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## **An Exploratory Study of the Black-White Achievement Gap in eMINTS-Student MAP Results**

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**This report presents Missouri Assessment Program (MAP) test results from the FY00, FY01, and FY02 eMINTS cohorts. The purpose of the study was to examine the relationship among factors of race, enrollment in an eMINTS classroom, and performance on the MAP examinations. Findings from this study showed that, while eMINTS enrollment did not impact the achievement gap between Black and White students in a statistically significant way, the performance of both Black and White students was higher and the gap was reduced.**

### **Introduction**

Many recent reform efforts, including the No Child Left Behind Act of 2001 (U.S. Department of Education, 2001) and Missouri's Outstanding Schools Act (1993), emphasized improved performance for all students. One area of particular concern was the difference in performance among different racial and ethnic groups of students. Research suggests that, while Black students have made gains in achievement scores, a gap in performance between Black and White students remains.

According to National Assessment of Educational Progress (NAEP) results over the last 30 years, the gap between Black and White students narrowed in the 1970s and into the 1980s, as Black students made considerable improvement, while the performance of White students over this time remained mostly flat. This trend was reversed during the latter part of the 1980s and into the 1990s, however, when the performance of Black students flattened out, while White-student performance improved (Lee, 2002).

Focusing on more recent statewide examinations in Missouri (i.e., Missouri Assessment Program examinations – MAP) from 2001 to 2003 for communication arts and mathematics in the elementary grades, the achievement gap between Black and White students also proved substantial. During this period, the percentage of Black students scoring in the Proficient or Advanced levels was less than half the percentage of White students scoring at those levels; whereas the percentage of White students scoring in the Proficient or Advance levels ranged from about 36 percent to 44 percent, the percentage of Black students ranged from about 15 percent to 19 percent.

While some programs such as Head Start have produced measured gains for Black children, it remains unclear exactly which policies, programs, or practices of schools may both reduce the achievement gap and sustain this reduction over time. The eMINTS

Program integrates multimedia technology into inquiry-based and student-centered learning. As eMINTS focuses on high achievement for all students, aims at increased parental involvement, and directs student time toward productive academic activities, it may help close the achievement gap. The purpose of this study was to examine this potential impact.

### **Research Design and Data**

This study examined achievement data for Black and White students by eMINTS enrollment for three cohorts of participating schools: the FY00, FY01, and FY02 cohorts. For each cohort, schools applied to participate in the eMINTS program, and upon acceptance, identified eMINTS teachers from those schools participated in a two-year process of professional development. This study used data from the second year of professional development for each cohort. Accordingly, the data covered a three-year period beginning with the 2000-2001 school year (FY00 cohort) and ending with the 2002-2003 school year (FY02 cohort).

Data for each cohort were analyzed independently from the other cohorts, as cohorts represented different students, teachers, and school contexts. The one exception to this pattern is the discussion and conclusion section toward the end of the report, where an assessment of trends regarding the Black-White achievement gap over the three-year period is given.

The student performance measure used in the study was the total Missouri Assessment Program (MAP) score. Scores from the communication arts, science, mathematics, and social studies MAP examinations were included. For each cohort and subject area, the scores of Black students were compared with the scores of White students, and those scores were compared according to enrollment in eMINTS or non-eMINTS classrooms. Data were collected at the individual student level and aggregated across all eMINTS schools per cohort.

### **FY00, FY01, and FY02 eMINTS Cohorts**

Similar to the overall ratio of White to Black students in the state of Missouri, each cohort consisted of a majority of White students and a much smaller percentage of Black students. When limiting the student population to just Black and White students, as this study did, the percentage of Black students according to eMINTS enrollment and subject area ranged from only 3 percent to 12 percent (see Tables 2, 4, and 6 below). Overall, the smallest percentage of Black students was in the FY00 cohort, and the largest was in the FY02 cohort.

Likewise, at the school-building level, the majority of students were White. For the FY00 and FY01 cohorts, each cohort had only one school with a percentage of Black students greater than 50 percent (so, 2 percent of schools for FY00 and 3 percent for FY01). For the FY02 cohort, however, six schools (15 percent of schools) had student populations that were more than 50 percent Black.

In terms of the numbers of Black students per cohort and subject area, those figures ranged from 85 to 235 in FY00, 116 to 138 in FY01, and 117 to 181 in FY02 (see Tables 2, 4, and 6 below). Again, White students represented the majority of the student population in the study; accordingly, in FY00 the range in the numbers of White students was from 1807 to 3543, depending on subject area, 1468 to 1987 in FY01, and 1099 to 1800 in FY02. Because the power of statistical analysis relates to the number of subjects in a study, and the number of Black students by eMINTS enrollment and subject area was as small as 23 (see Table 11), there was an increased likelihood of making a Type II error (i.e., failing to reject the null hypothesis, when in fact it is false) in some analyses.

The segregation of the schools also likely impacted the results of the statistical models used in the study. In particular, the effect of race was different for different classrooms in the FY02 cohort only, which had more classrooms with higher percentages of Black students. Despite this effect, however, the analyses found that Black students did not receive a performance effect that was different from White students when enrolled in an eMINTS classroom (but, as stated above, this may have been due to the small numbers of Black students in each subject area and by eMINTS enrollment).

#### *FY00 Cohort*

The FY00 eMINTS cohort consisted of 47 elementary schools in 44 districts. The eMINTS classrooms in those schools were in the third and fourth grades. Table 1 presents the number of classrooms and students by subject area and eMINTS enrollment. Note that the numbers represent all students, including Black and White students. The numbers of students in eMINTS classrooms were much smaller than the numbers in other classrooms. Whereas the numbers of students in eMINTS classrooms ranged from 508 to 1335, depending on subject area, the numbers in non-eMINTS classrooms ranged from 1520 to 2714.

Table 2 presents the breakdown of students according to the percentages and numbers of Black and White students in the FY00 cohort. The percentages of White students were much larger than the percentages of Black students across classroom type and subject area; the percentages of Black students ranged from 3.4 percent to 8.5 percent of the Black-White population for FY00, whereas the percentages of White students ranged from 91.5 percent to 96.6 percent.

