Montgomery County Public Schools

Evaluation Brief

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Outcomes of Middle School Extended Year Courses, Summer 2005

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Background

In summer 2005, the Montgomery County Public Schools (MCPS) offered extended year (summer) courses at 37 middle schools to prepare students for success with the MCPS curriculum, and by extension, the Maryland School Assessment (MSA) (Fulton & Kress, 2005). Program objectives were as follows:

- Ensure that students have achieved grade-level requirements in English and mathematics classes.
- Provide students with a preview of the English or mathematics course they would experience in fall 2005 to increase their likelihood of success.
- Increase the number of students participating in advanced mathematics classes.

To address the first two objectives, intervention courses were offered to students who had not been successful with the curriculum, were at risk of not meeting proficiency on MSA, or both. Intervention courses were offered in English/reading or mathematics for Grades 6, 7, and 8. They reviewed previous years' curricula and previewed the first one or two units of the next year's curriculum. These courses had a maximum size of 20 students and lasted for 19 days.

Focus on Mathematics courses were offered to address the third objective and increase students' chances of success in above-grade-level mathematics courses. These summer courses had a maximum size of 20 students and lasted for nine or ten days. They targeted students who were enrolled or being considered for enrollment in the following courses for fall 2005: Math B for Grade 6, Investigations in Mathematics (IM) for Grades 6 and 7, and Algebra for Grades 6–8.

An earlier study examined the implementation of the 2005 extended year courses (see summary in Appendix A). This brief addresses the following questions:

1. Do intervention courses help students to be more successful in their course or on MSA for that subject?
2. Do Focus on Mathematics courses increase enrollment in above-grade-level mathematics courses?
3. Do Focus on Mathematics courses help students to be more successful in above-grade-level mathematics courses or on MSA?

Summary of Methodology

To test the impact of extended year courses, outcomes for attendees were compared with those for non-attendees for each course, based on 33 schools who submitted data. Outcome measures were spring 2006 MSA scale scores and first quarter and end-of-course grades for 2005–2006 English, reading, and mathematics courses. Statistical significance tests and effect sizes were calculated from regressions and chi-square tests. Analyses were done separately for each grade level.

Summary of Findings

There was very little evidence that intervention courses helped attendees to be more successful in their courses for the subsequent school year or on MSA, except for Grade 6 mathematics. Attendees at this course, compared with non-attendees, were significantly more likely to earn grades of C or above for first quarter and final course grades. These differences in grades were large enough to be practically significant; thus suggesting that the program had the desired effect for Grade 6 mathematics course grades only.

There was more evidence of success for the objectives of the Focus on Mathematics courses. Nearly all attendees at these courses took an above-grade-level mathematics course in the following school year and were successful, as indicated by final course grades of a C or above. Compared with non-attendees, Grade 6 and Grade 8 attendees at Focus on Mathematics courses were significantly more likely to be in above-grade-level courses and to earn higher MSA mathematics scale scores. These differences in enrollment and MSA scores between attendees and non-attendees for Grades 6 and 8 were large enough to be practically significant, thus suggesting that the program did have its desired effect for these two grades.

Recommendations include lengthening or refocusing the intervention courses and encouraging rising Grade 8 students to take Focus on Algebra. Creating a database that identifies invited and participating students for extended year courses would facilitate future research and permit tracking of student progress post program by school staff.

Detailed Methodology

Attendees attended at least 75% of the class sessions for the extended year course. Non-attendees were invited to the same extended year course, but did not attend it or any other MCPS summer course. Only students enrolled in an MCPS middle school for 2005–2006 were included. Analysis excluded four schools that did not submit files of invited students. (Outcomes for all students from all 37 schools are in Appendix B.)

For end-of-course grades, end-of-year grades for middle school level courses and second semester grades for high school level courses were used.

Statistical significance tests and effect sizes were calculated from regressions and chi-square tests. Effect sizes were used to judge the practical significance of observed differences (American Psychological Association, 2001) and drew on previous studies of summer school programs (Appendix C). Multiple regression was used for MSA scale scores. Logistic regression was used for the likelihood of earning a C or above versus a D or below in course grades. To control for possible differences between attendees and non-attendees, the regressions included the following control measures: gender, racial/ethnic group, limited English proficiency status, Free and Reduced-price Meals System status, special education status, attendance rate during 2005–2006, and prior achievement (i.e., MSA scores from spring 2005). For simplicity, unadjusted means and proportions are shown in the results tables.

Detailed Findings

English/Reading Intervention Courses

MSA scores. For English/reading intervention courses, differences between attendees and non-attendees in mean MSA reading scores were not statistically significant, for any grade level (Table 1).

Table 1
MSA Scale Scores in Reading by 2005–2006 Grade Level and Attendance at English/Reading Intervention Course

	Students invited to attend				All students
	Attended		Did not attend		
Grade	Mean scale score (Group *N*)	SD	Mean scale score (Group *N*)	SD	Minimum scale score for MSA proficiency
6	382.0 (346)	30.4	384.8 (503)	30.3	381.0
7	379.7 (425)	25.6	387.7 (641)	32.9	385.0
8	381.8 (295)	22.2	390.4 (562)	29.2	391.0

Note. SD = standard deviation.

