Evaluation Brief

November 2008 Program Evaluation Unit

Evaluation of Math Content Coach Initiative: Survey of Classroom Teachers in Title I Schools

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Executive Summary

This brief presents findings from a 2008 survey of instructional staff in Title I schools. The survey was designed to examine the extent to which the math content coach (MCC) initiative was implemented in Title I schools during the 2007–2008 school year and to identify areas needing improvement.

The findings indicated that MCCs created an infrastructure of ongoing site-based support—locating and providing exemplary instructional resources, facilitating lesson planning and instruction, and using data to analyze student performance. The MCC professional development sessions placed a strong emphasis on increasing coherence in the implementation of standards-based mathematics curricula within and across grade levels, application of a variety of instructional strategies/differentiated instruction, and active learning by teachers.

Overall, the changes resulting from MCC sessions were reported at the school and teacher levels. The teachers reported moderate to great improvements in their knowledge of mathematics content and their understanding of and ability to apply a variety of instructional strategies. The positive perceptions of professional development were strongly associated with type of support, level of support received, and mathematics topics addressed during the MCC sessions.

Further, the teachers cited increased use of strategies to differentiate instruction, increased acceleration of students in mathematics, and stronger focus on mathematics as the significant changes evident at the district and school level.

The greatest challenges to improving mathematics proficiency were the perceived fast pace and rigor of Montgomery County Public Schools' (MCPS) mathematics curriculum and students' limited basic skills in mathematics as they progressed from one level to the next. Therefore, appropriate pacing of the MCPS mathematics curriculum and ensuring that students master required basic skills at each mathematics level were identified as critical to improving student performance. Finally, the majority expressed the need for continued support from MCCs through lesson planning, class demonstrations, model lessons, and the application of a variety of instructional strategies in mathematics.

Key recommendations concerning the implementation of the MCC initiative are as follows:

- Support teachers with strategies for managing the pace of the MCPS mathematics curriculum.
- Continue to clarify required skills and expectations at each grade level.
- Ensure that teachers know the vertical articulation of the continuum of mathematical skills from one grade level to the next.
- Continue emphasis on strategies for providing challenging and enriched instruction in a heterogeneous classroom as well as strategies for supporting struggling students within the regular classroom instructional block.
- Review teachers' needs regarding pedagogical content knowledge in mathematics and target MCC sessions accordingly.
- Provide more coaching, classroom demonstrations, and follow-up sessions.

Background

Beginning with the 2002–2003 school year, MCCs were placed in federally funded Title I and other high-needs schools to support implementation of the MCPS standards-based mathematics curriculum. MCC support is job-embedded site-based professional development (MCPS, 2007). The purpose of the MCC position is to positively impact student achievement in mathematics through support, training, coaching, and mentoring which builds school and teacher capacity to implement the mathematics curriculum. The expectation is that having an MCC in a school will lead to increased classroom teachers' knowledge of mathematics content and curriculum implementation (see Appendix A). Information on the impact of

MCCs in Title I schools is reported in a separate brief.

Evaluation Questions

The major questions of the study were:

1. What was the central emphasis of the support provided by MCCs?
2. To what extent do classroom teachers perceive that their knowledge of mathematics content, skill level in instructional strategies, or ability to utilize data has increased due to the support provided by MCCs?
3. Do teachers' perceptions of professional development differ by level of support received; type of support received or grade level of teacher?
4. What are the areas needing improvement?

Methodology

The survey was developed by the Office of Shared Accountability, in collaboration with the Division of Academic Support, Federal and State Programs, and the Office of Curriculum and Instructional Programs. All instructional staff in Title I schools were asked to complete an online survey. After three reminders, a total of 435 from a possible 885 teachers completed the survey, for an overall response rate of 49% (see Appendix B, Table B1). Response rates ranged from 10 to 99% in individual schools.

Data Analysis

Analyses were conducted to provide a demographic description of the sample and summary statistics for all of the structured survey items. The content of the open-ended survey responses was analyzed to categorize the central ideas elicited. Chi-square statistics were conducted to assess which aspects of the implementation were statistically associated with reported impact on teachers' capacity to implement a rigorous mathematics curriculum.

Findings

Respondents' Characteristics

Data on respondents' background information are presented in Appendix B, Table B2. The majority of the respondents were classroom teachers and the remaining were professional staff (e.g., special education, English for Speakers of Other Languages [ESOL], intervention). More than two thirds of the respondents (76%) indicated they were responsible for planning, coordinating, or teaching mathematics. The level of respondents' teaching experience varied, with nearly one third having taught for 1–5 years. Nearly one half (49%) had been at their current school for 1–5 years.

Central Emphasis of MCC Sessions

Overall, the MCC professional development sessions have a schoolwide focus, with the central emphasis on planning to ensure that instruction is consistent with MCPS mathematics curricula and goals, increasing content knowledge of mathematics, application of mathematics instructional strategies, and active learning (see Appendix B, Tables B3–B8).

Schoolwide focus and participation by teachers. Reflecting a schoolwide focus, the respondents were comprised of teachers with a wide range of teaching experience who taught mathematics from pre-K to Grade 5, including teachers who taught Math 6 and Math 7(see Appendix B, Table B3).

Nearly all (95%) had interacted with the MCC during the course of the year, and more than 60% had interacted with the MCCs through three or more methods (see Appendix B, Table B4). In all, the majority of teachers had interacted with the MCC primarily during staff meetings (80%), grade-level team meetings (70%), or through receiving instructional resources (63%) (see Appendix B, Table B5). For those who interacted with the MCC at one-on-one meetings (44%), the meetings were comprised of discussions about various instructional strategies, student progress and how to support students, or requests for MCC's assistance (see Appendix B, Table B6).