Table 1  
FY00 Classrooms by Grade and eMINTS Enrollment

	Number of Classrooms	Number of Students	Number of Classrooms	Number of Students
<i>Communication Arts</i>				
Non-eMINTS	75	1520	74	1541
eMINTS	26	508	26	512
Total	101	2028	100	2053
<i>Mathematics</i>				
Non-eMINTS	126	2697	126	2714
eMINTS	60	1328	60	1335
Total	186	4025	186	4049

Table 2  
FY00 Black and White Students by eMINTS Enrollment  
(in Percent)

	Non-eMINTS Students	eMINTS Students	Total Students	Number of Students
<i>Communication Arts</i>				
Black Students	3.4	7.5	4.4	85
White Students	96.6	92.5	95.6	1838
Total	100.0	100.0	100.0	1923
<i>Science</i>				
Black Students	3.9	7.5	4.8	91
White Students	96.1	92.5	95.2	1807
Total	100.0	100.0	100.0	1898
<i>Mathematics</i>				
Black Students	5.3	8.5	6.3	235
White Students	94.7	91.5	93.7	3471
Total	100.0	100.0	100.0	3706
<i>Social Studies</i>				
Black Students	5.2	8.4	6.2	235
White Students	94.8	91.6	93.8	3543
Total	100.0	100.0	100.0	3778

*FY01 Cohort*

Table 3 presents numbers for the FY01 eMINTS cohort, which consisted of 39 elementary schools in 36 districts. The eMINTS classrooms in those schools were in the third and fourth grades. The table presents the numbers of classrooms and students by subject area and eMINTS enrollment. Again, the numbers represent all students, including Black and White students. The numbers of students in an eMINTS classroom were again much smaller than the numbers of students in other classrooms; whereas the

Table 3  
FY01 Classrooms by Grade and eMINTS Enrollment

	Number of Classrooms	Number of Students	Number of Classrooms	Number of Students
	<i>Communication Arts</i>		<i>Science</i>	
non-eMINTS	56	1133	56	1132
eMINTS	32	616	32	616
Total	88	1749	88	1748
	<i>Mathematics</i>		<i>Social Studies</i>	
non-eMINTS	68	1448	68	1452
eMINTS	43	866	43	864
Total	111	2314	111	2316

Table 4  
FY01 Black and White Students by eMINTS Enrollment  
(in Percent)

	Non-eMINTS Students	eMINTS Students	Total Students	Number of Students
<i>Communication Arts</i>				
Black Students	10.8	4.1	8.5	137
White Students	89.2	95.9	91.5	1475
Total	100.0	100.0	100.0	1612
<i>Science</i>				
Black Students	10.6	4.3	8.4	134
White Students	89.4	95.7	91.6	1468
Total	100.0	100.0	100.0	1602
<i>Mathematics</i>				
Black Students	7.6	4.7	6.5	138
White Students	92.4	95.3	93.5	1987
Total	100.0	100.0	100.0	2125
<i>Social Studies</i>				
Black Students	6.2	4.5	5.6	116
White Students	93.8	95.5	94.4	1968
Total	100.0	100.0	100.0	2084

numbers of students in eMINTS classrooms ranged from 616 to 866, depending on subject area, the numbers of students in non-eMINTS classrooms ranged from 1132 to 1452.

Table 4 presents the breakdown of students according to the percentages and numbers of Black and White students in the FY01 cohort. The percentages of Black students were much smaller than the percentages of White students across classroom type and subject area; the percentages of Black students ranged from 4.1 percent to 10.8 percent of the

Table 5  
FY02 Classrooms by Grade and eMINTS Enrollment

	Number of Classrooms	Number of Students	Number of Classrooms	Number of Students
	<i>Communication Arts</i>		<i>Science</i>	
non-eMINTS	37	659	37	657
eMINTS	36	671	36	669
Total	73	1330	73	1326
	<i>Mathematics</i>		<i>Social Studies</i>	
non-eMINTS	48	951	48	955
eMINTS	59	1135	57	1103
Total	107	2086	105	2058

Table 6  
FY02 Black and White Students by eMINTS Enrollment  
(in Percent)

	Non-eMINTS Students	eMINTS Students	Total Students	Number of Students
<i>Communication Arts</i>				
Black Students	7.0	11.9	9.5	117
White Students	93.0	88.1	90.5	1116
Total	100.0	100.0	100.0	1233
<i>Science</i>				
Black Students	7.7	12.1	9.9	121
White Students	92.3	87.9	90.1	1099
Total	100.0	100.0	100.0	1220
<i>Mathematics</i>				
Black Students	6.4	11.1	9.0	177
White Students	93.6	88.9	91.0	1800
Total	100.0	100.0	100.0	1977
<i>Social Studies</i>				
Black Students	6.6	11.9	9.4	181
White Students	93.4	88.1	90.6	1739
Total	100.0	100.0	100.0	1920

Black-White population for the FY01 cohort, whereas the percentages of White students ranged from 89.2 percent to 95.9 percent.

#### *FY02 Cohort*

The FY02 eMINTS cohort consisted of 39 elementary schools in 39 districts. The eMINTS classrooms in those schools were in the third and fourth grades. Table 5 presents the number of classrooms and students by subject area and eMINTS enrollment.

Note that the numbers represent all students, including Black and White students. In contrast to FY00 and FY01, the numbers of student in eMINTS compared to non-eMINTS classrooms were more evenly distributed. The numbers of students in eMINTS classrooms ranged from 669 to 1135, depending on subject area, and the numbers of students in non-eMINTS classrooms ranged from 657 to 955.

Table 6 presents the breakdown of students according to the percentages and numbers of Black and White students in the FY02 cohort. The percentages of White students were much larger than the percentages of Black students across classroom type and subject area; the percentages of Black students ranged from 6.4 percent to 12.1 percent of the Black-White population for FY02, whereas the percentages of White students ranged from 87.9 percent to 93.6 percent.

### **The Import of Socioeconomic Status and Other Family Environment Factors**

Beginning with the release of the Coleman Report in 1966, a significant strand of research has suggested that student achievement may be explained to a large degree by factors outside the school building such as family socioeconomic status (SES) (see Alspaugh, 1992; Low & Clement, 1982; Payne & Biddle, 1999; Rothstein, 2004; Sutton, 1999). Including SES in a broader family environment index and then analyzing the relationship between this index and the Black-White achievement gap, one study found that as much as two-thirds of the gap may be explained by family environment factors (Phillips, Brooks-Gunn, Duncan, Klebanov, & Crane, 1998). Similarly, Rothstein affirmed “no analyst has been able to attribute less than two-thirds of the variation in achievement among schools to the family characteristics of their students” (p. 14). In addition to main effects, some researchers have argued that the effect of SES interacts with other variables such as district or school size (see Bickel & Howley, 2000), causing different effects for students at one end of the SES continuum than for students at the other end. With regard to eMINTS enrollment, earlier studies found statistically significant differences in the performance of FRL eligible students by eMINTS enrollment (eMINTS Evaluation Project, 2002, 2003, 2004). Therefore, when analyzing factors that may potentially help explain student outcomes, family environment factors should be included.

Due to the small number of Black students in this study, however, neither SES nor other family environment factors were included in the models, and therefore their effects on MAP performance were not taken into account in the statistical analyses. Their potential effect is worth noting and should be considered when framing appropriate interpretations of the findings. Accordingly, the percentages of Black and White students who were eligible to participate in the federal free or reduced lunch program (FRL) (a proxy for SES) are presented in tables A1, A2, and A3 in Appendix A. The percentages of FRL eligible students were relatively high. For the FY00 cohort, the percentage of FRL eligible Black students by eMINTS enrollment ranged from 50.4 to 83.3 percent, depending on subject area; FRL eligible White students ranged from 34.8 to 45.3 percent. For FY01, the percentage of FRL eligible Black students by eMINTS enrollment ranged from 27.8 to 48.3 percent, depending on subject area; FRL eligible White students ranged

from 41.3 to 44.1 percent. For the FY02 cohort, the percentage of FRL eligible Black students by eMINTS enrollment ranged from 79.7 to 86.7 percent, depending on subject area; FRL eligible White students ranged from 42.2 to 48.7 percent.

