajectories: Since the early years of implementation, we observed Ms. Angelou talking with colleagues—in the hallway or at lunch—sharing what they were learning about using the curriculum or giving each other tips about how to do lessons. In one interview, Ms. Angelou described her colleagues and CMSI professional development as the greatest supports to her instruction and use, commenting that “I don’t think I’d be able to do Math Trailblazers with as much understanding or get through it without my colleagues.” While noting that she has come to believe the program is very effective, she added that “I definitely think that if it wasn’t for my colleagues, I wouldn’t be as good at teaching Math Trailblazers or enjoying the program.”

Summary: Over the last five years, the extent to which Ms. Angelou has used the CMSI curriculum as intended has increased, moving from a moderate to fairly high level of use as intended. Her beliefs about the CMSI curriculum have become increasingly positive, moving from negative intrinsic beliefs (based on doubts that it could teach basic skills) to positive intrinsic beliefs, based on the recognition that the curriculum provided students much more math understanding.

Mr. Whitman’s Teacher Profile

Trajectory of Curriculum Use/Instruction: Mr. Whitman came to Harrison School three years ago, in its third year of implementation as recent graduate in English and secondary education. Although Mr. Whitman described himself as “not a math person,” he said he was thrilled to join a staff that was abuzz about CMSI and teaching “progressive” math. When hired he was told he would have to attend summer CMSI professional development and did so with the specialist the summer before he began teaching at Harrison school.

During Mr. Whitman’s first year of implementation, the specialist made a point of taking us to observe his 6th grade class as the specialist felt he was a “knock out” at using the CMSI curriculum. We found Mr. Whitman and his students engaged in CMSI lessons either doing discovery in groups or as a whole class in a call-response kind of constant interaction. In these classes student talk was consistently greater than 60% of the class time. In each observation over these three years, Mr. Whitman was observed using the curricula “as is.”

It is possible that Mr. Whitman’s instruction is affected by concerns about his students’ abilities. For instance, in a debrief this year, he explained that the reading of CMSI curricula “can be daunting” to students and that he has students do the homework assignment for the lesson prior to his teaching it so that they can get a sense of what the next concept will be before they begin it. He does this, not

with the expectation they will solve it correctly but to have them “mess” with it and take time to think about it so that when they come to class they will have already been exposed to it.

Trajectory of Sense-making/Beliefs: Over the three years in which we have talked with Mr. Whitman, he has always spoken positively about the CMSI curriculum. However, in our conversations with Mr. Whitman in his third year, he expressed concerns about using the curriculum “as is” alone. He conveyed a sense of needing to supplement with “the traditional method.”

At the end of his third year, when we asked Mr. Whitman whether he felt that the CMSI curriculum helps him provide his students with “good mathematics teaching,” he responded that yes, “a lot of the experimental stuff makes it relevant and makes it pertinent and makes it exciting.” Mr. Whitman then qualified his enthusiasm by reflecting that “a lot of times a progressive approach to teaching needs to have a good foundation in a traditional—not a rote method but almost.” He explained this further:

I think my students would be more successful with the experiments more on their own without me intervening as much as I have to with the CMP, if they have a more solid foundation of ten problems of this...So I think that the CMP definitely makes it real and makes it more fun and makes it more discovery-oriented, more like science, but the traditional method makes that happen more independently for them. So, the few times I've been very deliberate about laying that foundation and knowing where they came from in fifth grade and scaffolding from there. That's when I think they really work because they're doing it on their own and really discovering on their own instead of me leading them.

Role of Supports in Development of Use/Instruction and Sense-making: In an interview this spring, Mr. Whitman spoke of the wonderful support of his grade-level colleague for bouncing off ideas or learning what worked or didn't work for them. While Mr. Whitman described the specialist as a support—particularly in his first year of implementation—he noted that what seemed like constant interactions with the specialist in his first year were more and more infrequent (the specialist dropped to a half-time position after the first year).

Summary: Over the three years of our observations, Mr. Whitman has consistently taught the curriculum at a moderate level of intended use. In our conversations this year, we've heard him explain his concern that the curriculum, when used as intended, may need to be supplemented with some skill drill to ensure a base to build new learning on, and that he has been doing this. It would appear, then, that Mr. Whitman's belief about the need to provide his students with a “foundation” has led him to supplement the curriculum. In other words, his intrinsic belief in a shortcoming in the curriculum may be related to his moderate level of use.

****McCARTNEY SCHOOL****

School Context and History of Supports

McCartney School became a Readiness School in 2003-04. Even without becoming the promised Intensive Support School the following year, it proceeded with implementation of CMSI curriculum because, according to the principal, it represents good math instruction. A committee including teachers chose Everyday Math (EM, below). Teachers are expected to use EM, although both teachers profiled for this evaluation said there has been little follow-up as to how the curriculum is used by the administration.

Since adopting the CMSI curriculum, McCartney School has not used discretionary funds for a math specialist position. Early on and into this year, the principal described the curriculum as “here to stay.” At the same time, he explained that teachers have figured out that they need to modify the order of lessons and supplement with outside materials so that students are prepared for ISAT. It has long been his policy that teachers drill students weekly on their math facts. As there are two classes per grade and, in the case of the two teachers we talked to this year, one math teacher per grade level, teachers did not find grade level

meetings useful for mathematics instructional support. In addition, the school does not have vertical, content-area meetings.

Ms. Browning's Teacher Profile

Trajectory of Curriculum Use/Instruction: Ms. Browning has taught 3rd and 4th grade at McCartney since the school began implementing CMSI. Ms. Browning had worked with EM at a previous school, and voted to use it at McCartney School during the Readiness year as she had had the experience and felt she understood it enough to know she could “pick and choose what I want to do in the lesson.” Ms. Browning’s comments in a 2006 focus group discussion suggested that she continues to follow this practice. She explained that each lesson covers too many math concepts, and more than she can cover in the time available. She selects what she considers the most important concept and leaves out the others. In a recent debrief she indicated that, “I basically follow the lesson as presented in the book, but I never stick to the time and always have to modify. I know what parts I can take out; some materials I make up.” She says she regularly uses journaling and sometimes the math message, although out of sequence, and does not use options for individualizing, games, or mental math.

We have consistently observed Ms. Browning talking to the whole class, sometimes with an overhead display. Lessons we observed were characterized by a very high ratio of teacher to student talk, as she walked around the room talking to individual students as they worked on their own. No cooperative activities were evident, nor were students heard asking conceptual questions. Although Ms. Browning seemed to use curricular manipulatives sporadically, she was observed bringing in supplementary materials to teach concepts she said her students could not understand from EM. Over the past three years we have not observed or heard Ms. Browning describe substantive changes in her math instruction or curriculum use, although in a recent interview she noted that over the years she has been able to “get through it faster.”