At the same time, 20% or less of the respondents had interacted with their MCCs through follow-up meetings, feedback sessions (20%), coaching sessions (16%), classroom demonstrations (19%), or cross-grade-level meetings (12%) (see Appendix B, Table B5).

Mathematics content and instructional strategies. Responses from teachers indicated that their MCC addressed topics on number relationships and computation (67%) and geometry and measurement (58%), which reflected the key emphasis of the monthly MCC training (see Appendix B, Table B7).

The extent to which the MCC sessions emphasized on the instructional strategies specified on the survey varied. One half or more of the respondents indicated that MCC sessions placed strong emphasis on differentiating instruction within the same class

(55%), ensuring instructional activities are learner centered (53%), development of basic computational skills (52%), and strategies for supporting students working above grade level or for struggling students (50%) (see Appendix B, Table B8).

Ensuring instruction is consistent with content standards and MCPS goals. More than one half of the respondents indicated that their MCC sessions placed strong emphasis on using the standards as a basis for instructional planning (66%), planning instruction to support Adequate Yearly Progress (AYP) goals (63%), and clarifying skills, concepts, and knowledge to be mastered at each instructional level (62%).

Emphasis on coherence in mathematics instruction also included knowing and understanding mathematics content standards (59%) and ensuring that mathematics instruction is horizontally articulated (53%) and vertical articulated (51%) (see Appendix B, Table B8). Information specific to grade-level emphasis of the specified activities are presented in Appendix B, Tables B18.

Opportunities for active learning by teachers. Within professional development, active learning is characterized by lesson planning, coaching or classroom demonstrations, reviewing student work, and teachers engaging in a learning network (Blank, Alas, & Smith, 2007). The extent to which MCCs implemented specified components of active learning varied. There was a strong emphasis on MCCs compiling and providing instructional resources to teachers in an ongoing fashion (58%). At the same time, one third or more reported that their MCCs' professional activities placed strong emphasis on follow-up sessions/reflecting on mathematics instructional practices (38%), collaborative examination of student work (35%), opportunities for teachers to practice new skills (34%), or use of technology to support student learning in mathematics (30%) (see Appendix B, Table B8).

The top three preferred modes of interacting with MCCs were specified as grade-level team meetings (63%), receiving instructional resources (56%), and classroom demonstrations (47%) (see Appendix B, Table B9).

Use of data to guide instruction. MCC sessions placed strong emphasis on using data to diagnose students' mathematical proficiency (63%) and interpretation of formative data to guide mathematics instruction (59%) (see Appendix B, Table B8).

Impact of MCCs on Teachers and Classroom Practices

Gains in teachers' knowledge of mathematics content and curriculum implementation. The extent to which the teachers perceived that the MCC sessions deepened their knowledge of number sense and computation, statistics, and measurement[1] varied, with more than one half of the respondents reporting their knowledge of these mathematics concepts was increased to a moderate to great extent (see Appendix B, Table B10). In addition, this impact varied by modes of interaction with MCCs, extent to which teachers interacted with the MCCs, and mathematics topics addressed during the MCC sessions. Chi-square statistics indicated that teachers who interacted with the MCCs through more than three methods were more likely to report great gains in all specified aspects of mathematics knowledge and curriculum implementation than those who interacted with MCCs through fewer than three methods ($p<0.05$) (see Appendix B, Table B10a).

Similarly, teachers who interacted with MCCs through classroom demonstrations as well as teachers who received feedback or follow up from the MCCs were more likely to report that their knowledge of statistics increased to a moderate or great extent than those not involved in these activities. These groups also were more likely to report that their capacity to collaboratively examine student work and differentiate assignments and activities were improved to a moderate or greater extent than those who did not interact with the MCCs through these modes. In all instances, teachers who participated in sessions whereby mathematics topics and concepts were addressed were more likely to report gains in all aspects than those who attended sessions whereby mathematics concepts were not addressed (see Appendix B, Table B10a). Respondents who reported number sense and probability were addressed during MCC sessions were more likely to report moderate to great gains in knowledge of mathematics content than those who did not.

Change in mathematics instruction at the school level. Through responses elicited from open-ended items, the respondents described how MCC sessions produced changes at the school and student level (see Appendix B, Tables B11–B12). Over one half of the comments (n=128/51%) about change at the school level cited increase in teachers' application of variety of instructional strategies, particularly differentiated instruction (see Appendix B, Table B11). At the school level, the most frequently cited changes were a) more acceleration and exposure of students to

[1] These topics were specified in the survey because they focus of MCC year long outcomes for 2007–2008 monthly training. .

challenging work (*n*=47/22%); b) stronger mathematics focus in schools as demonstrated through staff development, training, and grade-level team meeting with the MCC (*n*=34/16%); and c) increased use of differentiated instruction in small groups and mathematics centers (*n*=29/13%) (see Appendix B, Table B12).

Impact on teachers' classrooms. The teachers also provided a variety of responses about the positive impact of MCCs on themselves and their classrooms. Specifically, their MCC was readily available to support teachers in multiple ways in the implementation of a rigorous curriculum (*n*=98/41%), MCCs provided instructional resources and materials *(n*=45/19%), or helped teachers implement the voluntary state curriculum through planning and modeling lessons (*n*=43/18%). Conversely, 11% (*n=27)* of the respondents indicated the MCC had no impact on their classroom or provided little help (see Appendix B, Table B13).

Challenges to Improving Students' Mathematical Proficiency

The two key challenges to improving student achievement in mathematics reported were the perception that the mathematics curriculum is fast paced (*n*=66/27%) and students' limited basic mathematics skills and foundational knowledge (*n*=61/25%).