With regard to the impact of eMINTS enrollment and the achievement gap, a previous study found a significant interaction between student FRL eligibility and eMINTS enrollment in mathematics for the FY02 cohort, suggesting that eMINTS enrollment narrowed the gap by differentially impacting the performance of low income students (eMINTS Evaluation Project, 2004). With this in mind, the means of Black and White student performance are presented in tables B1, B2, and B3 in Appendix B by FRL eligibility and eMINTS enrollment for all three cohorts. It should be noted that for the FY02 cohort (students in FY02 took the 2003 MAP examinations) in communication arts and science, Black low income students in eMINTS classrooms scored higher on average than White non-low income students not in eMINTS classrooms.

Finally, if SES and other family environment factors matter so much, why focus on race and the achievement gap between Black and White students? One answer to this question is that with regard to average performance, race still matters. When looking at Black and White families with similar incomes, for example, you will still find a significant gap between the races, especially in mathematics skills of entering kindergarten students (Rothstein, 2004). Another answer is that race matters according to recent federal education policy, in particular the No Child Left Behind Act, and its impact on state and local policy. Toward this end, the focus of this study was on race and the achievement gap between Black and White students.

### **Total MAP Scores by eMINTS Enrollment**

This section presents differences in total MAP scores by cohort in two ways. First, for each grade level (third grade for communication arts and science; fourth grade for mathematics and social studies), data are presented on Black student performance differences according to eMINTS enrollment and on White student performance differences according to eMINTS enrollment. The means, standard deviations, lower and upper 95 percent confidence limits for the means, and p-value for the differences in means are presented. Effect size estimates are presented where statistical significance was found. This part of the study addressed the following questions:

- Was there a statistically significant difference in performance between Black students who were enrolled in an eMINTS classroom and Black students who were not enrolled in those classrooms?
- If there was a statistically significant difference, how much of the variance in Black student performance was explained by eMINTS enrollment?
- Was there a statistically significant difference in performance between White students who were enrolled in an eMINTS classroom and White students who were not enrolled in those classrooms?
- If there was a statistically significant difference, how much of the variance in White student performance was explained by eMINTS enrollment?



The second way that differences in total MAP scores are presented compares Black and White student performance according to eMINTS enrollment. For each grade level and subject area, a plot and model are presented that address the following questions:

- What was the difference in mean performance scores for Black and White students according to eMINTS enrollment?
- Did eMINTS enrollment differentially impact the performance of Black students compared to the performance of White students in a statistically significant way?

The plots and models present results from a two-level hierarchical linear model (HLM), which regressed the student-level MAP score on race (Black or White) and eMINTS classroom enrollment. HLM is useful for testing main effects and interactions within and between levels (e.g., student level and classroom level) of data. Both the main effects and the interaction terms are presented. For FY00 and FY01, the model was a random intercept model. This assumed that MAP scores varied between classrooms, but that the effect associated with eMINTS classrooms remained constant across all classrooms. For FY02, the model presupposed both a random intercept and a random slope; the latter characteristic assumed that both the mean MAP score and the effect of race differed between classrooms. For example, this model assumed that the impact of race may differ between a classroom with a majority of Black students and a classroom with only a few Black students.

### **FY00 Cohort (2001 MAP Results)**

#### *Third Grade Performance: Communication Arts and Science*

Table 7 shows that Black students enrolled in an eMINTS classroom for communication arts during the 2000-2001 school year scored about 6 points higher on average than Black students not enrolled in an eMINTS classroom. This difference in means, however, was not statistically significant. For science, Black students not enrolled in an eMINTS classroom scored about 5 points higher on average than those students who were enrolled. Again, the difference was not statistically significant. Because statistical significance was not found, effect size estimates are not presented.

Table 7  
2001 Mean MAP Score Values by eMINTS Enrollment  
Black Students, 3<sup>rd</sup> Grade Tests

Student Enrollment	Number of Students	Mean	Standard Deviation	Lower 95% Confidence Limit for Mean	Upper 95% Confidence Limit for Mean
<i>Communication Arts</i>					
Non-eMINTS Students	48	622.06	30.62	613.17	630.95
eMINTS Students	37	628.11	23.38	620.31	635.90
All Black Students	85	624.69	27.71	618.72	630.67
<u>Differences in Means</u>			<u>P-Value</u>		
eMINTS vs. Non-eMINTS Students		6.05	0.3215		
<i>Science</i>					
Non-eMINTS Students	55	619.33	38.73	608.86	629.80
eMINTS Students	36	614.17	30.28	603.92	624.41
All Black Students	91	617.29	35.54	609.88	624.69
<u>Differences in Means</u>			<u>P-Value</u>		
eMINTS vs. Non-eMINTS Students		-5.16	0.5013		

Table 8 shows that White students enrolled in an eMINTS classroom for communication arts during the 2000-2001 school year scored about 5 points higher on average than White students who were not enrolled in an eMINTS classroom. While the difference in means was statistically significant, the effect size was small. An effect size of this magnitude meant that 1 percent of the variance in total MAP scores was explained by eMINTS enrollment. For science, White students enrolled in an eMINTS classroom scored about 5 points higher on average than those students who were not enrolled. Again, the difference was statistically significant, but less than 1 percent of the variance was explained by eMINTS enrollment.

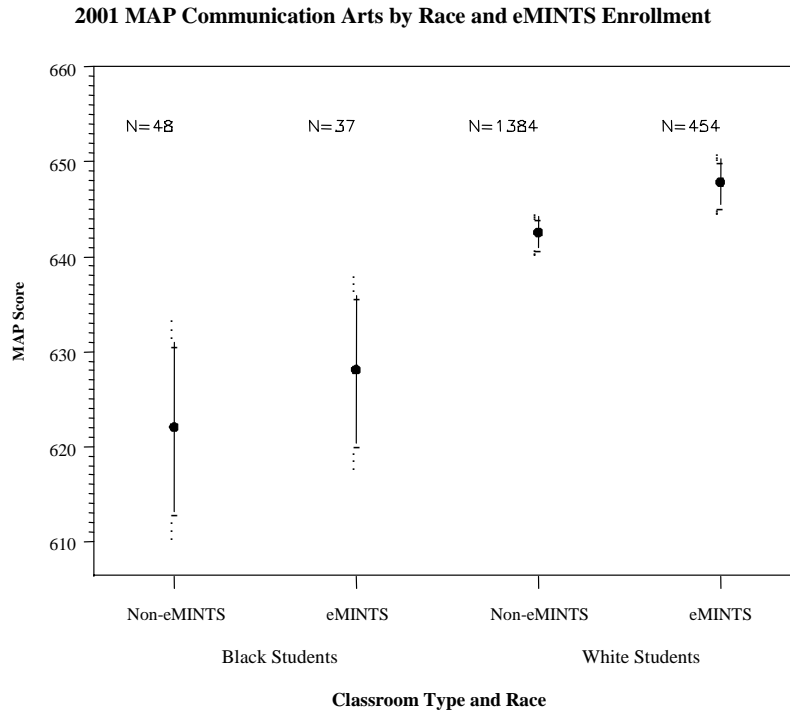
Table 8  
2001 Mean MAP Score Values by eMINTS Enrollment  
White Students, 3<sup>rd</sup> Grade Tests