English course grades. For English/reading intervention courses, differences between attendees and non-attendees in the likelihood of earning a C or above for English grades were not statistically significant for any grade level, expect for Grade 8 first quarter English grades (Table 2). Grade 8 attendees were significantly less likely to earn a C or above for their first quarter grade than non-attendees. This difference in grades was large enough to be practically significant (Appendix C).

Table 2
English Grades of A, B, or C by 2005–2006 Grade Level and Attendance at English/Reading Intervention Course

	Students invited to attend			
	Attended		Did not attend	
Grade	Group *N*	A, B, or C %	Group *N*	A, B, or C %
First quarter				
6	212	73.9	335	71.1
7	259	64.1	432	70.1
8	170	63.7	392	74.7
End-of-course				
6	240	72.3	368	74.8
7	271	67.1	447	72.2
8*	191	70.5	422	78.9

* p=0.05

Reading course grades. For English/reading intervention courses, differences between attendees and non-attendees in the likelihood of earning a C or above for reading grades were not statistically significant for any grade level (Table 3).

Table 3
Reading Grades of A, B, or C by 2005–2006 Grade Level and Attendance at English/Reading Intervention Course

	Students invited to attend			
	Attended		Did not attend	
Grade	Group *N*	A, B, or C %	Group *N*	A, B, or C %
First quarter				
6	251	81.0	351	78.3
7	144	75.0	199	79.6
8	109	79.6	136	80.0
End-of-course				
6	268	85.6	370	82.0
7	157	79.7	214	82.9
8	118	83.7	152	86.9

Mathematics Intervention Courses

MSA scores. For mathematics intervention courses, differences between attendees and non-attendees in mean MSA mathematics scores were statistically significant only for Grade 6 (Table 4). Grade 6 attendees had higher mean MSA scores than non-attendees. However, the observed difference was too small to be practically significant (Appendix C).

Table 4
MSA Scale Scores in Mathematics by 2005–2006 Grade Level and Attendance at Mathematics Intervention Course

	Students invited to attend				All students
	Attended		Did not attend		
Grade	Mean scale score (Group *N*)	SD	Mean scale score (Group *N*)	SD	Minimum scale score for MSA proficiency
6*	395.0 (362)	38.0	388.3 (440)	39.3	396.0
7	377.8 (423)	35.4	387.6 (559)	37.0	396.0
8	383.6 (389)	35.3	392.6 (581)	39.1	407.0

Note. SD = standard deviation. *F(1, 767) = 3.87; $p < 0.05$

Course grades. For mathematics intervention courses, differences between attendees and non-attendees in the likelihood of earning course grades of C or above in mathematics were statistically significant only for Grade 6 (Table 5). Grade 6 attendees were significantly more likely than non-attendees to earn first quarter and end-of-course grades of C or above. These differences in grades were practically significant (Appendix C).

Table 5
Mathematics Grades of A, B or C by 2005–2006 Grade Level and Attendance at Mathematics Intervention Course

	Students invited to attend			
	Attended		Did not attend	
Grade	Group *N*	A, B, or C %	Group *N*	A, B, or C %
First quarter				
6**	277	77.2	292	66.8
7	267	64.5	411	74.5
8	223	58.7	361	63.7
End-of-course				
6***	294	82.1	308	70.5
7	270	65.2	416	75.4
8	235	60.6	397	68.9

**p<0.005. ***p<0.001.

Focus on Mathematics Courses

Enrollment in above-grade-level courses. Attendees at Focus on Mathematics courses were more likely than non-attendees to take above-grade-level mathematics courses (Table 6). For Grades 6 and 8, these differences were statistically significant and large enough to be practically significant (Appendix C). However, these results may be due to differences between attendees and non-attendees in demographic factors or prior achievement. The statistical tests used (i.e., Fisher's exact tests) did not control for potential differences; the tests (i.e., logistic regressions) that would control for such differences were not used due to poor fit.

Table 6
Enrollment in Above-grade-level Mathematics Course by 2005–2006 Grade Level and Attendance at Focus on Mathematics Course

	Students invited to attend			
	Attended		Did not attend	
Grade	Group *N*	Enrolled %	Group *N*	Enrolled %
6*	343	92.7	403	88.2
7	359	90.9	396	89.6
8***	499	92.8	371	81.5

*p<0.05. ***p<0.001.

MSA scores. Attendees at Focus on Mathematics courses had higher MSA scale scores than non-attendees (Table 7). For Grades 6 and 8, these differences were statistically significant and practically significant (Appendix C). For Grade 7, the differences were not significant, possibly due to variation in attendees' scores.