It is unclear why teachers report that students have limited mathematics skills as they progress through the grade levels, given the strong emphasis on planning and vertical articulation reported. Specifically, more than one half of the teachers reported that clarifying skills to be learned and vertical articulation were a strong emphasis of the MCC sessions. As illustrated on Appendix B, Table B5, less than 20% indicated that they participated in cross-grade-level meetings. Additionally, having students with diverse abilities (*n*=19/8%) posed the expressed challenges of balancing acceleration and ensuring students working below grade level attain proficiency (see Appendix B, Table B14).

Areas Needing Improvement

Improving mathematics instruction at the school level. The majority of the respondents to the item about critical areas needing improvement indicated that the pacing of the mathematics curriculum is too fast (*n*=136/72%). Specific comments indicated that there was too much to teach in some units for real mastery or application and long-term retention to occur for many of the students. In other instances, some felt that the topics are crowded, too broad, and unrelated or assessment questions were not aligned with the lesson. Specific comments also indicated that the mathematics block did not allow enough time to cover the mathematics curriculum due to interrupted instruction.

Also expressed was that students need ongoing and intensive practice with mathematics vocabulary, fractions, decimals, computation, problem solving, and word problems (*n*=50/24%) (see Appendix B, Table B15). The general perception is that time for more instruction or practice is not accommodated at the current pace of the curriculum.

Improving mathematics instruction at the student level. The majority of the responses related to improving instruction at the student level indicated that students need time and ongoing practice to master basic facts and concepts, retain and apply skills to new situations, and become proficient in the material (*n*=106/61%). Also expressed was the need for in-depth instruction and practice on specified mathematics topics (*n*=67/35%). Examples of these topics included computation skills, time, place value, geometry, fractions, decimals, problem solving, word problems, and brief constructed responses (BCRs) (see Appendix B, Table B16).

Finally, the respondents made suggestions regarding concepts, topics, and strategies for the MCCs to address in future years. More than one half of the responses elicited expressed the need for continued support from MCCs through lesson planning, class demonstrations, model lessons, and application of a variety of strategies to teach mathematics concepts (*n*=112/54%) (see Appendix B, Table B17). In addition, nearly one half of the responses specified that MCCs should support teachers with strategies for meeting a variety of students needs (*n*=78/43%). Specifically, a) strategies for teaching and reinforcing basic skills and numbers sense; b) ideas on how to support struggling students; and c) ideas on how to challenge and accelerate students.

Conclusions

The support infrastructure put in place by MCCs was characterized primarily by ongoing schoolwide focused professional development sessions. Overall, MCC sessions demonstrated features of quality professional development programs (Blank, Alas, & Smith, 2007). These attributes are demonstrated through focus on mathematics content knowledge; active learning through collaborative planning, observing others and coaching of teachers; promoting coherence through attention to mathematics content standards, consistency with MCPS curricula, and

addressing AYP goals, and horizontal and vertical articulation; and instruction alignment with the districtwide goal of providing a rigorous mathematics program by emphasizing enriched and accelerated instruction.

Two types of interconnected outcomes of teacher development were reported by the respondents: a) increased knowledge of mathematics content and b) increased ability to apply multiple instructional strategies to a variety of situations and student needs. The results suggest that the greatest benefits of the MCC initiative were accomplished through ongoing and multiple modes of interactions with MCCs, the topics addressed during the MCC sessions, and particularly through coaching, classroom demonstrations, and follow-up sessions.

The greatest challenges to improving mathematics proficiency were the perceived fast pace and rigor of MCPS mathematics curriculum and students' limited mathematics basic skills as they progressed from one level to the next.

Recommendations

The results suggest several considerations concerning the implementation of the MCC initiative:

- Support teachers in understanding the MCPS mathematics curriculum and managing the fast pace through appropriate distribution of instructional time across skills and concepts.
- Continue to clarify the required indicators of mathematical proficiency at each grade level to reduce the challenge of students entering the next level with limited proficiency.
- Intensify emphasis on strategies for teaching and reinforcing essential concepts and skills including to facilitate meeting the needs of students with limited mathematical skills through the discussion of vertical articulation.
- Continue emphasis on strategies for providing challenging and enriched instruction in a heterogeneous classroom as well as strategies for supporting struggling students during within the regular classroom instructional block.
- Increase emphasis on the examination of student work to better understand which skills still need to be developed.
- Increased support to new teacher and teachers assigned to new grade levels.
- Balance MCC-teacher interaction in large group settings with in-classroom support to individual teachers by increasing coaching, demonstration, co-teaching, and follow-up guidance sessions.
- Review teachers' needs regarding pedagogical content knowledge of mathematics and their readiness to implement a rigorous mathematics program and target MCC sessions accordingly. Support teachers' knowledge of the content knowledge they are teaching as well as connections to levels prior and beyond the level.
- Develop and administer a common needs assessment to all teachers to better align MCC support with identified needs. Review how well teachers understand and implement vertical articulation.
- Increase opportunities for cross-grade-level team meetings to facilitate meeting the needs of students with limited mathematical skills through the discussion of vertical articulation.
- Increase emphasis on topics addressing algebraic standards.

References

Blank, R., Alas, D., & Smith, C. (2007). *Analysis of the Quality of Professional Development Programs for Mathematics and Science Teachers: Findings from a Cross-State Study, Year 2 Report*. Retrieved November 2008from http://www.ccsso.org/ content/ pdfs/cross-state_study_rpt_final.pdf.