Student Enrollment	Number of Students	Mean	Standard Deviation	Lower 95% Confidence Limit for Mean	Upper 95% Confidence Limit for Mean
<i>Communication Arts</i>					
Non-eMINTS Students	1384	642.60	30.20	641.01	644.19
eMINTS Students	454	647.89	26.17	645.48	650.30
All White Students	1838	643.91	29.34	642.56	645.25
<u>Differences in Means</u>			P-Value		
eMINTS vs. Non-eMINTS Students		5.29	0.0003		
<u>Effect Size Estimates</u>		Estimate	Variance		
Cohens D		0.195	0.003		
Hedges G		0.194	0.003		
<i>Science</i>					
Non-eMINTS Students	1361	640.91	36.66	638.96	642.86
eMINTS Students	446	645.86	32.61	642.82	648.89
All White Students	1807	642.13	35.76	640.48	643.78
<u>Differences in Means</u>			P-Value		
eMINTS vs. Non-eMINTS Students		4.95	0.0072		
<u>Effect Size Estimates</u>		Estimate	Variance		
Cohens D		0.147	0.003		
Hedges G		0.147	0.003		

Figure 1 presents the model for the 2001 MAP test in communication arts. Because the interaction term was not significant, Black students did not receive a performance effect that was different from White students when enrolled in an eMINTS classroom. In other words the achievement gap between Black and White students was not reduced in a statistically significant way when students were enrolled in an eMINTS classroom. Moreover, Black students scored 22.71 points lower on average than White students. Students in an eMINTS classroom scored 4.59 points higher on average than other students, controlling for the effect of race.

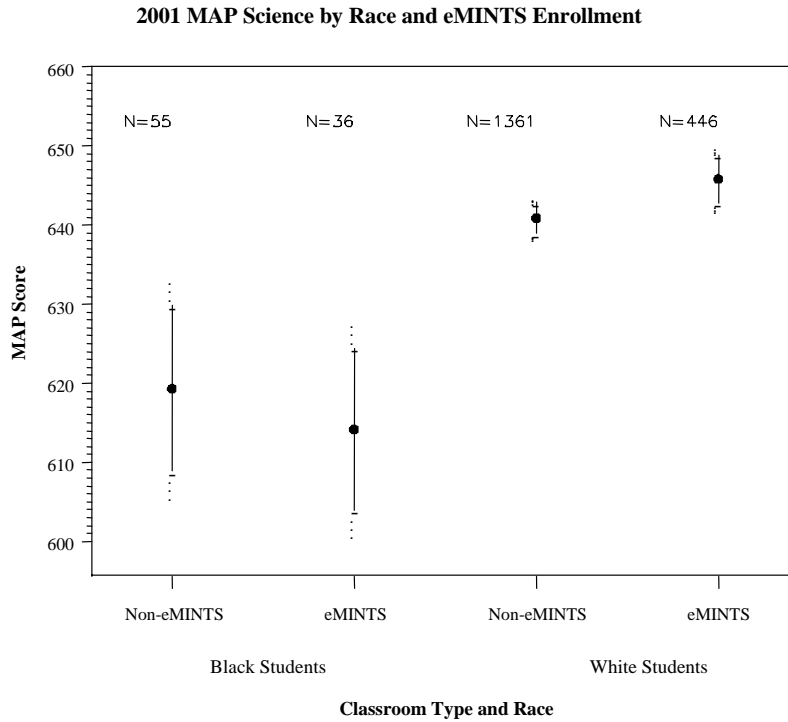
The overall fit of Model 2 was improved by 2.33 percent over Model 1 (i.e., the unconditional model), when race (Black or White) and eMINTS classroom enrollment were included.

**Figure 1**  
**2001 MAP Communication Arts Model: eMINTS Enrollment and Race**  
**Two-level HLM Model**



	<i>Model 1</i>				<i>Model 2</i>			
	Coefficient	Standard Error	Df	P-Value	Coefficient	Standard Error	Df	P-Value
Intercept	642.88	1.31	99	<0.0001	642.69	1.50	99	<0.0001
Black Student								
<i>No</i>								
Yes					-22.71	4.32	1820	<0.0001
Student Enrolled in an eMINTS Classroom								
<i>No</i>								
Yes					4.59	2.86	1820	0.1078
Interaction					1.75	6.55	1820	0.7890
Model P-Value	<0.0001				<0.0001			
Residual Variance	742.93				725.60			
% Improvement					2.33			
Number of Black & White Students	1923				1923			
Number of Classrooms	100				100			

**Figure 2**  
**2001 MAP Science Model: eMINTS Enrollment and Race**  
**Two-level HLM Model**



	<i>Model 1</i>				<i>Model 2</i>			
	Coefficient	Standard Error	Df	P-Value	Coefficient	Standard Error	Df	P-Value
Intercept	640.87	1.50	98	<0.0001	641.25	1.76	98	<0.0001
Black Student								
<i>No</i>								
Yes					-26.70	5.07	1796	<0.0001
Student Enrolled in an eMINTS Classroom								
<i>No</i>								
Yes					3.69	3.44	1796	0.2840
Interaction					-4.32	8.01	1796	0.5894
Model P-Value	<0.0001				<0.0001			
Residual Variance	1144.34				1112.76			
% Improvement					2.76			
Number of Black & White Students	1898				1898			
Number of Classrooms	99				99			

Figure 2 presents the model for the 2001 MAP test in science. Because the interaction term was not significant, Black students did not receive a performance effect that was different from White students when enrolled in an eMINTS classroom. In other words the achievement gap between Black and White students was not reduced in a statistically significant way when students were enrolled in an eMINTS class. Moreover, Black students scored 26.70 points lower on average than White students. Students in an eMINTS classroom scored 3.69 points higher on average than other students, controlling for the effect of race.

The overall fit of Model 2 was improved by 2.76 percent over Model 1 (i.e., the unconditional model), when including race (Black or White) and eMINTS classroom enrollment.