Trajectory of Sense-making/Beliefs: In focus group discussions and debriefs, Ms. Browning has consistently expressed a mixture of acceptance of and frustration with the EM curriculum. In a focus group three years ago, Ms. Browning expressed concern about spiraling. She stressed her belief in the importance of “basic skills” and “mastery” in any curriculum, although she liked the idea of “constantly circling.” She added that the spiraling approach assumed knowledge that her students did not have and thus would frustrate them. She also commented that the level and volume of reading required by the curriculum could be problematic: “It’s nice that they’re combining everything, but our kids can’t even read the story problem and make sense of it.”

In an interview three years later, Ms. Browning’s view on spiraling seemed to have changed somewhat. She commented that it is not crucial for students to master the topic the first time around, “just to be introduced to it because it will come back.” She continued to express discomfort with some EM lessons, and conflicting views about relating her use to ISAT preparation, noting that she doesn’t believe in teaching to the test, but does “look at the test and figure out what it is they need to know” when planning her lessons, as there is not enough time to teach the lessons as designed. She described her goals for her students as being able to solve problems and use math in everyday life, adding, “Math to me is reading, if you can read the problem and figure out key words. Then they have got it.”

Role of Supports in Teacher's Trajectories: Because Ms. Browning had used EM before the school began to implement it, the principal and other teachers considered her an “expert” in the program. Instead of attending New User professional development, she attended Experienced User. However, she told us, since she knew how to navigate the instructional materials and had experience teaching the lessons, she was frustrated by the professional development sessions and felt they provided her with little if any substantive support. Nor has she found conversations with colleagues to be a source of support for her own instruction. Rather, over the years teachers have looked to her for insight and support. Mr. Browning told us that last year (2007-08) she taught both sections of 4th grade math and did not meet with anyone to discuss math.

Summary: Ms. Browning’s curriculum use and instructional practices appear to have changed very little over the five years we have observed her teach and debriefed with her. She continues to “pick and choose” ways to teach EM lessons, maintains a teacher-centered approach to instruction, uses manipulatives minimally, and

supplements with basic skills material. Her trajectory of curriculum use could be described as a consistently low level of use as intended. Similarly, her trajectory of sense-making about the curriculum has remained primarily negative: she has consistently expressed a mixture of positive intentions based on a rather unarticulated sense that there is some value in the curriculum; and negative situational beliefs based in great part on what she feels her students can or can't manage.

Mr. Frost's Teacher Profile

Trajectory of Curriculum Use/Instruction: Mr. Frost has been a teacher for over six years and has an undergraduate background in math. He has taught 5th and 6th grade at McCartney since before CMSI was implemented. In focus groups and interviews, Mr. Frost has described the extent to which he has followed the curriculum. Mr. Frost was at first supportive of EM despite doubts about spiraling, but found implementation difficult because of the time he had to spend introducing or reviewing math concepts EM seemed to expect students to know, and skills they were expected to have, particularly in writing. He did use the checklist and assessments to make instructional choices. After the first semester he said he found the need to supplement and "do it the old, traditional way" so demanding, because "otherwise students would be lost," that he dropped the curriculum altogether. He began using it again the following year, although with serious reservations about how it diverged from his own beliefs.

In our visits to Mr. Frost's classroom over the past two years, we found him using all EM components, in sequence, and repeatedly saying, "Don't tell me the answer; tell me how you got there." The ratio of teacher talk to student talk during the lessons we observed was about 50-50, and students were asked to respond to each other's questions, demonstrate to the class, and work in pairs or groups. Mr. Frost made modifications in order to take time to explain vocabulary and review key concepts, primarily in a class with a large proportion of ELLs. Mr. Frost said he never follows the pacing guide, which he described as unrealistic, particularly with respect to ELLs.

Trajectory of Sense-making/Beliefs: Based on Mr. Frost's comments during focus groups and debriefs, it seems that he was positively disposed toward the EM curriculum from the beginning. He voted for EM because he felt the content was good, and he was comfortable teaching with guided exploration, which he values. He also said he hoped it would bring consistency to math instruction across the school. In a (2005) focus group Mr. Frost said he found EM helped kids be "mathematically minded—just get them thinking about math." He described his goal as challenging students and instilling critical thinking skills. Mr. Frost said he wanted to trust the curriculum but he worried how to do so when students lacked the critical scaffolding for the curriculum to build on. He also worried that by not being faithful to the curriculum and pacing, he might be creating a disadvantage for his students as well.

In a fall 2006 focus group, he spoke of the "middle/high" students being able to "get" EM, but said it was not helping low-performing ones. He decided "to trust EM will do what it says, the kids will get it some time. I feel horrible about that. Because what if they don't," and continued to use the EM lessons, with modifications. The third year, his fidelity to the curriculum increased, although in his most recent debrief he indicated he does not follow EM guidelines of moving ahead even if students don't understand, as he is philosophically against that: "I want to be able to trust the curriculum, but how do you deny that part of yourself that says there's no understanding going on here? My responsibility is to the kids, not a workbook. I could 'expose' them—but what does that mean? There's nothing to attach it to." He continues to supplement with outside materials to prepare for ISAT, and mentioned that he does this where he feels the curriculum may not align with standards.

Role of Supports in Teacher Trajectories: Like his colleague Ms. Browning, Mr. Frost said he received no support at the school, area, or district level. He said he would welcome opportunities for collaboration, and felt he would benefit from being observed and getting feedback. Frost has attended summer New and Experienced User professional development sessions. He also attended a few sessions of school year professional development during the first two years of his implementation. However, he did not consider them useful because the structure of the sessions and the content made for an inefficient use of his time. Mr.

Frost complained that the sessions were repetitive, focusing on which skills per lesson were introductory, developing, or secure. He felt that a better use of his time would have been to have a more collaborative structure in which teachers shared ideas and techniques of implementation with each other. That said, Mr. Frost did reflect on messages during professional development in light of his own practice. For instance, he told us that he heard at professional development that he should “stick to it [the curriculum] only. And if students don’t get it, go on.” Because Mr. Frost teaches both sessions of math for his grade level, he does his planning on his own. However, on occasions he and the teacher who loops with him have conversations in passing on how things are going.

Summary: Over the past three years, the extent to which Mr. Frost has used the curriculum as intended has fluctuated considerably: from a low level of intended use, to no use at all, to an increased level of use as intended. Meanwhile, his beliefs about the curriculum have remained consistently skeptical or conflicted. His sense-making is a mixture of negative intrinsic beliefs (ex. about the curriculum’s lack of attention to mastery), to relative negative beliefs (that his students do not have the aptitudes needed to succeed with the curriculum); to positive intrinsic beliefs (that the CMSI curricula represent “the best way to teach math”). It would thus seem that Mr. Frost’s increasing use of the curriculum as intended is based on “a leap of faith,” in which he is willing to relinquish his desire to provide his students with “mastery,” trusting that the curriculum’s promotion of learning through exploration (an approach that is consistent with his own belief and methods) will be effective with his students.