Table 7
MSA Scale Scores in Mathematics by 2005–2006 Grade Level and Attendance at Focus on Mathematics Course

	Students invited to attend				All students
	Attended		Did not attend		
Grade	Mean scale score (Group *N*)	SD	Mean scale score (Group *N*)	SD	Minimum scale score for MSA advanced
6***	449.4 (370)	22.3	444.5 (457)	29.2	447.0
7	441.7 (395)	25.6	437.0 (442)	28.2	451.0
8**	434.5 (538)	23.2	429.9 (455)	25.9	444.0

Note. SD = standard deviation.
**F(1,969)=9.23; p<0.005. ***F(1,804)=11.42; p=0.001.

Course grades. Because the objective for Focus on Mathematics courses refers to success in above-grade-level mathematics courses, only grades from such courses were analyzed. Attendees were not significantly more likely than non-attendees to be successful in these courses (Table 8).

Table 8
Grades of A, B, or C in Above-grade-level Mathematics Course by 2005–2006 Grade Level and Attendance at Focus on Mathematics Course

	Students invited to attend			
	Attended		Did not attend	
Grade	Group *N*	A, B, or C %	Group *N*	A, B, or C %
First quarter				
6	339	98.8	389	97.5
7	339	95.8	376	96.4
8	468	93.8	337	90.8
End-of-course				
6	337	98.3	392	97.5
7	338	96.0	373	95.4
8	440	88.2	313	84.6

Limitations

In interpreting the results, it is important to note that this brief assumes the program was implemented as designed and that attendees matched the targeted students (see Appendix A for evidence on implementation and targeting). Also, the analyses excluded four schools (11% of all schools) that did not submit files of invited students. In reference to enrollment in above-grade-level mathematics courses, students typically select courses in the spring prior to the school year; this analysis did not examine whether students changed their course selection, following the summer program.

Conclusions

This brief examined the outcomes of the middle school extended year intervention and Focus on Mathematics courses. The first question this brief addressed was whether or not the intervention courses help students to be more successful in their course the following school year or on MSA for that subject? The analysis showed no positive impact on students' success with the MCPS curriculum for the subsequent school year or MSA, except for Grade 6 mathematics (Table 9). Attendees at the Grade 6 mathematics intervention course were significantly more likely to earn grades of C or above for first quarter and final course grades the following school year than were non-attendees. These differences in grades were large enough to be practically significant. These same students had a statistically significant difference in mathematics MSA scores; however, this difference was not practically significant. Therefore, it can be concluded that the Grade 6 mathematics intervention course had a limited effect on student achievement.

Table 9
Association between Attendance at Intervention Courses and Student Outcomes by 2005–2006 Grade Level

Course and grade	First quarter grades	End-of-course grades	MSA scores
Summer English/Reading course			
English outcomes 2005-2006			
6	no	no	no
7	no	no	no
8	yes (-)[a]	no	no
Reading outcomes 2005-2006			
6	no	no	NA
7	no	no	NA
8	no	no	NA
Summer Mathematics course			
Mathematics outcomes 2005-2006			
6	yes	yes	yes
7	no	no	no
8	no	no	no

Note. NA = not applicable
[a] (-)=negative effect

For Focus on Mathematics, this brief addressed whether these courses increase enrollment in above-grade-level mathematics courses and help students to be more successful in above-grade-level mathematics courses or on the MSA. Nearly all attendees at these courses took an above-grade-level mathematics course in the following school year and were successful, as indicated by final course grades of C or above. Compared with non-attendees, Grade 6 and Grade 8 attendees at Focus on Mathematics courses were significantly more likely to be in above-grade-level courses and to earn higher MSA mathematics scale scores (Table 10). These differences in enrollment and MSA scores for Grades 6 and 8 were large enough to be practically significant, thus suggesting that the program did have its desired effect in those grades. However, this program did not have the same outcomes for Grade 7 students.

Table 10
Association between Student Outcomes and Attendance at Focus on Mathematics Courses by 2005–2006 Grade Level

Grade	First quarter grades	End-of-course grades	MSA scores	Enrollment in above-grade-level mathematics course
6	no	no	yes	yes
7	no	no	no	no
8	no	no	yes	yes

Recommendations

Given the lack of evidence that the intervention courses help students succeed, perhaps these courses should be longer or cover fewer concepts. Focus on Mathematics courses were more successful; their biggest effect was for Grade 8 students' enrollment in Algebra. Therefore, more rising Grade 8 students should be encouraged to take Focus on Algebra.

A common database that identifies invited and participating students is recommended to permit tracking of student progress post program by school staff. Such tracking would allow refinement of program goals, content, and student selection for future extended year programming. This database should interface with other MCPS student information systems, including high school data systems, so that Grade 9 staff is aware of interventions received in middle school.

Additional recommendations, based on the findings summarized in Appendix A, follow:

- *Targeting students for extended year classes.* Targeting of intervention students in 2005 was successful for Grades 7 and 8, but less so for Grade 6 where attendees were more capable than the intended targets. These results should be shared with schools as feedback about their recruitment practices.