*Fourth Grade Performance: Mathematics and Social Studies*

Table 9 shows that Black students enrolled in an eMINTS classroom for mathematics during the 2000-2001 school year scored only about 2 points higher on average than Black students who were not enrolled in said classroom. This difference in means was not statistically significant. For social studies, Black students not enrolled in an eMINTS classroom scored less than 1 point higher than those students who were enrolled. Again, the difference was not statistically significant. Because statistical significance was not found, effect size estimates are not presented.

Table 9  
2001 Mean MAP Score Values by eMINTS Enrollment  
Black Students, 4<sup>th</sup> Grade Tests

Student Enrollment	Number of Students	Mean	Standard Deviation	Lower 95% Confidence Limit for Mean	Upper 95% Confidence Limit for Mean
<i>Mathematics</i>					
Non-eMINTS Students	131	621.80	31.98	616.27	627.33
eMINTS Students	104	623.68	34.51	616.97	630.39
All Black Students	235	622.63	33.07	618.38	626.88
<u>Differences in Means</u>			P-Value		
eMINTS vs. Non-eMINTS Students		1.88	0.6658		
<i>Social Studies</i>					
Non-eMINTS Students	131	642.68	21.55	638.95	646.40
eMINTS Students	104	641.98	20.31	638.03	645.93
All Black Students	235	642.37	20.97	639.68	645.07
<u>Differences in Means</u>			P-Value		
eMINTS vs. Non-eMINTS Students		-0.70	0.8004		

Table 10 shows that White students enrolled in an eMINTS classroom for mathematics during the 2000-2001 school year scored almost 9 points higher on average than White students who were not enrolled. While the difference in means was statistically

significant, the effect size was small. An effect size of 0.24 meant that 1.4 percent of the variance in total MAP scores was explained by eMINTS enrollment. For social studies, White students enrolled in an eMINTS classroom scored about 7 points higher on average than those students who were not enrolled. The difference was statistically significant. The effect size was 0.34, therefore 2.8 percent of the variance was explained by eMINTS enrollment.

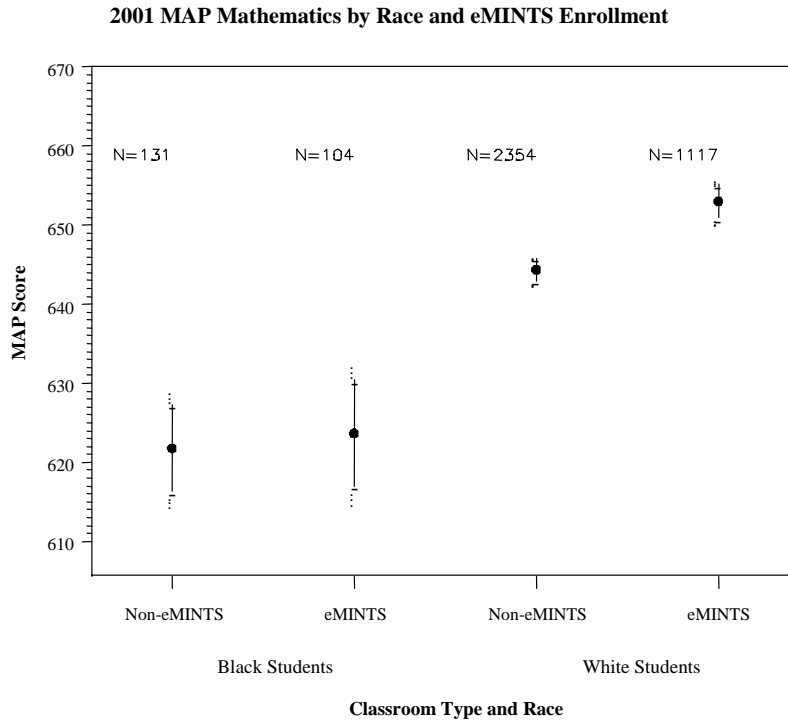
Table 10  
2001 Mean MAP Score Values by eMINTS Enrollment  
White Students, 3<sup>rd</sup> Grade Tests

Student Enrollment	Number of Students	Mean	Standard Deviation	Lower 95% Confidence Limit for Mean	Upper 95% Confidence Limit for Mean
<i>Mathematics</i>					
Non-eMINTS Students	2354	644.38	34.82	642.97	645.79
eMINTS Students	1117	653.03	36.66	650.88	655.18
All White Students	3471	647.16	35.65	645.98	648.35
<u>Differences in Means</u>			P-Value		
eMINTS vs. Non-eMINTS Students		8.65	0.0001		
<u>Effect Size Estimates</u>			Estimate	Variance	
Cohens D			0.240	0.001	
Hedges G			0.240	0.001	
<i>Social Studies</i>					
Non-eMINTS Students	2406	656.16	21.99	655.28	657.04
eMINTS Students	1137	663.41	21.00	662.19	664.63
All White Students	3543	658.49	21.94	657.76	659.21
<u>Differences in Means</u>			P-Value		
eMINTS vs. Non-eMINTS Students		7.26	0.0001		
<u>Effect Size Estimates</u>			Estimate	Variance	
Cohens D			0.340	0.001	
Hedges G			0.340	0.001	

Figure 3 presents the model for the 2001 MAP test in mathematics. Because the interaction term was not significant, Black students did not receive a performance effect that was different from White students when enrolled in an eMINTS classroom. In other words the achievement gap between Black and White students was not reduced in a statistically significant way when students were enrolled in an eMINTS class. Moreover, Black students scored 22.87 points lower on average than White students after controlling for the effect of eMINTS enrollment. Students in an eMINTS classroom scored 9.71 points higher on average than other students, controlling for the effect of race.

The overall fit of Model 2 was improved by 1.88 percent over Model 1 (i.e., the unconditional model), when including race (Black or White) and eMINTS enrollment.

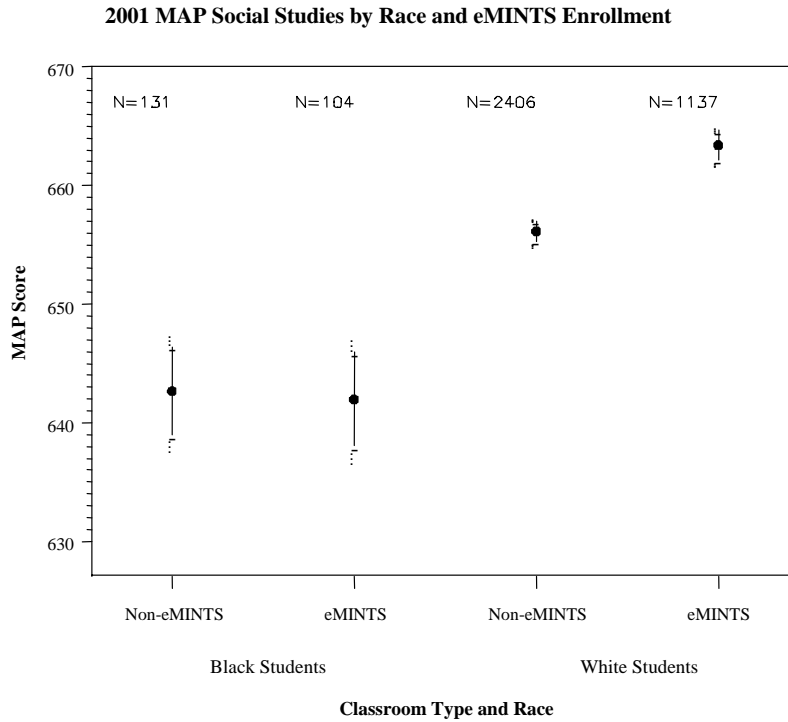
**Figure 3**  
**2001 MAP Mathematics Model: eMINTS Enrollment and Race**  
**Two-level HLM Model**