****LENNON SCHOOL****

School Context and Supports

Because of Lennon School’s probation status, it was required by its Area to begin implementing the CMSI math and science curricula in 2004-05. The school is implementing Math Trailblazers (MTB) and Math Thematics (MT). Lennon School’s principal of 15 years has been committed from the get-go to implementation of CMSI curricula. The principal expects the faculty to take the CMSI seriously and has included attendance at professional development sessions in teacher evaluations and told us that he regularly visits classrooms to look for engaging instruction. When asked in past years about some teachers’ resistance to the curricula, the specialist noted they had none, and the principal explained that teachers who don’t want to use the curricula are no longer at the school.

The school has supported an in-school specialist position since it began using the CMSI curricula. (The first specialist left after two years and the position was then given to a middle grades teacher.) Where in past years there was a chronic lack or late arrival of curricular materials, in 2007-08 the specialist indicated in an interview (and demonstrated to the researchers) that the school had all the math materials for all the grades. During the initial year(s) of implementation, the Area coach also provided support, contributing to the decision about which curriculum to choose and, according to the specialist, effective in working with “resistant” teachers. Teachers described the Area coach as accessible and responsive to the needs of the teachers and specialist.

Lennon School has had frequent teacher turnover in a number of grades and will have more again next year as the middle grades science teacher retires. Also, the student population has been in flux—new students moving in and out throughout the year. Thus instability is a facet of the Lennon School context.

Mr. Hughes’ Teacher Profile

Trajectory of Curriculum Use/Instruction: Mr. Hughes has been teacher for 11 years, and has taught the middle grades at Lennon School for three years. He has a minor in math, a math endorsement, and is currently getting the credential to teach 8th grade algebra. Mr. Hughes, who has taught 7th and 8th grade, taught 6th grade for the first time in 2007-08, so that the students would “become familiar with the program and my style of teaching it.” At Lennon School the fluctuation in students has meant that Mr. Hughes often has an unstable classroom population, and in some instances has had to teach a combined 7th and 8th grade classroom.

Mr. Hughes told us that prior to coming to Lennon School, he had used a different curriculum that “taught math the old way.” In a debrief, he described his initial challenges with the curriculum: “The first year was rough. It was new for me. It was new for the students. . . It was very difficult until after I started going to the professional development and then it began to make sense.” He explained that until he attended the professional development and understood how the textbook and workbook were “aligned,” he had been supplementing.

Mr. Hughes’ instruction—as he describes it and as we have observed on several occasions—is based on closely following the book. He tries to keep to the pacing and does not supplement. In an interview, Mr. Hughes characterized his math instruction as including student books and workbooks daily, partner and small group work daily, warm-ups daily, and check points one or two times per week. During the lessons we observed, about 65% of the class time was spent in whole group instruction, much of which entailed the teacher asking students questions and challenging them to explain their answers. Each lesson also included some individual work time and some time for students to present work on the board and to explain their process but little or no group work. Mr. Hughes spent considerable time in each lesson encouraging students to think critically and come up with their own answers. We did not observe Mr. Hughes supplementing or skipping.

Role of Supports in Teacher Trajectories: Mr. Hughes told us that he has attended New user and Experienced user professional development and was planning to attend the professional development for the new version of the book summer 2008. During debriefs he described the professional development as very helpful, particularly early on when he “learned how to use the book.” However in a longer interview Mr. Hughes questioned the message during professional development that they were not to review prior material, but to keep moving through the curriculum. He felt that he should be able to review earlier sections so that students could build on “prior knowledge.”

In addition to CMSI professional development, Mr. Hughes told us that the Area coach and an OMS facilitator also came out during his first year and showed him how to use the materials and teach lessons, which was very helpful. When asked about support from the school specialist, Mr. Hughes described appreciatively how the specialist would do anything he asked in terms of support. He gave examples of the specialist taking one half of the split 7th/8th grade class he was teaching that year (2007-08). “Whenever I need something—materials, or support with teaching—I get it...The supports are there,” he added. Mr. Hughes has not reported receiving supports from his colleagues. In past years he alluded to some colleagues not teaching the curriculum but would not elaborate. While the school implemented a schedule for grade level meetings in fall of 2007, Mr. Hughes did not mention these during our discussions nor were we able to attend any of these as the two times we tried, the meetings were canceled so that teachers could have time to do their own work.

Summary: During the first few months of implementation, prior to attending professional development, Mr. Hughes’ level of curriculum use was low to non-existent, instruction and use were at very low levels, and his beliefs about the curriculum negative or non-comprehending. After attending professional development, he began using as intended to a considerable extent, and has done so consistently, neither increasing nor decreasing. He follows the book, tries to teach all facets of the lesson, encourages students to solve problems in different ways and explain their thinking to each other. He is less likely to have students work in small groups than to work individually; however, during both whole class and individual work time he was observed encouraging students to share their thinking and struggle with the problem and concepts. Meanwhile, his beliefs about and sense-making around the curriculum continue to be positive. Mr. Hughes’ positive sense-making is both intrinsic (describing the curriculum as the right way to teach math) and relative, as he believes that the emphasis of the curriculum on writing, explaining, developing a conceptual understanding of math, and emphasizing multiple ways of solving a problem teach critical thinking skills that his students particularly need (implicitly because of their underprivileged status).

Ms. Dickinson's Teacher Profile

Trajectory of Curriculum Use/Instruction: Ms. Dickinson has an M.A. in education. She has taught first grade for four years, all at Lennon School. In an extended interview she mentioned that she had taken math in graduate school because her prior preparation was inadequate. She described herself as enjoying teaching math but “not very good at it” (i.e. the subject of math). She also mentioned having been exposed to the EM curriculum during her student teaching.

In a fall 2006 focus group discussion Ms. Dickinson said that she supplemented the curriculum with basic skills practice. In a January 2007 observation/debrief, we found her using the curricula “as intended.” In the debrief she described the range of modifications she made because her students were “very low,” her class size larger than expected (26 instead of 18), and because she had five students with special needs. She described using a lot of visuals and tactile stimulation in her lessons, including hands-on activities because “kids learn better from each other than necessarily from an adult.” Still, another factor impeding her full implementation that year was the lack of materials. That year, the first grade teachers did not receive their math workbooks until the end of October.

Ms. Dickinson explained that she modified and supplemented the curriculum for a variety of reasons, including because the curriculum was “above [the students’] limit and they can’t handle it” and because of time constraints. For example, in the lesson we observed in January 2007, the Daily Practice Problem¹³ involved measurement and Ms. Dickinson add in extra examples of “who is taller/shorter?” and other such examples that seemed in keeping with the lesson of the day. For the discovery part of the lesson, students were supposed to measure their desks in pairs instead of small groups. Ms. Dickinson felt that if they worked in pairs, the activity would have taken too long and “it wouldn’t have gotten done.”