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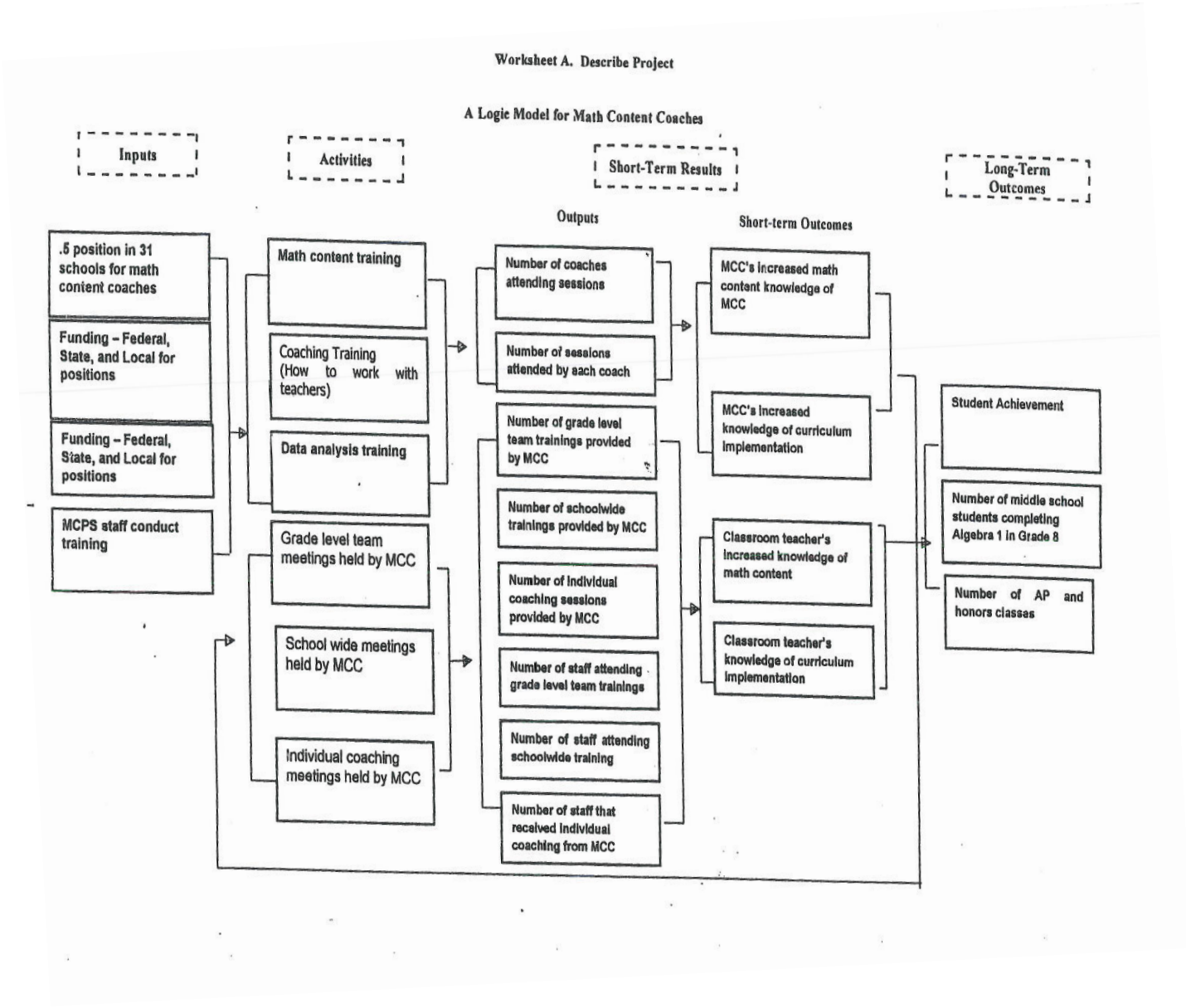
Appendix A: A Logic Model for Math Content Coaches



Appendix B: Survey Results

Table B1
Response Rate for 2008 Classroom Teacher Survey, by Title I Elementary School

Name of School	Total Number of Teachers[a]	*N* Respondents	% Response Rate
Arcola	34	26	75.80
Broad Acres	40	4	9.93
Burnt Mills	30	8	26.58
East Silver Spring	26	6	23.26
Gaithersburg	40	34	85.86
Georgian Forest	37	13	35.52
Harmony Hills	43	32	74.25
Highland	45	26	58.43
Kemp Mill	35	16	45.45
Montgomery Knolls	37	15	41.10
New Hampshire Estates	41	9	21.90
Oak View	37	13	35.04
Rolling Terrace	21	7	32.71
Roscoe Nix	51	16	31.50
Rosemont	45	44	98.88
Sargent Shriver	49	32	65.84
South Lake	44	16	36.53
Summit Hall	41	15	37.04
Twinbrook	41	14	34.15
Viers Mill	42	26	61.61
Washington Grove	32	19	59.75
Weller Road	40	20	49.50
Wheaton Woods	34	17	49.42
TOTAL	885	428	49.15

[a] Total number of teachers is derived from Schools at a Glance data on the Web page for each school.

Table B2
Teaching Experience

Experience		*N*	%
Total years teaching			
	Less than 1 year	25	5.9
	1–5 years	127	30.0
	6–10 years	101	23.8
	11–15 years	64	15.1
	16–20 years	39	9.2
	More than 20 years	66	15.6
Years at current school			
	Less than 1 year	75	17.7
	1–5 years	208	49.1
	6–10 years	101	23.8
	11–15 years	28	6.6
	16–20 years	5	1.2
	More than 20 years	5	1.2
Responsibility for teaching, planning, or coordinating mathematics instruction			
	No	102	24.1
	Yes	322	75.9

Note. All questions were not answered by all respondents.