- *Reading intervention curriculum.* Teaching materials in 2005 allowed for a great deal of teacher discretion. As a result, students in some classes may have received less than the desired amount of

instruction in key areas of middle school literacy. For example, vocabulary building lessons were observed in less than half of observed class sessions. Some activities termed "daily" were not taught daily in all classrooms. Provide a curriculum guide that provides teachers with specific lesson plans for teaching and reinforcing literacy skills and explicit time allowances for each lesson component. To insure that daily and course outcomes are met, "look-fors" should be developed for the summer reading courses. Additional guidance in focusing the summer curriculum may be obtained by reviewing summer students' post assessment results.

- *Math intervention and Focus on Mathematics curriculum.* Despite professional development in 2005, 40% of observed class sessions did not include manipulatives. Future professional development should emphasize daily use of manipulatives, as indicated in the *Moving with Math* curriculum.

Program response to these recommendations included the following. Staff from Student Systems designed a database for the extended year and extended day programs. In summer 2007, this database allowed schools to include information as to which students were invited to the extended year program. Another program change was to provide coordinators at all 38 middle schools to oversee the daily running of the programs. The coordinators were given responsibilities outlined by the middle school office and, therefore, were able to provide the necessary guidance for their teachers. Additional responses to these recommendations and changes in the extended year program are summarized for mathematics in Appendix D and for reading in Appendix E

References

American Psychological Association. (2001). *Publication manual of the American Psychological Association (5th ed.).* Washington, DC: Author.

Fulton, D. & Kress, D.H. (2005). Middle School Extended Year (summer) Program. Memorandum to Middle School Principals, March 3, 2005. Rockville, MD: Montgomery County Public Schools.

Outcomes of Middle School Extended Year Courses, Summer 2005

Appendixes

Appendix A

Data Collection on Implementation of Extended Year Classes
with Rachel A. Hickson, M.A.

Targeting of Students for Extended Year Classes

Intervention Classes

A primary goal of the intervention courses was to provide academic support to students at risk of scoring basic on the Maryland State Assessment (MSA). While spring 2005 MSA scores were not available to schools in time for use as selection criteria for summer 2005, they were available post program. Based on spring 2005 MSA performance, targeting of students for intervention classes was successful, with the possible exception of Grade 6 classes (Table A1). For Grades 7 and 8, the majority of students scored at basic; they were two to three times as likely as all students in their grade to score at basic. In Grade 6 classes, less than half of the students scored at basic (e.g., 47.7% in English/reading). They were twice as likely as all students in Grade 6 to do so (47.7% vs. 20.2% for English/reading).

Table A1
Spring 2005 MSA Results for Intervention Students by Summer 2005 Course

Summer 2005 course	% of Students at basic		% of Students at proficient		% of Students at advanced	
	Extended year attendees	All students	Extended year attendees	All students	Extended year attendees	All students
6 English/reading	47.7	20.2	48.7	40.2	3.5	39.6
6 Mathematics	48.3	21.5	44.8	47.8	7.0	30.7
7 English/reading	60.5	24.2	33.9	37.4	5.6	38.5
7 Mathematics	75.0	32.3	24.2	45.0	0.8	22.7
8 English/reading	69.7	23.2	27.4	36.6	2.9	40.3
8 Mathematics	78.8	32.2	21.2	44.5	0	23.2

Note. Includes all intervention students, regardless of their level of attendance.

Focus on Mathematics Classes

The goal of Focus on Mathematics classes was to increase the number of students participating in advanced mathematics classes. Neither the goal nor the targeted population relates explicitly to MSA scores. However, the most appropriate target is probably students who are proficient, because students at basic are the target of intervention classes, and students at advanced may not need additional support. Based on this interpretation, the targeting was successful for Grades 7 and 8 in which the majority of students scored at proficient (Table A2).

Table A2
Spring 2005 MSA Results for Focus on Mathematics Students by Summer 2005 Grade Level

Grade	% of Students at basic		% of Students at proficient		% of Students at advanced	
	Extended year attendees	All students	Extended year attendees	All students	Extended year attendees	All students
6	2.1	21.5	44.0	47.8	53.9	30.7
7	4.9	32.3	62.1	45.0	33.0	22.7
8	12.1	32.2	76.8	44.5	11.1	23.2

Note. Includes all intervention students, regardless of their level of attendance.

Implementation of the Reading Intervention Program

Six middle schools were selected for classroom observations, using a systematic sampling technique to ensure that all types of schools were represented on student demographic and academic characteristics. Observers visited 13 reading classrooms in those six schools, including Grade 6 (four classes), Grade 7 (four classes), and Grade 8 (five classes).