In 2007-08, we again found Ms. Dickinson using the curriculum “as is.” She told us that she was following the format of the lessons as laid out with greater “fidelity,” as she felt her students were at a higher level than the previous year. Based on our observations of and debriefs with Ms. Dickinson over the last two years, she uses the MTB curriculum “as is,” sometimes modifying within the framework of the curriculum’s intentions, in order to add more visual examples or to make a small group activity a whole class exercise.

Trajectory of Sense-making/Beliefs: In a recent extended interview, Ms. Dickinson described herself as initially apprehensive about the MTB curriculum. However, despite regular complaints she heard from “seasoned teachers,” she felt as a newer teacher she should give it a try. She explained, “At first I was apprehensive about it, and now, with four years, I see how it works, and I am more comfortable with it. But I see things that I wish were different. Like there are two: its spiraling which is great but I think the children are not exposed enough to the basics like money—it’s briefly touched on—and time. Time is not touched on in first grade and that is a really big problem.” Ms. Dickinson went on to say that the spiraling nature doesn’t help students to master and that students don’t have a home background that supports the nature of a spiraling curriculum (SES/Family deficit).

Role of Supports in Teacher's Trajectory: Ms. Dickinson has taken all of the MTB trainings for New users, which she described in positive terms. (She explained that she has not continued attending because of scheduling conflicts and her focus on her certification classes.) In a fall 2006 focus group discussion, Ms. Dickinson commented that professional development did not address the needs of special education students. She noted that the Area has been putting pressure on her and the school more generally to implement, and to keep to pace. She commented positively on the support she received from the Area coach. In terms of in-school supports, Ms. Dickinson commented that the current math specialist was not a support to her instruction and use. She and the specialist do not seem to get along, and it appears they have agreed to not interact with each other.¹⁴ During a focus group discussion in 2006 and an in-depth interview spring 2008, Ms. Dickinson mentioned that she and her grade-level colleagues talk about and plan their use of MTB together.

¹³ A regular component of the Math Trailblazers curriculum

¹⁴ Ms. Dickenson would not talk about the specifics of the disagreement on the record, but did say that the grade level meeting attended by our researcher and the specialist was orchestrated for our benefit.

Summary: Ms. Dickinson began teaching the CMSI curriculum at a low level of use as intended. Over the past two years, her level of use as intended continues to increase, and while she does some supplementing and modifying, she seems to do so within the intentions of the curriculum. In 2007-08 her implementation was at a higher level of use as intended, which she explained in terms of her students' abilities. Ms. Dickinson's sense-making about the curriculum also became more positive during her first year, and seems to have stayed fairly steady since then. She continues to express some doubts about the curriculum, as her statements of beliefs about the curriculum and rationales for use vacillate between intrinsic positive and negative beliefs (the curriculum teaches conceptual thinking, but not basic skills; the students learn better from each other, but they can't work in pairs), as well as some enduring situational negative beliefs, most commonly relating to her perceptions of her students' abilities or the limitations of the home environment.

****STARR SCHOOL****

School Context and Supports

Starr School is a school with probation status and a declining student population. It began implementing Math Trailblazers (MTB) and Connected Math (CMP) curricula in 2004 as a probation school mandated to implement. Starr has received the support of a citywide specialist for three of four years implementing. Over those four years the school has been served by two different citywide specialists. The principal at Starr sees CMSI as a force for change in student achievement, and finds evidence of this in the school's improved ISAT scores since 2004-05 and following years.

Mr. Poe's Teacher Profile

Trajectory of Curriculum Use/Instruction: Mr. Poe is a seasoned teacher of 24 years who has been teaching 1st grade at Poe for 11 years. Over our three years of conversations with Mr. Poe, he has been consistent in describing and justifying his practices of skipping and supplementing to help students work toward mastery. For instance, when he first started using the curriculum, Mr. Poe said he skipped the Daily Practice Problems to do other skill drills that he thought would help the students with mastery. In 2006, he indicated that he "skipped the areas and solids lesson to reinforce things they really needed to know," and described spending one day a week specifically doing "more actual number computation and extended response." Poe justified the skipping and supplementing based on what he described as his "responsibility to the students' total education."

In fall 2007, he explained—and we observed—him doing a "modified" explore, in which he showed the students how to explore before they did so themselves. He showed them while they were in a big group, often putting students together in pairs instead of individually to help the students learn about sharing and because he does not want students mishandling the manipulatives. Mr. Poe also explained that he draws more pictures and does more modeling than the curriculum requires, in order to assist students based on what he perceives to be their lack of understanding.

Over the years Mr. Poe has apparently modified some facets of his use of the curriculum. For instance, in the spring of 2008, he reported that he now modifies the DPPs (to make them shorter or to break down the steps) and homework and does them in class to give students more practice.

Trajectory of Sense-making/Beliefs: In a 2006 focus group, Mr. Poe commented that he was familiar with the MTB approach to instruction because it was similar to the "New Math" approach that was popular years ago. Nonetheless, Mr. Poe initially found it difficult to work with MTB for two reasons: he felt strongly that students need to have "mastery" over one concept before moving on to another, and he thought the curriculum was too challenging for his students in reading and in abstract thinking. Mr. Poe said that while he understood the spiraling approach, it "goes against my gut." He has often explained his beliefs about the curriculum in terms of his students' "lack of exposure." In the spring of 2008, he said, "In 1st grade, this curriculum doesn't expect mastery....How will they be able to do more complicated math in 3rd and 4th grade if they haven't mastered 1st grade skills?"

Mr. Poe's perception of his students' lack of preparation or mastery appears to be related to notions about the local community, culture, and home environment. In spring of 2008, he commented that "There are things in [the curriculum] that they want the children to learn about ...that maybe if I had middle or upper middle class children [they] would get, but there are a lot of lessons in there that I skip because I know they don't get it." In one interview Mr. Poe wondered aloud whether the curriculum was created, "without considering the parents' education...a lot of them can't do 1st grade work."

Mr. Poe has also complained that the curriculum is too word-heavy. In 2006, he altered the worksheets to have fewer words. This perception seemed to be tied to his assessment of students' lack of math exposure and the students' home environment. In 2006, he said that the parents did "75% of the homework." In 2008, however, he mentioned that the parents have such a low level of education that they could not help the students with the homework. He has used both explanations to justify not giving homework.

There are a few aspects of the curriculum that Mr. Poe likes. For instance, on two occasions he told us that his favorite part of the curriculum is the manipulatives, which he noted the students "love." He said that the manipulatives help his students "understand the concepts," and make the concepts "more concrete." He also mentioned that that his students "understand the hands-on and modeling."