	<i>Model 1</i>				<i>Model 2</i>			
	Coefficient	Standard Error	Df	P-Value	Coefficient	Standard Error	Df	P-Value
Intercept	644.62	1.23	176	<0.0001	643.25	1.34	176	<0.0001
Black Student								
<i>No</i>								
Yes					-22.87	3.51	3526	<0.0001
Student Enrolled in an eMINTS Classroom								
<i>No</i>								
Yes					9.71	2.16	3526	<0.0001
Interaction					-4.37	5.59	3526	0.4343
Model P-Value	<0.0001				<0.0001			
Residual Variance	1122.18				1101.08			
% Improvement					1.88			
Number of Black & White Students	3706				3706			
Number of Classrooms	177				177			



**Figure 4**  
**2001 MAP Social Studies Model: eMINTS Enrollment and Race**  
**Two-level HLM Model**



	<i>Model 1</i>				<i>Model 2</i>			
	Coefficient	Standard Error	Df	P-Value	Coefficient	Standard Error	Df	P-Value
Intercept	657.09	0.75	180	<0.0001	655.54	0.80	180	<0.0001
Black Student								
<i>No</i>								
Yes					-13.74	2.17	3594	<0.0001
Student Enrolled in an eMINTS Classroom								
<i>No</i>								
Yes					8.23	1.31	3594	<0.0001
Interaction					-5.12	3.45	3594	0.1386
Model P-Value	<0.0001				<0.0001			
Residual Variance	423.55				414.68			
% Improvement					2.09			
Number of Black & White Students	3778				3778			
Number of Classrooms	181				181			

Figure 4 presents the model for the 2001 MAP test in social studies. Because the interaction term was not significant, Black students did not receive a performance effect that was different from White students when enrolled in an eMINTS classroom. In other words the achievement gap between Black and White students was not reduced in a statistically significant way when students were enrolled in an eMINTS class. Moreover, Black students scored 13.74 points lower on average than White students after controlling for the effect of eMINTS enrollment. Students in an eMINTS classroom scored 8.23 points higher on average than other students, controlling for the effect of race.

The overall fit of Model 2 was improved by 2.09 percent over Model 1 (i.e., the unconditional model), when including race (Black or White) and eMINTS classroom enrollment.

### *FY00 Cohort: Summary and Discussion*

This cohort analysis of total MAP scores according to race and eMINTS enrollment for the 2000-2001 school year suggests that Black student performance in an eMINTS classroom was mixed when compared to the performance of Black students not enrolled. Enrolled White students, however, consistently performed higher than those White students not enrolled in an eMINTS classroom. Keep in mind that the small numbers of Black students and the relatively large percentages of students eligible for the federal free or reduced lunch program likely impacted the findings from the statistical analyses; accordingly, those findings should be viewed cautiously.

For communication arts and to a lesser degree mathematics, Black students enrolled in an eMINTS classroom scored higher on average than Black students not enrolled in an eMINTS classroom. For science and social studies, however, the performance of Black students enrolled was on average just slightly lower than of those Black students not enrolled. No statistically significant differences were found between the performance of Black students enrolled and the performance of Black students not enrolled in an eMINTS classroom. Therefore, there is little evidence to suggest that Black students in the FY00 cohort experienced a consistent performance benefit associated with eMINTS.

The findings suggested a different impact on White students, as the effect of eMINTS enrollment on their performance was found to be statistically significant across all four subject areas. The average differences in performance of White students enrolled in eMINTS classes compared to those White students not enrolled ranged from 4.95 points higher in science to 8.65 points higher in mathematics. The greatest amount of variance of total MAP scores explained was in social studies, with almost 3 percent of the variance explained by eMINTS enrollment; the amount of variance explained in the other content areas was around 1 percent.

Despite the differences in average performance of Black students compared to White students by eMINTS enrollment, however, the HLM models showed that Black students did not receive a performance effect that was statistically significantly different from White students when enrolled in an eMINTS classroom. In other words, there was no

statistically significant reduction in the achievement gap for the FY00 cohort. For all subject areas except communication arts, however, the gap between Black and White student performance was greater for students enrolled in an eMINTS classroom than for those students not enrolled.

On average, student performance was higher (ranging from 3.69 to 9.71 points higher) when enrolled in an eMINTS classroom.

### **FY01 Cohort (2002 MAP Results)**

#### *Third Grade Performance: Communication Arts and Science*

Table 11 shows that Black students enrolled in an eMINTS classroom for communication arts during the 2001-2002 school year scored 7.60 points higher on average than Black students who were not enrolled in an eMINTS classroom. The difference in means, however, was not statistically significant. For science, Black students enrolled in an eMINTS classroom scored more than 12 points higher on average than those students who were not enrolled. Again, the difference was not statistically significant. Because statistical significance was not found, effect size estimates are not presented.

Table 11  
2002 Mean MAP Score Values by eMINTS Enrollment  
Black Students, 3<sup>rd</sup> Grade Tests

Student Enrollment	Number of Students	Mean	Standard Deviation	Lower 95% Confidence Limit for Mean	Upper 95% Confidence Limit for Mean
<i>Communication Arts</i>					
Non-eMINTS Students	114	618.58	29.44	613.12	624.04
eMINTS Students	23	626.17	21.08	617.06	635.29
All Black Students	137	619.85	28.29	615.07	624.63
<u>Differences in Means</u>			P-Value		
eMINTS vs. Non-eMINTS Students		7.60	0.2416		
<i>Science</i>					
Non-eMINTS Students	110	603.61	33.83	597.22	610.00
eMINTS Students	24	616.21	24.70	605.78	626.64
All Black Students	134	605.87	32.67	600.28	611.45
<u>Differences in Means</u>			P-Value		
eMINTS vs. Non-eMINTS Students		12.60	0.0869		

Table 12 shows that White students enrolled in an eMINTS classroom for communication arts during the 2001-2002 school year scored almost 2 points lower on average than White students who were not enrolled in an eMINTS classroom. The difference was not statistically significant. For science, White students enrolled in an eMINTS classroom scored more than 2 points lower on average than those students who were not enrolled.