The program did not feature a district-issued curriculum guide that would have set rigid guidelines and "look-fors" for instructional block format and lesson content. Therefore, the ability to determine whether instruction was being implemented as designed was limited. However, the following evidence, including primary data collection and document reviews, indicates those aspects of the program that were implemented as designed.
The extended year reading curriculum was *Gourmet Reading*, published by Gourmet Curriculum Press. Each reading class used one of the editions of the *Gourmet Reading* materials, based on grade level and content. Supplemental

materials from Jamestown Reading, published by Glencoe, and Reader's Theater, posted online by Aaron Shepard, were also available for teachers to use. Classroom observations indicated that teachers were using the assigned curriculum and related materials associated with their class. However, there was wide variation in which components of the curriculum and supplemental materials were used.

Teachers were required to communicate the lesson objective for the day—orally, in writing, or both. In the 13 reading classes, objectives were communicated in writing in 8 classes, orally in 4 classes, and both ways in 1 class.

The three main skills featured in the reading program were reading fluency, vocabulary, and comprehension. Observers sought evidence that these skills were addressed by the instruction in reading classes. All observed classes addressed both reading fluency and comprehension, but lesson segments on vocabulary were observed in less than half the classes (Table A3).

Table A3
Number of Lesson Segments by Skill Area Observed during Reading Intervention Classes

	Number of classes (maximum =13)[a]			
Skill	At least one segment	At least two segments	At least three segments	At least four segments
Reading fluency	13	9	3	1
Vocabulary	5	2	1	0
Comprehension	13	7	5	2

[a]Multiple activities and skills possible

Several key themes for the reading lessons were featured in the extended year reading program. Observers saw modest evidence of the key themes being taught during reading lessons as follows:

- Context clues - three classes
- Main idea - two classes
- Making inferences - two classes
- Reading for details or facts - two classes

A set of lesson components was specified in the summer curriculum information provided to teachers by MCPS. Some of these components were built into the Gourmet Reading lessons; others were introduced at teachers' discretion. The component(s) observed depended on which part of a lesson was taught during an observer's visit. (Class sessions dedicated to performance assessment were not observed; however, assessment activity was observed in some classes.)

Observers saw evidence that teachers were using one or more of the prescribed reading lesson components. In order of frequency of observation, the components observed in the 13 summer class sessions visited were MCPS summer reading project activities (10 classes), Gourmet "Main Dish" whole group lesson (nine classes), Jamestown Reading (seven classes), Gourmet "Appetizer" warm-up activity (six classes), daily oral language activities (six classes), teacher read-aloud (five classes), Reader's Theater (one class), and Gourmet "Desserts" (one class). Other activities were observed in seven classes.

The amount of class time devoted to the respective components was in line with the recommended guidelines. Among the commonly observed lesson components, the average length of time devoted to each one was as follows:

- MCPS summer reading project activities - 23.8 minutes
- Gourmet "Main Dish" whole group lesson - 32.5 minutes
- Jamestown Reading - 17 minutes
- Gourmet "Appetizer" warm-up activity - 17.3 minutes
- Daily oral language activities - 15.2 minutes
- Teacher read-aloud - 21.8 minutes

Implementation of the Mathematics Intervention and Focus on Mathematics Programs

Observers visited 25 summer mathematics class sessions in the six sample schools. All of the summer mathematics program offerings were observed including intervention Grade 6 (four classes), intervention Grade 7 (four classes), intervention Grade 8 (five classes), Focus on Math B (four classes), Focus on IM (three classes), and Focus on Algebra (five classes).

As with reading, the mathematics program did not feature a district-issued curriculum guide that would have set rigid guidelines and "look-fors" for instructional block format and lesson content. Therefore, the ability to determine whether instruction was being implemented as designed was limited. However, the following evidence indicates those aspects of the program that were implemented as designed.

The Focus on Mathematics curriculum was *Moving With Math*, published by Math Teachers Press, Inc. Each course used one of the editions of the *Moving With Math*, based on grade-level and content. Observations indicated that teachers used the assigned curricula and supplemental materials.

Teachers were required to communicate the lesson objective for the day—orally, in writing, or both ways. Objectives were communicated in writing in 13 of the 25 mathematics classes, orally in 7 classes, and both ways in 5 classes.

Moving with Math features four content areas common to all editions of the texts. Observed classes addressed one of the content areas as follows:

- Geometry and measurement - nine classes
- Properties of numbers - six classes
- Operations with numbers - six classes
- Algebra and data analysis - three classes

Moving with Math outlines a set of recommended mathematics lesson components. Observers saw evidence of all components in at least some of the 25 observed class sessions, as follows:

- Focus lesson/hands on lesson - 23 classes
- Independent practice - 21 classes
- Daily review - 15 classes
- Journal prompt - 6 classes
- Games - 6 classes
- Reteaching - 3 classes

A key feature of the *Moving with Math* series is the use of manipulatives to teach mathematics concepts. Observers saw manipulatives used in 15 of the 25 class sessions. The most commonly used manipulatives specified by the curriculum were paper or wax paper folding for creating angles and geometric shapes (six classes), fraction bars (three classes), and interlocking cubes (two classes).

Appendix B

Outcomes for All Attendees

The following tables present outcomes for all attendees from all 37 schools that offered extended year courses during summer 2005.