Role of Supports in Teacher's Trajectories: Mr. Poe is currently the only math teacher in his grade level. He told us that there are no grade-level or vertical meetings. Furthermore, he said this year (2007-08) that while he received support from his principal in acquiring materials—which have arrived late for the past two years—he does not feel there is any additional support from the school administration. He has had to use his own money to make transparencies and photocopies. Two years ago, Mr. Poe mentioned that his school had a citywide specialist but that he focused only on the upper grades and Mr. Poe rarely saw him. This past year, Mr. Poe mentioned that the citywide specialist had recently come into his classroom and conducted a class that Mr. Poe would have done in three days. He said, "The kids did not understand the lesson. They were totally lost." Thus, Mr. Poe still does not see the specialist as much of a help. As for professional development, while Mr. Poe felt the first year two years of New and Experienced User professional development helped acquaint him with and help him understand the structure of the curriculum, the professional development sessions for Experienced Users he attended this past year were a waste because they did not give examples to use with his students or because they did not apply to the way he taught the curriculum (i.e. doing one-on-one assessments).

Summary: Although Mr. Poe has attended professional development and had some sporadic support from his principal and a CMSI citywide specialist, his curricular use has remained at a low level of implementation, with no significant changes in his instructional practice over time. Although he uses the MTB lessons, he regularly modifies, skips, and/or supplements them in order to support students' "mastery" of basic skills. Mr. Poe continues to express the same negative beliefs about the MTB curriculum he expressed when he first started to use the materials. He holds an intrinsic belief that MTB does not provide students with the kind of mastery he is committed to teaching; and he holds situational negative beliefs about the curriculum that are strongly tied to his perceptions of his students and their community.

Ms. Plath's Teacher Profile

Trajectory of Curriculum Use/Instruction: Ms. Plath has been teaching for seven years, has an M.A. in math, and has taught middle grades math for three years at Starr School. Ms. Plath had some trouble starting to use the CMP curriculum, according to the citywide specialist and Ms. Plath. Both recognized and explained to our researcher that in her first year, Ms. Plath had many class management issues, which consequently disturbed the flow of the curriculum. Over time, Ms. Plath has used the curriculum closer to its original intent. She told us that each year she teaches it, the more comfortable she gets with it, and the more closely she can follow it. She talked about all the components and how she uses them to help her students and herself.

In a spring 2008 interview with Ms. Plath, she said that she follows the book very closely and includes all the components of the curriculum. (However, the "Explore" and "Summarize" portions were not always

included in the lessons we observed.) Ms. Plath said that she modifies the curriculum if she feels her students have not grasped a topic. During a fall 2006 observation/debrief, she spoke of reinforcing the curriculum with practice books and making word problems “more concrete.” In spring 2008, she indicated that she makes additional worksheets or activities for students to make sure they understand a certain concept (e.g., such as the distributive property). Sometimes these worksheets follow the model of the CMP curriculum.

Trajectory of Sense-making/Beliefs: In conversations with Ms. Plath, she has commented that she likes the curriculum because it helps her students become more independent. She expects students to do their work, and they follow through. She also likes the manipulatives, which, she says, keep her students engaged and interested. Ms. Plath noted that she has been able to use them more as her students have become “less rowdy” over the years. She also says that if the kids act up, they do not get to use the manipulatives. Thus she has apparently decided to use facets of the curriculum to assist with classroom management. While she said that often most of her students do not understand the material right away, she still likes the curriculum because it is starting to help them “think outside the box.” Ms. Plath noted that she sees this development most in her 8th grade students, whom she’s had for three years. While the citywide specialist had commented that Ms. Plath did not believe this curriculum could work with “inner city kids,” we did not hear similar comments, nor any justification of instruction or use based on such a belief.

Role of Supports in Teacher’s Trajectory: In our spring interview with Ms. Plath she spoke retrospectively about the positive and negative aspects of CMSI professional development that she attended in her first years of implementation. She found professional development helpful in that it helped her to focus on the goal of the lesson; however, she found it a waste of time when it veered into a gripe session. In this same interview, Ms. Plath mentioned to us that the reason for her “rocky” start at Starr was due in part to the school not having had a consistent math teacher “or structure, period” for middle grades students in over 15 years. Ms. Plath found the citywide specialist to be particularly helpful in her own learning and understanding about the curriculum. Through the modeling and presence of the citywide specialist, Plath learned how to teach the lessons with “another way of thinking” and learned that “there was no answer that is wrong so you ask [the student] how they came up with the answer to see where they got it from, because it came from somewhere.” During these years, the principal has been seen as a support in that she is interested in how things are going and tries to provide the materials; however, Plath explains that while the school is upgrading to CMP II, she does not have all the books for all the students in each grade to have the new version. In addition, she doesn’t have the teacher edition for the new versions so has to work between the old version and the new student version on a constant basis.

Summary: While Ms. Plath seemed to have started out with some resistances to the curriculum and doubts about her students’ ability to learn from it, over her three years using the CMP, her trajectory of math instruction and curriculum use seem to be developing a positive direction toward increasing use as intended. Moreover, her beliefs about the curriculum seem to be increasingly positive and consistent with the spirit of the curriculum—that is, she accepts moving on without mastery, and appreciates that it supports her students’ thinking “outside the box.” The positive direction of Ms. Plath’s sense-making may be related to her recognition that her students are learning math effectively.

Analysis Section

In this section we describe some of the patterns and trends that can be discerned across the eight teachers’ trajectories of curriculum use/instruction and sense-making. We then consider the relevance of such factors as school context and supports to the teachers’ trajectories, in order to think about how those factors may or may not contribute to the teachers’ development in their use of CMSI curricula.

1. Overall patterns and trends in teachers’ trajectories

What are teachers’ trajectories of curriculum use and sense-making? Do teachers’ use and sense-making follow similar trajectories?

When we examine the trajectories of curriculum use and sense-making for the eight teachers in our sample, we find that six teachers’ curriculum use has improved, six teachers’ sense-making around the curriculum

has become more positive over time, and two teachers' use and sense-making have remained steady. Four teachers showed improvements in their curriculum use and increasingly positive beliefs about the curriculum; while two teachers' use improved while their sense-making has remained consistent (Mr. Frost and Mr. Poe). Of the two teachers whose curriculum use and sense-making have remained steady, for Ms. Browning these have both remained at moderately low levels; and for Mr. Whitman they have remained at moderate levels.

Three of the eight teachers had at least some positive beliefs about the CMSI curriculum when they started implementing it in their classroom. These teachers have had rather distinct trajectories over the past three to five years: Ms. Angelou's use and sense-making have both improved; while her colleague Mr. Whitman's use and sense-making have remained steady (these two teachers have received comparable supports over the years). Mr. Frost's sense-making has remained fairly constant and somewhat ambivalent, while his use has fluctuated considerably. The remaining five teachers had negative or mixed beliefs about the curriculum when they began using it. Of these, the two Lennon School teachers (Hughes and Dickinson) developed more positive beliefs about the curriculum after attending professional development, and their use has improved as well. Ms. Plath's positive trajectories were similar, although more gradual. Two teachers—Ms. Browning and Mr. Poe—have retained their predominantly negative beliefs, and demonstrated little to no change in their use.