Table B3
Mathematics Grade Level Taught

Grades (multiple responses)	*N*	*%*
Pre-kindergarten	19	5.8
Kindergarten	83	25.2
Grade 1	76	23.1
Grade 2	73	22.2
Grade 3	76	23.1
Grade 4	63	19.1
Grade 5	57	17.3
Mathematics 6	13	4.0
Mathematics 7	2	0.6

Note. Responses are drawn from a multiple response item. The percentage of responses may exceed 100% because respondents marked more than one response.

Table B4
Modes of Interaction with MCC

Modes of interaction	*N*	%
No interaction	20	4.7
1–2 interactions	145	34.2
3–4 interactions	192	45.3
5–6 interactions	67	15.8

Note. All questions were not answered by all respondents.

Table B5
Interactions with MCC

Types of interactions (multiple responses)	*N*	*%*
Staff meetings	338	80.1
Grade-level team meetings	297	70.4
Providing resources	267	63.3
Casual or informal drop-in conversations	258	61.1
One-on-one meetings	184	43.6
Leadership team meetings	129	30.6
Feedback from MCC or follow-up sessions	84	19.9
Classroom demonstrations	80	19.0
Coaching meetings	68	16.1
Cross-grade-level team meetings	50	11.8
Observation by MCC	41	9.7
No interaction	24	5.7

Note. Responses are drawn from a multiple response item. The percentage of responses may exceed 100% because respondents marked more than one response.

Table B6
Interactions during One-on-One Meetings with MCC

Interactions during one-on-one meetings (multiple responses)	*N*	*%*
Discussing assessments, data, meeting, student, student progress, and how to support struggling students	52	29.9
Discussion related to mathematics instruction, various strategies, and mathematics vocabulary	48	27.6
Planning discussions about meetings, assemblies, presentations, training, staff development, and observations	43	24.8
Response to request for teacher assistance to support specific needs	23	13.3
Locating materials and instructional resources to support a lesson	18	10.3
Discussion of curriculum, use of curriculum guides, and how to reteach	12	6.9
Suggestion for differentiation of a lesson, use of small groups, and use of mathematics centers	12	6.9
Discussion of acceleration ideas/lessons/advanced instruction	10	5.7
Miscellaneous (e.g., not applicable, just checking in, private conversations, how to handle parental issues and mathematics, unclear e-mails, talked about survey items, School Improvement Plan [SIP] discussions)	15	8.7

Note. Responses are drawn from a multiple response item. The percentage of responses may exceed 100% because respondents marked more than one response.

Table B7
Topics and Concepts Addressed in MCC Professional Development Sessions

Topics and concepts addressed (multiple response)	*N*	*%*
Number relationships and computation	256	67.0
Geometry and measurement	221	57.9
Algebra	123	32.2
Probability	109	28.5
Statistics	109	28.5
None	77	20.2
Instructional technology	60	15.7
Other	27	7.1

Note. Responses are drawn from a multiple response item. The percentage of responses may exceed 100% because respondents marked more than one response.

Table B8
Central Emphasis of MCC Professional Development Sessions

Central emphasis	None		Slight		Strong	
	n	%	*n*	%	*n*	%
Coherence						
Using standards as a basis for instructional planning	37	8.7	76	17.9	278	65.6
Planning mathematics instruction that supports Adequate Yearly Progress goals	43	10.1	79	18.6	268	63.2
Clarify skills, concepts, and knowledge to be mastered	39	9.2	88	20.8	261	61.6
Knowing and understanding the mathematics content standards	41	9.7	100	23.6	251	59.2
Ensuring mathematics instruction is horizontally articulated	46	10.8	119	28.1	224	52.8
Ensuring mathematics instruction is vertically articulated	49	11.6	120	28.3	215	50.7
Instructional Strategies						
Differentiating instruction within the same class	44	10.4	104	24.5	234	55.2
Ensuring instructional activities are learner centered	51	12.0	106	25.0	226	53.3
The development of basic computational skills	50	11.8	113	26.7	222	52.4
Strategies for supporting students working above grade level	53	12.5	114	26.9	212	50.0
Strategies for supporting students not meeting grade-level standards	51	12.0	120	28.3	213	50.2
Study of how students learn particular concepts and skills in mathematics	65	15.3	126	29.7	198	46.7
Reteaching for mastery	56	13.2	126	29.7	204	48.1
Questioning techniques to check for students' understanding of mathematics concepts or skills	58	13.7	127	30.0	201	47.4
Differentiating assignments (e.g., homework, in-class assignments) within the same class	80	18.9	132	31.1	171	40.3
Active Learning						
Providing instructional support resources to teachers	39	9.2	97	22.9	247	58.3
Reflection on mathematics instructional strategies in use and follow up sessions from mathematics content coach?	89	21.0	132	31.1	163	38.4
Use of technology to support student learning in mathematics	108	25.5	146	34.4	129	30.4
Collaborative examination of student work	89	21.0	147	34.7	147	34.7
Opportunities for teachers to practice new skills	88	20.8	148	34.9	146	34.4
Data Analyses/Review						
Using data to diagnose students' mathematical proficiency	31	7.3	85	20.0	267	63.0
Interpretation of formative assessment data to guide mathematics instruction	40	9.4	87	20.5	252	59.4

Table B9
Modes of Interaction with the MCC

Modes of interaction (multiple responses limited to 3)	*N*	%
Grade-level team meetings	262	63.3
Providing resources	230	55.6
Classroom demonstrations	195	47.1
One-on-one meetings	135	32.6
Casual or informal drop-in conversations	128	30.9
Staff meetings	126	30.4
Coaching meetings	75	18.1
Leadership team meetings	56	13.5
Feedback from MCC and follow-up sessions	48	11.6
Cross-grade-level team meetings	44	10.6
Observation by MCC	20	4.8
No interaction	22	5.3

Note. Responses are drawn from a multiple response item. The percentage of responses may exceed 100% because respondents marked more than one response.