Table 12  
2002 Mean MAP Score Values by eMINTS Enrollment  
White Students, 3<sup>rd</sup> Grade Tests

Student Enrollment	Number of Students	Mean	Standard Deviation	Lower 95% Confidence Limit for Mean	Upper 95% Confidence Limit for Mean
<i>Communication Arts</i>					
Non-eMINTS Students	943	647.44	28.59	645.61	649.26
eMINTS Students	532	645.52	29.87	642.98	648.07
All White Students	1475	646.75	29.06	645.26	648.23
<u>Differences in Means</u>			P-Value		
eMINTS vs. Non-eMINTS Students		-1.91	0.2246		
<i>Science</i>					
Non-eMINTS Students	930	644.06	31.02	642.06	646.05
eMINTS Students	538	641.53	32.47	638.78	644.28
All White Students	1468	643.13	31.57	641.52	644.75
<u>Differences in Means</u>			P-Value		
eMINTS vs. Non-eMINTS Students		-2.52	0.1403		

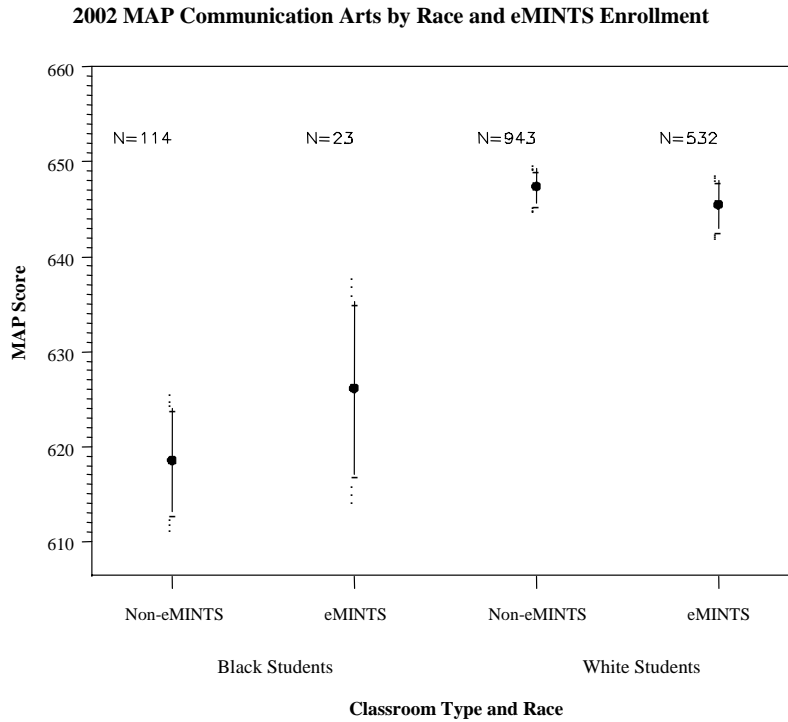
Again, the difference was not statistically significant. Because statistical significance was not found, effect size estimates are not presented.

Figure 5 presents the model for the 2002 MAP test in communication arts. Because the interaction term was not significant, Black students did not receive a performance effect that was different from White students when enrolled in an eMINTS classroom. In other words the achievement gap between Black and White students was not reduced in a statistically significant way when students were enrolled in an eMINTS class. Moreover, Black students scored 22.93 points less on average than White students. Students in an eMINTS classroom scores were similar to other students; eMINTS student scores were only 0.85 points lower on average.

The overall fit of Model 2 was improved by 1.71 percent over Model 1 (i.e., the unconditional model), when including race (Black or White) and eMINTS enrollment.

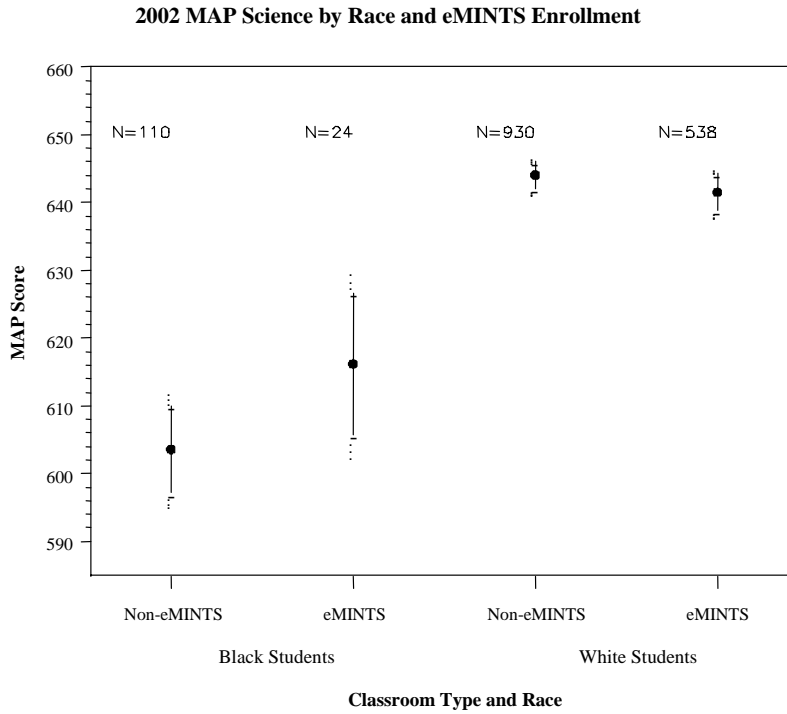
Figure 6 presents the model for the 2002 MAP test in science. Because the interaction term was not significant, Black students did not receive a performance effect that was different from White students when enrolled in an eMINTS classroom. In other words the achievement gap between Black and White students was not reduced in a statistically significant way when students were enrolled in an eMINTS class. Moreover, Black students scored 32.27 points lower on average than White students. Scores on average of students in an eMINTS classroom scores were similar to other students; eMINTS student scores were only 0.60 points on average lower after controlling for race.

**Figure 5**  
**2002 MAP Communication Arts Model: eMINTS Enrollment and Race**  
**Two-level HLM Model**



	<i>Model 1</i>				<i>Model 2</i>			
	Coefficient	Standard Error	Df	P-Value	Coefficient	Standard Error	Df	P-Value
Intercept	644.38	1.41	87	<0.0001	646.59	1.59	86	<0.0001
Black Student								
<i>No</i>								
Yes					-22.93	3.57	1522	<0.0001
Student Enrolled in an eMINTS Classroom								
<i>No</i>								
Yes					-0.85	2.63	86	0.7487
Interaction					-2.26	7.85	1522	0.7730
Model P-Value	<0.0001				<0.0001			
Residual Variance	766.96				753.82			
% Improvement					1.71			
Number of Black & White Students	1612				1612			
Number of Classrooms	88				88			

**Figure 6**  
**2002 MAP Science Model: eMINTS Enrollment and Race**  
**Two-level HLM Model**



	<i>Model 1</i>				<i>Model 2</i>			
	Coefficient	Standard Error	Df	P-Value	Coefficient	Standard Error	Df	P-Value
Intercept	640.45	1.94	87	<0.0001	643.12	2.21	86	<0.0001
Black Student								
<i>No</i>								
Yes					-32.27	4.05	1512	<0.0001
Student Enrolled in an eMINTS Classroom								
<i>No</i>								
Yes					-0.60	3.65	86	0.8699
Interaction					0.07	8.28	1512	0.9937
Model P-Value	<0.0001				<0.0001			
Residual Variance	825.26				794.01			
% Improvement					3.79			
Number of Black & White Students	1602				1602			
Number of Classrooms	88				88			

The overall fit of Model 2 was improved by 3.79 percent over Model 1 (i.e., the unconditional model), when including race (Black or White) and eMINTS enrollment.