What kinds of improvements do teachers make in their use of the curricula?

We observed and/or heard teachers report increases in the level of their use (“as intended”) in various ways. Two teachers, who started using the curriculum with a moderate level of use as intended, continued to improve their practice, finding ways to modify lessons in accordance with their students' abilities. One teacher started to use all parts of the lesson. One teacher has shifted from a teacher-centered, whole-class instructional approach to a student-centered approach with more group work and time for students to learn from each other. (This shift in teaching practice paralleled a shift in intrinsic belief about the curriculum, as the teachers began to trust, or value, the constructivist, experiential theory of the curriculum.)

Two teachers (Hughes and Plath) started using poorly with minimal or no supports. Both improved their use considerably after a short amount of time (in the case of Hughes, after attending New User professional development; in the case of Plath, the important support was the citywide specialist over time). They both began to follow the workbook and pacing closely, and endorse the theory of the curriculum—its emphasis on solving problems in different ways, on acquiring a conceptual understanding of math principles, and on the heavy use of reading and writing to explore and solve problems. However, both teachers continue to maintain a teacher-centered classroom, to the extent that most of class time is spent teaching to the whole group, and dialogue is characterized by the teacher prompting students for questions and answers. Where these teachers differ is that one (Hughes) encourages students to struggle with the problems, solve them in their own ways, and assist each other in problem-solving; while the other (Plath) prompts for correct answers and tends to move on through the lesson without giving students time to struggle, consider incorrect answers, or support each other in problem-solving.

One thing that is striking about these two middle grades teachers' trajectories (both of whom teach in probation schools) is that the different kinds of supports they received were effective because they happened to mesh with their backgrounds: Hughes is an experienced math teacher with considerable background in the discipline, confidence with his students, and a strong social justice perspective who was able to “run” with the curriculum after a short introduction; whereas Plath is a newer teacher with a math minor and less confidence working with her classroom, and thus has benefited from ongoing individual support. The similarities and differences in their trajectories—both their growth and ongoing limitations—begs the question of what kinds of supports can they each benefit from at this point in their development.

What kinds of beliefs/sense-making seem to most impact use and how?

For six teachers, their sense-making (whether positive or negative or skeptical) around the CMSI curricula was directly related to their use. It bears noting that, while for these six teachers their sense-making and use co-varied, and they generally explained their decisions about curriculum use in terms of their positive or

negative beliefs about the curriculum, we cannot claim that there has been a causal relationship between the two. Of the remaining two teachers, one has expressed consistently mixed (positive and negative) views about the curriculum while his use varied; the other has expressed continuously negative views of the curriculum but has used the curriculum at a moderately low level, often using the curriculum as intended in ways that are not consistent with his negative beliefs.

Six of the eight teachers constructed their intrinsic beliefs about the curriculum at least in part in terms of the issue of “mastery.” For all six the issue of mastery at least initially led them to have concerns about the curriculum’s value (that is, it contributed to negative intrinsic beliefs). Moreover, these teachers’ concerns about and commitment to mastery was a key rationale they offered for supplementing the curriculum with basic skills problems.

The quality of spiraling was another one around which all teachers expressed intrinsic beliefs about the curriculum. Where two teachers never questioned the spiraling approach, three teachers changed their sense-making around spiraling over time, beginning with a negative disposition and coming to believe that it was either not a problem, or effective. (Three teachers have remained resistant to the spiraling approach of the CMSI curricula.) Of the three teachers who were positively disposed to the curriculum from the outset, the positive qualities they identified were its emphasis on exploration, the fact that it taught math concepts, the extensive use of manipulatives, and/or its encouragement of multiple ways to solve problems.

The ISAT affected some teachers’ sense-making around the curricula. Two teachers’ sense-making around the curricula became more positive when they saw students’ ISAT scores improve; and for two other teachers, increases in test scores validated their already positive views of the curricula.

All eight teachers’ sense-making about the curriculum was influenced by their situational beliefs about “their” students. Most teachers who had negative beliefs about the curriculum explained their concerns at least in part in terms of their perceptions of their students’ needs, abilities, and aptitudes. Two teachers justified their deviations from the curriculum (skipping and supplementing) in terms of the importance of meeting their students’ “needs”; and two others expressed ambivalence about the curriculum because they feared using it “as intended” might not fully meet their students needs.

While all the teachers described their students as lacking in certain abilities or backgrounds required by the curricula—including limited literacy or language skills, insufficient basic skills, a lack of experience approaching math conceptually, or inadequate support in the home—they ranged in the ways and extent to which they modified the curriculum to accommodate these perceived lacks. Several supplemented with outside materials, and other skipped parts of the lessons they felt their students could not do. Two others made modifications within the spirit of the curriculum, such as Ms. Plath, who added problems to reinforce key concepts. For Mr. Hughes, it was precisely because his students came to him without a critical or conceptual approach to mathematics that he felt compelled to teach the curriculum “as intended.” In this sense he was unique in having a positive situational belief that the CMSI curriculum was important for his students. This was based in part on his social justice perspective that the CMSI curriculum encouraged the kind of critical thinking skills and valuing of individual differences, that students in underprivileged communities needed.

Questions for Reflection

- Given the prevalence and impact of teachers’ misconceptions and negative beliefs about CMSI curricula, how can CMSI supports effectively dispel those misconceptions and beliefs in sustainable ways?
- Given the range of individual variation in teachers’ instructional development and sense-making, how can supports be tailored to address particular teachers’ needs at different points in their professional growth?

2. School contexts affecting teachers' use and sense-making of CMSI curricula

In the Findings Section we gave a brief description of the school context. Here we look more extensively at two of the schools (**Harrison and McCartney**) as the basis for thinking more deeply about whether and how school context matters in teacher implementation of and sense-making about the CMSI curricula.

As noted above, **Harrison school** began implementation in fall 2003 with all the supports of the CMSI (materials, specialist, and professional development). The principal has been and continues to be supportive of the CMSI: He urged the Local School Council to provide additional funding support in 2003 and encouraged more than First Wave teachers to implement in Year 1 (in order to get the materials, they needed to attend professional development). He has hired new teachers with CMSI experience or who are willing to participate in the CMSI professional development, and has had regular meetings with the specialist and continued to hire her in this role after OMS no longer funded the position. Finally, he makes it a practice of observing his teachers' math lessons as part of his supervision of their teaching.