Table B10
Level of Impact

	To a small extent		To a moderate extent		To a great extent	
Specified aspect	*n*	%	*n*	%	*n*	%
Enhance your ability to engage students working above grade level	62	24.1	78	30.4	117	45.5
Enhance your ability to support students who are not achieving grade-level standards	65	22.6	98	34.0	125	43.4
Enhance your ability to diagnose students' mathematical proficiency	71	25.0	105	37.0	108	38.0
Enhance your ability to use questioning to check for student understanding	70	26.1	100	37.3	98	36.6
Enhance your ability to collaboratively examine student work	72	27.1	100	37.6	94	35.3
Help provide scaffolded and differentiated instructions for the same assignment to accommodate a variety of student strengths and needs	74	26.3	109	38.8	98	34.9
Help provide differentiated assignments and activities to accommodate a variety of student strengths and needs	73	26.3	110	39.6	95	34.2
Deepen your knowledge of number sense and computation	87	31.5	107	38.8	82	29.7
Deepen your knowledge of measurement	68	29.4	104	45.0	59	25.5
Enhance your ability to use instructional technology to support learning of mathematics	84	37.5	90	40.2	50	22.3
Deepen your knowledge of statistics	77	38.1	84	41.6	41	20.3

Table B10a

Chi-Square Tests for Association between Change in Teachers and Aspects of MCC Sessions

Aspects of teacher change		Topics Addressed	Number of Modes of Interactions	Methods of Interaction
Deepen knowledge of number sense and computation[a]	Chi-square	173.48	65.85	204.94
	df	8.00	3.00	12.00
	Sig.	.000(*)	.000(*)	.000(*)
Deepen your knowledge of statistics [a,b]	Chi-square	180.63	58.99	160.71
	df	8.00	3.00	12.00
	Sig.	.000(*)	.000(*)	.000(*)
Deepen your knowledge of measurement	Chi-square	189.23	46.96	241.58
	df	8.00	3.00	12.00
	Sig.	.000(*)	.000(*)	.000(*)
Enhance your ability to support students who are not achieving grade-level standards	Chi-square	261.39	82.52	240.67
	df	8.00	3.00	12.00
	Sig.	.000(*)	.000(*)	.000(*)
Enhance your ability to engage students working above grade level	Chi-square	182.67	83.99	202.47
	df	8.00	3.00	12.00
	Sig.	.000(*)	.000(*)	.000(*)
Enhance your ability to use questioning to check for student understanding	Chi-square	171.05	57.76	200.02
	df	8.00	3.00	12.00
	Sig.	.000(*)	.000(*)	.000(*)
Enhance your ability to collaboratively examine student work [b]	Chi-square	145.81	54.29	227.09
	df	8.00	3.00	12.00
	Sig.	.000(*)	.000(*)	.000(*)
Enhance ability to provide scaffolded and differentiated instructions for the same assignment to accommodate a variety of student strengths and needs [b]	Chi-square	171.86	72.80	231.26
	df	8.00	3.00	12.00
	Sig.	.000(*)	.000(*)	.000(*)
Enhance ability to provide differentiated assignments and activities to accommodate a variety of student strengths and needs	Chi-square	211.13	70.38	116.03
	df	8.00	3.00	12.00
	Sig.	.000(*)	.000(*)	.000(*)
Enhance your ability to diagnose students' mathematical proficiency	Chi-square	120.33	29.01	56
	df	8.00	3.00	12
	Sig.	.000(*)	.000(*)	0.00(*)

* The Chi-square statistic is significant at the 0.05 level. Specifically, those who interacted with the MCCs in three ways or more were more likely to report greater improvements in their knowledge of mathematics content and curriculum implementation (all aspects of impact specified) than those who interacted with MCCs through fewer modes.

[a] Those who participated in sessions whereby number sense and probability were discussed were more likely to report increase in knowledge of number sense and computation, and deepened knowledge of statistics than those who attended sessions where these topics were not discussed.

[b] Those who interacted with the MCCs through classroom demonstrations and follow-up feedback sessions were more likely to report moderate to great improvements in their knowledge of statistics and enhanced ability to provide scaffolded and differentiated instructions for same assignments, and ability to collaboratively examine students work.

Table B11

Significant Changes in Mathematics Instructional Practices during 2008–2009

Changes (multiple responses)	*N*	*%*
Increased application of differentiation; a variety of other instructional strategies[a]	128	50.9
Use of mathematics centers, manipulatives, and hands on experiences; includes use of technology and computer software programs	46	17.4
Increased acceleration, challenge, and higher expectations for all students	23	9.1
Increased collaboration, team teaching and team planning and analyzing and using data	21	8.4
Providing support for students[b]	16	6.4
Use of formative and summative assessment	14	5.6
Reteaching and retesting	13	5.2
Miscellaneous comments[c]	31	12.3

Note. Responses are drawn from an open-ended item. The percentage of responses may exceed 100% because respondents marked more than one response.