English/Reading Intervention Courses

MSA scores. Among the 1,377 students that attended English/reading intervention courses, reading MSA scores were available for 1,255 attendees; mean scale scores are in Table B1.

Table B1
MSA Scale Scores in Reading by 2005–2006 Grade Level

Grade	Group *N*	Mean scale score (standard deviation)	Minimum scale score for MSA proficiency
6	411	380.2 (29.8)	381.0
7	497	379.1 (26.6)	385.0
8	347	381.1 (22.1)	391.0

Course grades. Among the 1,377 students that attended English/reading intervention courses, 1,178 attendees had an end-of-year grade for an English course (Table B2) and 802 attendees had an end-of-year grade for a reading course (Table B3).

Table B2
End-of-year Grades in English by 2005–2006 Grade Level

Grade	Group *N*	A %	B %	C %	D %	E %
6	396	8.1	33.8	30.3	17.2	10.6
7	463	9.7	29.8	27.9	20.7	11.9
8	319	8.2	24.8	38.2	18.2	10.7

Table B3
End-of-year Grades in Reading by 2005–2006 Grade Level

Grade	Group *N*	A %	B %	C %	D %	E %
6	379	17.9	36.9	28.5	12.7	4.0
7	247	19.8	32.8	28.7	13.4	5.3
8	176	8.5	36.4	36.9	13.6	4.5

Mathematics Intervention Courses

MSA scores. Among the 1,409 students that attended mathematics intervention courses, mathematics MSA scores were available for 1,307 students. Mean scale scores for the mathematics MSA are in Table B4.

Table B4
MSA Scale Scores in Mathematics by 2005–2006 Grade Level

Grade	Group *N*	Mean scale score (standard deviation)	Minimum scale score for MSA proficiency
6	395	394.4 (38.4)	396.0
7	473	378.6 (35.0)	396.0
8	439	382.2 (35.1)	407.0

Course grades. Among the 1,409 students that attended mathematics intervention courses during summer 2005, grades for a mathematics course were available for 1,290 attendees (Table B5).

Table B5
End-of-year Grades in Mathematics by 2005–2006 Grade Level

Grade	Group *N*	A %	B %	C %	D %	E %
6	383	11.7	35.0	36.0	13.3	3.9
7	466	7.5	27.3	31.5	23.6	10.1
8	441	4.1	23.4	31.7	24.7	16.1

Mathematics Focus Courses

Enrollment in above-grade-level courses. Of the 1,505 attendees at Focus on Mathematics courses, 1,436 had enrollment records for the following year. Enrollment rates in an above-grade-level mathematics course were as follows: 92.8% for Grade 6, 91.9% for Grade 7, and 91.6% for Grade 8. The remaining attendees (115 students) took on-grade-level courses.

Course grades. End-of-year course grades for above-grade-level mathematics courses are in Table B6.

Table B6
End-of-year Grades in Above-grade-level Mathematics Course by 2005–2006 Grade Level

Grade	Group *N*	A %	B %	C %	D %	E %
6	347	52.4	37.2	8.6	1.4	0.3
7	399	31.6	46.9	17.3	3.8	0.5
8	567	16.4	41.3	30.5	10.1	1.8

MSA scores. Among the 1,505 students that attended Focus on Mathematics courses, 1,438 attendees had MSA mathematics scores. Mean scale scores are in Table B7.

Table B7
MSA Scale Scores in Mathematics by 2005–2006 Grade Level

Grade	Group *N*	Mean scale score (standard deviation)	Minimum scale score for MSA proficiency	Minimum scale score for MSA advanced
6	376	449.3 (22.3)	396.0	447.0
7	443	442.4 (25.0)	396.0	451.0
8	619	433.3 (23.7)	407.0	444.0

Appendix C

Effect Sizes

Effect sizes are used to summarize the magnitude of difference between two comparison groups. The effect size has the advantage of being free of the scale of any observed variable and as a consequence is useful for comparisons across different kinds of studies. Effect sizes are not tested for significance; instead, they are compared to conventional thresholds for size. These thresholds vary according to the particular measure of effect size used.

The analyses for course grades (i.e., earning a C or above vs. earning a D or below on a course grade) used a logistic regression and a natural measure of effect size in this context is the odds ratio. This is the ratio of the odds of a treatment group student (i.e., an attendee) earning a C or above relative to the odds of a non-treatment group student (i.e., a non-attendee) earning a C or above. Values greater than 1 indicate greater odds of attendees earning a C or above than non-attendees whereas values less than 1 indicate greater odds of non-attendees earning a C or above. The further the odds ratio is from 1, the larger the effect. For example, for English/reading intervention, the odds of Grade 6 attendees earning first quarter grades of C or above on their subsequent English courses were 1.15 of students who were invited but did not attend (Table B1). This effect was not significantly different than 1, suggesting the odds of earning a C or above for a first quarter grade are equivalent for attendees and non-attendees in Grade 6. Odds ratios for enrollment are the odds of attendees enrolling in above-grade-level mathematics courses over the odds of non-attendees enrolling in above-grade-level mathematics courses.