The specialist's role has also been and continues to be supportive of the CMSI. Intensively in the first two years and now more sporadically, the specialist at Harrison school worked with the bilingual coordinator to run a parent program focused on the CMSI math curricula during the school day. Occasionally throughout these years, the specialist had brief opportunities to be on the agenda at faculty meetings. Over the course of our interactions at Harrison, teachers have shared mixed views of the specialist with us: Early on, some teachers noted that the specialist almost weekly co-taught a class; others noted that they got a few minutes exchange of greetings in the hallway or by their classroom door but no substantive help from the specialist, and others noted that the specialist was often an extra pair of hands for them—getting supplies, making copies, helping with groups. In 2005-06, the specialist position continued on a part-time basis with the specialist picking up other duties as specified by the administration. Often times, we heard of and observed the specialist working closely with new teachers.

The commitment at Harrison school to utilize CMSI has often been observed by prominent and thorough display of student math work throughout the classrooms and hallways of the school. Often we noticed teachers and students abuzz with talk about mathematics and the processes they were using to solve problems. Many times, teachers would stop our researcher in the hallway to tell of some success or new learning they had with the CMSI materials. In addition, we often noted the “family” feel of Harrison school where teachers often talked with each other about their math lessons, where students and teachers share a feeling of care and respect, and where teacher-teacher trust is high.

In this context we find Mr. Whitman and Ms. Angelou. Both teachers highlight the role of grade level colleagues within this context as a source of support. While the context of the school remains the same for both, the context and quality of the sharing within grade levels differs. While Angelou and her four colleagues at the grade level have been working together for at least the 5 years of implementation (going through the whole of the implementation process together—i.e., moving from First Wave implementers to seasoned users of MTB), Whitman and his colleague began their implementation two years after the rest of the school—they were not part of the Intensive Support year(s) and don't share the experience of doing something “new” from the vantage of “the whole school is in this new thing together.” Whitman and his colleague do share being new classroom teachers together trying to learn a new math curriculum among all the other duties of being a self-contained classroom teacher. The richness of the conversations between colleagues is tempered by the years of experience teaching and years of experience thinking deeply about the CMSI curricula.

Recall that **McCartney School** applied for Intensive Support but began as a Readiness school with the promise of getting “intensive” support in 2004-05. Still, the school welcomed the opportunity to participate in the Readiness stage as they saw this as giving them a year to better prepare for becoming an IS school. They looked forward to having the opportunity to learn about all of the other curricula so as to make a more thoughtful choice of curricula for their school. However, with OMS asking for a February decision on which curricula the school would be implementing in the 2004-05 school year, the frustrated principal complained that this early decision seemed to defeat the purpose of the Readiness year as teachers had only participated

in a few TAMS classes prior to this and hadn't had enough exposure to CMSI curricula to make an informed choice between them, much less distinguish between them.

During 2003-04, the school conscientiously tried to stick by their Readiness school commitments. The administrator attended most of the principal meetings; participated in the external evaluation of CMSI, and utilized the help of the Area Math and Science Coach. Teachers attended TAMS workshops with a 98% attendance rate, participated in Math/Science Committee meetings, and as Math or Science Committee members went to the Medill Resource Room and attended the CMSI Showcase in order to compare CMSI materials and make decisions for their school on what curricula to implement. Because of their commitment to the principles behind the CMSI (namely standard-based curricula aligned throughout the elementary school), the school moved forward with full implementation of CMSI curricula for grades K-6 without the earlier promised OMS's IS supports, namely without the funding of a specialist position. However, while the administration steered teachers towards CMSI implementation (at least in grades K-6), they continued to require teachers to utilize "math facts" timed tests with students on basic arithmetic.

Although all teachers signed up for the PD in their first year of implementation, not all consistently attended, and a number of teachers outright confirmed that they didn't continue to attend: some because they felt they got nothing out of it, a few because they were too overwhelmed; still, others continued to attend. About 10 teachers participated in some aspect of summer 2004 CMSI professional development. Beyond OMS provided professional development, this school started the 2004-05 year with a calendar that included about 4 Institute/Restructured Days for CMSI—either with professional development scheduled with the Area Coach or with in-house meetings geared to grade level discussions of CMSI. However, as the year progressed, this time was reassigned to other things as these scheduled meetings got canceled or changed in terms of having a CMSI mathematics purpose as originally intended.

Throughout the years, we've also found that scheduled grade level meetings don't often take place and/or that teachers don't talk together about their math instruction. A number of teachers have shared their struggle with both the implementation of and, for some, their commitment to the CMSI curricula. They speak in particular of their difficulty trusting the spiraling or not teaching to mastery, in particular they are concerned about students not having the background knowledge needed to do the lessons as written in the curricula. The principal and the Area are focused on ISAT preparation and less so on the use of CMSI as intended. The principal is very much aware of teachers who supplement or re-order the curricula to teach certain units out of sequence such that they are covered before ISAT or who include test prep or extended response into a lesson and believes these teachers are doing what is best for their students by doing this. And while the principal "loves" the games, he recognizes that teachers just don't have time to do these as they don't have time and/or are using the time they do have to "reinforce other math concepts or even basic math facts."

In this context of supports and school structure, we find Ms. Browning and Mr. Frost. Like Angelou, both have had some teaching experience prior to their schools implementation of CMSI, however, unlike Angelou and Whitman, for that matter, both do their work pretty much in isolation of others. Within the school, there are few opportunities to make sense with others about their use of the CMSI curriculum. In fact, both Angelou and Whitman told our researcher in spring 2008 that she [the researcher] was the person they had talked to most about math in all the years of the initiative or their careers as teachers.

Questions for Reflection

- How do OMS/CMSI/PDL Planners account for differences in school contexts as they go about planning which schools to give CMSI supports of a citywide specialist or as they plan to provide professional development to teachers?
- What other ways besides PD might be implemented to reach the non-attending teacher?
- How do OMS/CMSI/PDL Planners help schools create, promote, and sustain a culture of curriculum use based in the kinds of positive and accurate sense-making that are crucial to effective math instruction with these curricula?

3. The role of supports in teachers' developing use of and sense-making around the CMSI curricula

In this section we take a step back from the immediacy of individual teachers to paint a broad stroke of what supports looked like across these schools. All eight of the teachers in our sample reported receiving some kind of support for their math instruction through CMSI, mentioning one or more of the following: professional development in the curriculum provided by OMS (off-site), the support of a specialist (either school-level or Citywide), or the support offered by the Area. When teachers were asked about whether and how those supports contributed to the way they taught mathematics and used the CMSI curricula, seven teachers characterized at least one of the supports they received in positive terms. For example, five teachers spoke of how CMSI curricula professional development helped them understand how to use the CMSI materials or understand the process or content of lessons. Only one of the teachers characterized these supports in negative terms, stating adamantly that nothing the school, OMS, or the district did was supportive of her instruction (See Ms. Browning's profile above). She did not offer any suggestions as to the kinds of support she would have liked. Below we relate teachers' engagement/participation in the different forms of support with the kinds of benefits they described receiving from these supports.