[a] E.g., increased mathematics vocabulary, used questioning strategies, more mathematics discourse, exploration, calendar mathematics, warm-ups, more focus on basic mathematics skills, small groups formation and instruction

[b] E.g., use of MCC, pull out, plug in, special education support, ESOL support

[c] E.g., created practice books to go home, used VSC more, participation in schoolwide computation program, organized instructional block, learning new grade-level curriculum

Table B12

Significant Changes in Mathematics Instruction at School Level during 2008–2009

Changes in mathematics instruction (multiple responses)	*N*	*%*
More acceleration of mathematics students and exposure to challenging work	47	21.5
Stronger mathematics focus in schools as demonstrated through: staff development, training, student placement and scheduling; grade-level team meetings among teachers and with MCC, planning mathematics lessons, and sharing instructional strategies	34	15.5
Differentiation through small group instruction and mathematics centers	29	13.3
Collecting more mathematics data and using it to gauge progress and plan instruction	24	11.0
Increased emphasis on improving basic mathematics skills	22	10.0
Use of more mathematics discourse, manipulatives, mathematics resources, and mathematics software	18	8.2
Grade-level teams meeting with each other and MCC/sharing information on mathematics/planning lessons/sharing strategies	14	6.4
Providing support to students through : mathematics interventions, scaffolding, support for students, and reteaching as needed for mastery and creating retesting schedules	13	5.9
Miscellaneous comments[a]	17	7.8

Note. Responses are drawn from an open-ended item. The percentage of responses may exceed 100% because respondents marked more than one response.

[a] E.g., shifted from self-contained at all grades to departmentalized in Grades 2–5, academic support teacher not used correctly, co-teaching mathematics with special educator, use of problem solving activities

Table B13
Positive Impact of MCCs' Support of Teachers and Classrooms

Positive impact (multiple responses)	*N*	*%*
MCC is readily available to provide support on appropriate application of mathematics instructional strategies/knowledge/reinforcement to teachers [a]	98	41.1
Provides instructional resources and materials	45	18.9
Plans and models lessons and meets with teams/helps teachers include and implement voluntary state assessment standards	43	17.9
Works with and supports students [b]	30	12.6
MCC provided no impact/very little help[c]	27	11.3
Helps teachers with re-teach, giving assessments, meeting data deadlines, and data analysis	21	8.8
Miscellaneous[d]	9	3.9

Note. Responses are drawn from an open-ended item. The percentage of responses may exceed 100% because respondents marked more than one response.

[a] E.g., answers questions, provides resources, open door policy, provides technology support, gives teachers input, suggestions, feedback.

[b] E.g., works with small groups, works with individual students, teaches mathematics vocabulary, supports students below grade level.

[c] E.g., not willing to provide instructional support, created additional stress, never saw MCC, long term substitute proved to be more useful than MCC, never interacted with teachers, did not follow through on ideas.

[d] E.g., held very successful mathematics nights, more mathematics focused dialogue, made teacher aware of value of language of mathematics.

Table B14
Challenges to Improve Mathematics Proficiency

Challenges encountered (multiple responses)	*N*	*%*
Mathematics curriculum too fast and difficult; not enough time to plan, instruct, reteach, work with small groups	66	27.4
Students lack basic mathematics skills and mathematics foundational knowledge	61	25.3
Teachers need strategies demonstrated or provided to differentiate, accelerate, and challenge students during mathematics lessons	33	13.7
Limited vocabulary and mathematics language; in particular, ESOL student's language barriers and lack of mathematics background knowledge	26	10.8
Classes too large or contain wide range of ability levels; struggling students are not able to meet MCPS grade-level expectations	19	7.9
Assessment, unit testing, and retesting concerns	16	6.6
Miscellaneous comments[a]	39	16.1

Note. Responses are drawn from an open-ended item. The percentage of responses may exceed 100% because respondents marked more than one response.

[a] E.g., need for parental support, lack of materials, length of mathematics block, grade-level teachers staying on same concept, mathematics center preparation, limited access to computer lab, homework completion, attendance.

Table B15
Critical Areas Needing Improvement at the School Level/District Level

Critical areas at the school level/district level (multiple responses)	*N*	*%*
Pacing and rigor of mathematics curriculum is too fast and difficult; mathematics block does not allow enough time to cover the mathematics curriculum, time to reteach or reassess[a]	136	72.4
Plan and provide intensive instruction and practice on specific mathematics topics/mathematics vocabulary [b]	50	24.1
Need for more differentiation, intervention, and acceleration of mathematics lessons	11	5.3
Need for classroom support/resources to be provided by MCC (modeling, support of students, lesson materials)	10	5.0
Miscellaneous (e.g., students need to "experience" mathematics through communication and manipulatives, grouping, ability to incorporate technology, data helped teachers believe that students could master above grade level indicators)	23	11.1

Note. Responses are drawn from an open-ended item. The percentage of responses may exceed 100% because respondents marked more than one response.

[a] E.g., interruptions, pull outs, MSA testing, assessment questions not aligned with lessons.

[b] E.g., basic facts--need for memorization and skill retention, geometry, measurement, fractions, decimals, computation, problem solving, word problems.

Table B16
Critical Areas Needing Improvement at the Student Level

Critical areas at the school level (multiple responses)	*N*	*%*
Students need to master basic facts and basic concepts; retain and apply skills to new situations; become proficient in material learned	106	61.0
Need for intensive instruction and work on specific mathematics topics [a]	67	35.3
Gap and range exists between student abilities ranging from struggling students in need of support to students in need of acceleration and challenge within same class and school	15	7.9
Vocabulary and mathematics language is necessary so students can explain the process (BCRs)	14	7.4
Miscellaneous[b]	30	15.8

Note. Responses are drawn from an open-ended item. The percentage of responses may exceed 100% because respondents marked more than one response.

[a] E.g., computation skills, time, place value, geometry, measurement, fractions, decimals, computation, problem solving, applying problem solving strategies to word problems.