Mean differences on MSA scale scores (non-attendees scores subtracted from attendees scores) were converted to a measure of effect size called Cohen's *d* (Cohen, 1988). A positively signed *d is* consistent with beneficial effects whereas negatively signed *d* is associated with negative effects. Conventional thresholds for the size of Cohen's *d* are 0.20 for a small effect, 0.50 for a moderate effect, and 0.80 for a large effect. By this measure, the mean differences in MSA scores between attendees at Focus on Mathematics classes and non-attendees represent small effects for Grades 6 and 8 (Table B1).

Kline (2004) provides a formula for converting an odds ratio to a logit *d*, which is then comparable with standardized mean difference effect sizes expressed as *d*. This puts effect sizes, Cohen's *d* and the odds ratio, on a common metric. That formula is:

$$\text{logit } d = \frac{\ln(OR)}{pi/\sqrt{3}}$$

For example, for English/reading intervention, the odds of Grade 6 attendees earning a C or above for first quarter grades for their subsequent English course were 1.15 of students who were invited but did not attend (Table B1). Converting this odds ratio to a logit *d* results in:

$$\text{logit } d = \frac{\ln(1.15)}{pi/\sqrt{3}} = \frac{0.14}{1.81} = 0.08$$

Previous research provides a context for interpreting the magnitude of effect sizes in new studies that are more useful than the conventional benchmarks suggested by Cohen (1988). Cooper, Charlton, Valentine, and Muhlenbruck (2000) reported on a meta-analysis of summer school programs for remedial and accelerated purposes and determined that an average effect size (Cohen's *d*) of 0.26 (95% confidence interval 0.24-0.28) characterized the effects of summer remedial programs whereas an average effect size of 0.16 (95% confidence interval 0.10-0.21) was found for summer acceleration programs. These values can be used to compare the results of the middle school extended year program. Intervention program effect sizes within 0.26±0.02 can be considered effective relative to other remedial programs reported in the research literature whereas Focus on Mathematics program effect sizes within 0.16±0.06 can be considered effective relative to other acceleration programs in the research literature.

Using these criteria, mathematics intervention was associated with effects larger than those found for other remedial programs on both first quarter and end-of-year grades for Grade 6 students (0.29 > 0.28, 0.39 > 0.28). The effect on MSA scores for Grade 6 was much smaller.

For Grade 8 students, the association between attendance at Focus on Mathematics courses and first quarter grades was larger than those found for other accelerated programs (0.25 > 0.21). The association was a more typical size for end-of-year grades (0.10 < 0.14 < 0.21). The effect size for Focus on Mathematics on enrollment in above-grade-level

mathematics courses was large for both Grades 6 and 8 (0.29 and 0.61, respectively) but smaller than average for Grade 7 (0.08 < 0.10). Attendance at Focus on Mathematics classes was associated with large effects on MSA scores for Grade 6 (0.24 > 0.21) and with an effect size typical of other acceleration programs for Grade 8 (0.19 ≈ 0.16).

Other effect sizes were smaller than those found by Cooper et al. (2000), and in some cases negative.

Table C1
Measures of Effect Size for Tests of Association between Student Outcomes and Attendance at Extended Year Courses by 2005–2006 Grade Level

	First quarter grades		End-of-course grades		Enrollment in above-grade-level mathematics course		MSA scores
Course and grade	Odds ratio	Logit *d*	Odds ratio	Logit *d*	Odds ratio	Logit *d*	Cohen's *d*
English/reading intervention							
English outcomes							
6	1.15	0.08	0.86	-0.08	NA	NA	0.02
7	0.86	-0.08	0.86	-0.08	NA	NA	-0.03
8	0.70	-0.20	0.59	-0.29	NA	NA	-0.04
Reading outcomes							
6	1.12	0.06	1.30	0.14	NA	NA	NA
7	0.84	-0.10	0.84	-0.10	NA	NA	NA
8	0.92	-0.05	0.73	-0.17	NA	NA	NA
Mathematics intervention							
Mathematics outcomes							
6	1.69	0.29	2.02	0.39	NA	NA	0.14
7	0.83	-0.10	0.80	-0.12	NA	NA	-0.03
8	0.91	-0.05	0.74	-0.17	NA	NA	-0.04
Focus on Mathematics							
Mathematics outcomes							
6	1.05	0.03	0.90	-0.06	1.70	0.29	0.24
7	0.85	-0.09	0.88	-0.07	1.16	0.08	0.09
8	1.59	0.25	1.29	0.14	3.00	0.61	0.19

Note. NA = not applicable

References

Cohen, J. (1988). Statistical power analysis for the behavioral sciences. 2nd ed. Lawrence Erlbaum and Associates: Hillsdale, NJ.