CMSI-provided professional development:

When looking at CPS data on these eight teachers' participation in professional development provided by the CMSI, we found that the highest rates of attendance occurred during the summer sessions. All eight teachers completed at least one summer CMSI professional development series, attending at least 75% of the sessions, and all but one attended 100% of the sessions. Six of these teachers attended school-year CMSI professional development for one or two years. However, only one teacher attended 75% or more of the school-year sessions they attended; the other five attended less than 75%. In other words, teachers' rate of attendance was, on average, higher for the summer professional development (See table in methods section on how many years and which years they attended).

Six of the eight teachers described the CMSI professional development sessions as instrumental in helping them understand how to use the materials and/or how to conceptualize the mathematical concepts contained within the lessons (See teacher profiles for details). Mr. Hughes attended less than 75% of New and Experienced User school year professional development and 75% or greater of summer professional development; still, over the course of three years, he consistently said professional development has influenced his use of the curricula and observations of his classes suggest an increase in *use as intended*. During this same span of time, Mr. Poe attended 75% or greater of New and Experienced User summer professional development and 75% or greater of Experienced User school year professional development. Yet, while Poe's views of the curriculum have slightly increased over the course of these three years, he regularly modifies, skips, or supplements the curriculum. Both teachers at McCartney school went to summer professional development at 75% or greater (Browning 1 summer; Frost 2 summers); even so, their beliefs and use of the CMSI curriculum as intended have remained rather low.

Questions for Reflection

- Given the data on teachers' limited and discontinuous attendance at CMSI professional development, and given the CMSI theory of action's premise that teachers should attend at least 54 hours of professional development to improve their use and instruction over time (according to , is OMS keeping track of and analyzing professional development attendance data in order to inform decision-making? What lessons are being learned from those data?
- In light of the centrality of off-site professional development to the CMSI theory of action, is the way professional development is currently provided the best way to garner teachers' attendance? Given the eight teachers' poor attendance at year-long professional development compared to summer professional development, and the fact that $\frac{3}{4}$ of the teachers reported positively about the PD they attended, is it worth rethinking the PD delivery model?
- How might OMS and the district think differently about the role of professional development? Might it be more effective for Professional Development Leaders (PDLs) to work directly within an Area or school on a school's professional development day, for example, to assist schools in creating a culture of teacher discourse around math instruction and student work?
- How do PD planners address teachers' sense-making in relation to their curriculum use within their PD?

In-school specialist support for math instruction and curriculum use:

Three of the four schools had some **school-level support** for teachers' math instruction via the role of a school-level or citywide specialist. On whole, it seems whether as a prod or supportive hand, the specialists at these schools have kept teachers engaged in using the CMSI curricula. The specialist's presence itself seems to have supported the majority of these teachers in gaining confidence in their use of the curricula. For example Whitman described how horrified he was to have the specialist in his room everyday as he felt he was "messing up all the time;" however, now the specialist will "check in with me, and ask for my help with something, or whatever. [The specialist] is definitely, kind of like letting me go and do my thing because he knows I'm ok now." In McCartney school, only the middle grades teacher seemed to have access to the citywide specialist; all the same, Ms. Plath described the help of the citywide specialist as helping her to adopt "another way of thinking" and to begin to see what students and she could learn from "wrong" answers if students are made to explain their thinking. Only McCartney school had not had the benefit of a school-level specialist. Of all the teachers in our sample, these are the two teachers who made the least positive movements in areas of use and/or sense-making.

Questions for Reflection

- At this juncture (five years into CMSI), what messages are OMS, the Area, or the District sending to schools about the role of the specialist? Is there coherence in their messages and should there be?
- What has been learned about the effectiveness of the ways various specialists interact with teachers?
- Would schools that never have had specialists or no longer have specialists benefit from having one at this point in time? If so, what type of supports might they need to encourage positive sense-making about the CMSI and greater implementation of the CMSI curricula?

Collegial support:

Across our sample, when teachers spoke of collegial support, they were referring to the opportunity to talk with their peers (usually grade-level) in useful ways about their math teaching and/or curriculum use. The eight teachers in our CMSI study differed, first, in terms of whether they had the opportunity to talk to their colleagues; and second, in terms of whether their colleagues were a support to their instructional use of CMSI curricular materials.

Two teachers (Whitman and Angelou) spoke at length about the support of colleagues. The other six did not; however, two of these teachers (Hughes and Plath) were middle grades teachers and the sole teacher of math for grades 6th-8th and both spoke of support of their specialists as instrumental to their use and/or sense-making. Two other teachers (Poe and Dickinson) were primary grades teachers and were the veteran teachers for their grade level. Dickenson spoke of helping her less experienced colleague use the curricula by sharing supplies and strategies; Poe, who no longer had a colleague at the same grade level, reminisced about bygone days when he did have colleagues to converse with about his work. A fifth teacher (Ms. Browning) spoke of the total lack of collegial support from her colleague within the same grade. Another teacher (Mr. Frost) explained that he looped between 5th and 6th grade teaching math for all classes, so has no other math teacher to talk with in his grade level.

Finally, if we compare teachers' engagement with colleagues to their trajectories of use and sense-making, we find that those teachers who have engaged in some level of conversation with colleagues about the CMSI curriculum seemed to be on a greater positive trajectory in use and/or sense-making. Of the eight teachers, Ms. Angelou was perhaps the most explicit about the positive impact of her colleagues on her use of the curriculum and the quality of her math instruction, when she commented that she wouldn't be using it with as much understanding without her colleagues support.

Questions for Reflection

- What structures do CMSI planners expect schools to put in place to cultivate a culture of deep teacher-teacher conversation about instruction?
- How can CPS/OMS support teacher-teacher conversations around instruction in schools that have only one mathematics teacher per grade level due to school size or the utilization of a departmentalization approach? Conversely, how can CPS/OMS support this talk in schools with multiple teachers of mathematics per grade level?
- What supports can OMS or the district give to schools to support teachers in their joint planning and use of instructional materials?
- What might OMS or the district learn from schools like Harrison that seem to cultivate a culture of conversation about instruction and student work?

Area Support:

Few teachers this year spoke about the influence or support of the **Area** in terms of mathematics instruction. Most spoke of the Area as interested in ISAT preparation when they come to do a walk through—for example, looking for evidence of extended response work or coming to do a professional development on teaching extended response. Teachers at Lennon school spoke of how early on the Area coach worked with them to garner needed supplies such as calculators or books. Only Angelou and Hughes spoke of OMS facilitators who came to their schools in the early years of CMSI. Hughes found the facilitator effective in helping him to understand how to use the materials the “right way” as the facilitator modeled and co-taught. Angelou, as noted above, would have preferred to have the facilitator working with her school model aspects of lessons.

Questions for Reflection

- How are OMS, Area, and District leaders working together to give a united message about ISAT preparation in relationship to the use of CMSI curricula?
- How might Area walkthroughs be organized to promote a greater understanding and use of the CMSI materials?