[b] E.g., students not developmentally ready for skills they are expected to demonstrate, no home support for homework, critical thinking skills, pacing of the units, students not seeing mathematics integrated into other subjects.

Table B17
Recommended Concepts, Activities, or Strategies for the MCC to Address in Future Years

Concepts, activities, or strategies (multiple responses)	*N*	*%*
Continue support to teachers: Advise teachers on how to develop, plan, or use ideas/lessons/strategies for teaching various mathematics concepts[a]; demonstrate and model lessons and provide training to teachers; provide activities to use with small groups and how to best use time in small group instruction	112	53.5
Provide teachers with specified strategies: strategies for teaching and reinforcing basic skills/number sense; ideas to support struggling students (re-teaching, interventions, visual clues for ESOL); provide ideas on how teachers can challenge and accelerate students	78	42.6
Provide a variety of activities, resources, center ideas and games, manipulatives and integrate technology and mathematics vocabulary; provide activities to use with small groups and how to best use time in small group instruction	53	25.4
MCC should work directly with students	12	5.8
Provide all levels of testing and data collection support	11	5.3
Miscellaneous comments[b]	19	9.1

Note. Responses are drawn from an open-ended item. The percentage of responses may exceed 100% because respondents marked more than one response.

[a] E.g., problem solving, word problems, money, time, fractions, decimals, measurement, percents, algebra, vertical alignment of mathematics content, pacing, time management, etc.

[b] E.g., with tight budget this is a useless position, scheduling, visits to other schools, conduct needs assessment staff survey, learn how to communicate, continue providing support, share teacher concerns with district level staff**.**

Table B18
Central Emphasis in Mathematics by Grade Level

	Pre-K		K		Grade 1		Grade 2		Grade 3		Grade 4		Grade 5		Mathematics 6	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Knowing and understanding the mathematics content standards	9	47.4	52	62.7	47	61.8	57	75.0	39	61.9	39	61.9	33	57.9	11	84.6
Using standards as a basis for instructional planning	9	47.4	55	66.3	50	65.8	58	76.3	40	63.5	40	63.5	36	63.2	10	76.9
Planning mathematics instruction that supports Adequate Yearly Progress goals	10	52.6	50	60.2	47	61.8	58	76.3	41	65.1	41	65.1	36	63.2	11	84.6
Ensuring mathematics instruction is vertically articulated	8	42.1	43	51.8	41	53.9	46	60.5	34	54.0	34	54.0	33	57.9	9	69.2
Ensuring mathematics instruction is horizontally articulated	9	47.4	43	51.8	37	48.7	54	71.1	36	57.1	36	57.1	32	56.1	9	69.2
Clarify skills, concepts, and knowledge to be mastered	9	47.4	52	62.7	43	56.6	60	78.9	35	55.6	35	55.6	34	59.6	10	76.9
Study of how students learn particular concepts and skills in mathematics	9	47.4	37	44.6	30	39.5	42	55.3	31	49.2	31	49.2	29	50.9	6	46.2
The development of basic computational skills	8	42.1	34	41.0	41	53.9	50	65.8	37	58.7	37	58.7	31	54.4	10	76.9
Strategies for supporting students working above grade level	8	42.1	43	51.8	40	52.6	46	60.5	26	41.3	26	41.3	23	40.4	11	84.6
Strategies for supporting students not meeting grade level standards	8	42.1	39	47.0	39	51.3	45	59.2	32	50.8	32	50.8	29	50.9	10	76.9
Questioning techniques to check for students' understanding of mathematics concepts or skills	9	47.4	39	47.0	34	44.7	43	56.6	26	41.3	26	41.3	28	49.1	8	61.5

(Continued)

Table B18
Central Emphasis in Mathematics by Grade Level

	Pre-K		K		Grade 1		Grade 2		Grade 3		Grade 4		Grade 5		Mathematics 6	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Reteaching for mastery.	9	47.4	39	47.0	37	48.7	42	55.3	31	49.2	31	49.2	31	54.4	9	69.2
Ensuring instructional activities are learner centered	9	47.4	46	55.4	45	59.2	51	67.1	35	55.6	35	55.6	28	49.1	8	61.5
Differentiating instruction within the same class	9	47.4	43	51.8	43	56.6	47	61.8	32	50.8	32	50.8	29	50.9	8	61.5
Differentiating assignments (e.g., home work, in-class assignments) within the same class	7	36.8	33	39.8	29	38.2	33	45.2	34	44.7	20	31.7	23	40.4	6	46.2
Interpretation of formative assessment data to guide mathematics instruction	9	47.4	45	54.2	44	57.9	45	61.6	53	69.7	39	61.9	35	61.4	9	69.2
Use of technology to support student learning in mathematics	8	42.1	22	26.5	24	31.6	26	35.6	27	35.5	15	23.8	20	35.1	6	46.2
Using data to diagnose students' mathematics proficiency	9	47.4	48	57.8	41	53.9	47	64.4	56	73.7	40	63.5	40	70.2	12	92.3
Providing instructional support resources to teachers	10	52.6	48	57.8	42	55.3	46	63.0	55	72.4	37	58.7	31	54.4	8	61.5
Collaborative examination of student work	8	42.1	23	27.7	23	30.3	28	38.4	33	43.4	19	30.2	19	33.3	7	53.8
Opportunities for teachers to practice new skills	8	42.1	28	33.7	23	30.3	30	41.1	28	36.8	20	31.7	20	35.1	6	46.2
Reflection on mathematics instructional strategies in use and follow-up sessions from mathematics content coach	8	42.1	32	38.6	28	36.8	31	42.5	32	42.1	24	38.1	21	36.8	6	46.2