Cooper, H., Charlton, K., Valentine, J.C. & Muhlenbruck, L. (2000). Making the most of summer school: A meta-analytic and narrative review. Monographs of the Society for Research in Child Development, 65 (1), 1-118.

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Appendix D

Changes in Middle School Extended Year Mathematics Program with Becky Nelson

Summer 2005 was the first year the extended year program used the Moving with Math (MWM) program. Subsequently, OCIP staff conducted a correlation study between MWM materials and MCPS curriculum. As a result, the materials used for the majority of extended year mathematics courses were changed to increase rigor and to better align the summer program to the MCPS curriculum students would experience in the upcoming school year. Materials used in summer 2005 in comparison to summers 2006 and 2007 are listed in Table D1.

Table D1
Materials Used in Extended Year Mathematics Program for 2005, 2006, and 2007 by Course

Course	Materials 2005	Materials 2006 & 2007
Intervention Math 6 (Math A)	MWM Level C Numbers & Patterns topic	MWM Summer Extensions Grade 7
Intervention Math 7 (Math B)	MWM Summer Extensions Grade 6	MWM MH Number Sense, Reasoning & Data
Intervention Algebra Prep (Math C)	MWM Middle/High (MH) Geometry & Measurement	MWM MH Geometry & Measurement AND MWM MH Fractions & Decimals
Focus on Math 7 (Math B)	MWM Summer Extensions Grade 7	MWM MH Number Sense, Reasoning & Data
Focus on Investigations in Mathematics	MWM Summer Extensions Grade 8	William & Mary materials (Spatial Reasoning and Numbers & Numerals)
Focus on Algebra	MWM MH Algebra	MWM MH Algebra
Focus on Geometry	No program was offered	Algebra Prep Geometry & Measurement Unit with supplemental created materials

After summer 2005, the Focus on Investigations in Mathematics course was redesigned using material from the Center for Gifted Education, College of William and Mary. In 2006 and 2007, the extended year program included an offering for Focus on Geometry. The program was designed centrally using materials from the geometry and measurement unit within Algebra Prep (Math C) curriculum, because students taking Honors Geometry in middle school have not had the Algebra Prep course.

In summer 2005, teachers used the pacing calendars provided in the Moving with Math materials. In 2006, detailed pacing calendars were designed to ensure that the sequencing and instructional practices aligned with MCPS curriculum. In 2007, those calendars were revised slightly to include more specific opportunities for teachers to differentiate instruction for those students who demonstrate understanding of the concepts.

For summer 2005, there were limited funds available to purchase manipulative kits (student kits and teacher overhead projector kits). For that year, schools were instructed to locate necessary manipulatives to support the program based on materials already available in their mathematics department. For the summer 2006 program, three manipulative student kits and two teacher overhead kits were purchased for each school. In addition, more kits were purchased for the extended day program for 2006–2007 and again for the summer 2007 program. Therefore, for the 2007 extended year program, there were enough kits for each teacher to have their own.

Intervention classes were increased to 20 days and Focus on Mathematics classes were increased to 15 days for summers 2006 and 2007

For summer 2007, professional development was differentiated. Teachers new to using the Moving with Math program were trained on the philosophy of the program and how to follow the MCPS pacing calendars. Use of manipulatives was emphasized, but other information was included to provide a complete picture of the program and its expectations. For staff who had received training previously on the Moving with Math program, the professional development provided more focus on additional ways to design lessons using the manipulatives and differentiating instruction for students within the program.

Appendix E
Changes in Middle School Extended Year Reading Program
with Karen Goldberg

For summer of 2007, all schools were asked to enter their information into OASIS by indicating invitees and if they attended or did not attend. Using the OASIS system, teachers are capable of analyzing MSA test scores and use them as one of the indicators in selecting students.

Since summer 2005, the reading program has made several changes for the extended year program. The focus for reading was limited to four topics based on MSA results: summarization, context clues, main idea, and inferences. These topics were the ones that needed additional time. For each of the four focus topics, teachers received a detailed schedule of specific lessons to be used. The focus topics were designed to be different for each week, resulting in four topics.

The Main Dishes from the Gourmet Curriculum, Inc. were the primary source of materials for the program. These are comprehensive programs are designed as guides that enable the teachers to introduce, practice, and test reading objectives. Within the schedule of recommended lessons, teachers used the introductory lesson then followed by activities, practice exercise and a test. Each focus area started with a pre-assessment, which was intended to help teachers pick the skills that needed increased instruction for students to master the objective. The post-assessment given at the end of the week was used to measure increases in student knowledge. Most of the activities suggested from the Gourmet Curriculum are good for small groups of students, pairs, or even whole class activities.

Only grade level materials were available for use in the program. The material, therefore, was more rigorous for the majority of the students. Jamestown Education Reading Fluency books for levels D, E, and F and also Reader's Theater Plays were also available for use.

"Look-fors" were provided for the reading classes. All reading classes were asked to have objectives posted each day of the program, so students would know what they are working on for the day, as well as anyone visiting the class.