*Fourth Grade Performance: Mathematics and Social Studies*

Table 13 shows that Black students enrolled in an eMINTS classroom for mathematics during the 2001-2002 school year scored almost 20 points higher on average than Black students who were not enrolled in an eMINTS classroom. This difference in means was statistically significant. The effect size was medium; the amount of variance in the total MAP scores explained by eMINTS enrollment was 7 percent. For social studies, Black students enrolled in an eMINTS classroom scored about 9 points higher on average than those students who were not enrolled. The difference, however, was not statistically significant. Because statistical significance was not found for social studies, effect size estimates are not presented.

Table 13  
2002 Mean MAP Score Values by eMINTS Enrollment  
Black Students, 4<sup>th</sup> Grade Tests

Student Enrollment	Number of Students	Mean	Standard Deviation	Lower 95% Confidence Limit for Mean	Upper 95% Confidence Limit for Mean
<i>Mathematics</i>					
Non-eMINTS Students	100	601.03	36.36	593.82	608.24
eMINTS Students	38	620.63	35.49	608.97	632.30
All Black Students	138	606.43	37.05	600.19	612.66
<u>Differences in Means</u>			<u>P-Value</u>		
eMINTS vs. Non-eMINTS Students		19.60	0.0051		
<u>Effect Size Estimates</u>		<u>Estimate</u>	<u>Variance</u>		
Cohens D		0.553	0.038		
Hedges G		0.549	0.037		
<i>Social Studies</i>					
Non-eMINTS Students	80	634.68	27.68	628.52	640.83
eMINTS Students	36	643.94	27.35	634.69	653.20
All Black Students	116	637.55	27.79	632.44	642.66
<u>Differences in Means</u>			<u>P-Value</u>		
eMINTS vs. Non-eMINTS Students		9.27	0.0967		

Table 14 shows that White students enrolled in an eMINTS classroom for mathematics during the 2001-2002 school year scored almost 8 points higher on average than White students who were not enrolled. While the difference in means was statistically significant, the effect size was small. An effect size of 0.027 meant that 1.2 percent of the variance in total MAP scores was explained by eMINTS enrollment. For social studies, White students enrolled in an eMINTS classroom scored 2.56 points higher on

Table 14  
2002 Mean MAP Score Values by eMINTS Enrollment  
White Students, 3<sup>rd</sup> Grade Tests

Student Enrollment	Number of Students	Mean	Standard Deviation	Lower 95% Confidence Limit for Mean	Upper 95% Confidence Limit for Mean
<i>Mathematics</i>					
Non-eMINTS Students	1213	641.27	33.58	639.38	643.16
eMINTS Students	774	649.21	38.48	646.49	651.92
All White Students	1987	644.36	35.77	642.79	645.93
<u>Differences in Means</u>			P-Value		
eMINTS vs. Non-eMINTS Students		7.94	0.0001		
<u>Effect Size Estimates</u>			Estimate	Variance	
Cohens D			0.217	0.002	
Hedges G			0.217	0.002	
<i>Social Studies</i>					
Non-eMINTS Students	1201	655.31	22.52	654.04	656.59
eMINTS Students	767	657.87	25.18	656.08	659.65
All White Students	1968	656.31	23.62	655.27	657.35
<u>Differences in Means</u>			P-Value		
eMINTS vs. Non-eMINTS Students		2.56	0.0224		
<u>Effect Size Estimates</u>			Estimate	Variance	
Cohens D			0.106	0.002	
Hedges G			0.106	0.002	

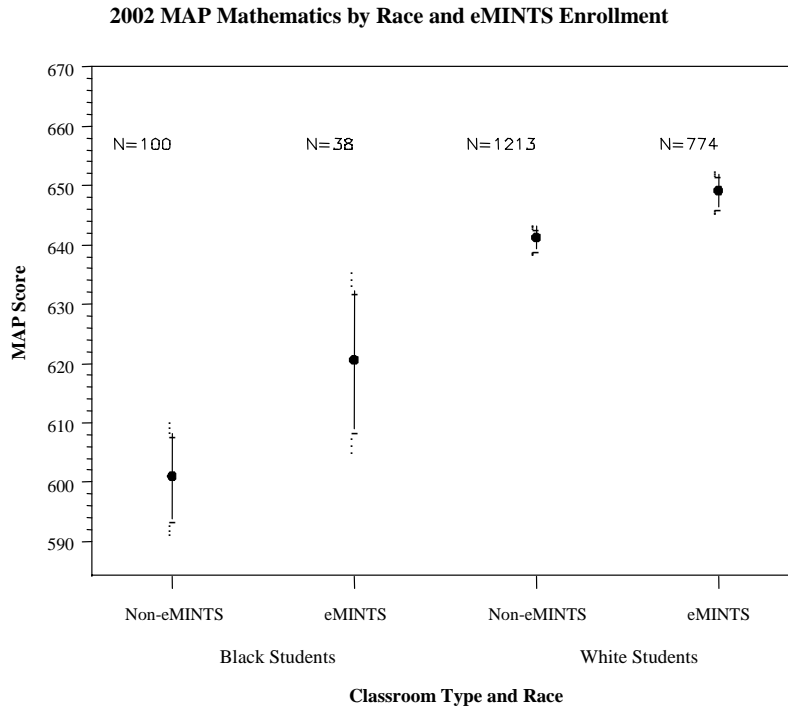
average than those students who were not enrolled. The difference was statistically significant. The effect size was 0.106, and so less than 1 percent of the variance was explained by eMINTS enrollment.

Figure 7 presents the model for the 2002 MAP test in mathematics. Because the interaction term was not significant, Black students did not receive a performance effect that was different from White students when enrolled in an eMINTS classroom. In other words the achievement gap between Black and White students was not reduced in a statistically significant way when students were enrolled in an eMINTS class. Moreover, Black students scored 30.21 points less on average than White students, controlling for the effect of eMINTS enrollment. Students in an eMINTS classroom scored 9.32 points on average higher than other students, controlling for the effect of race.

The overall fit of Model 2 was improved by 2.64 percent over Model 1 (i.e., the unconditional model), when including race (Black or White) and eMINTS enrollment.

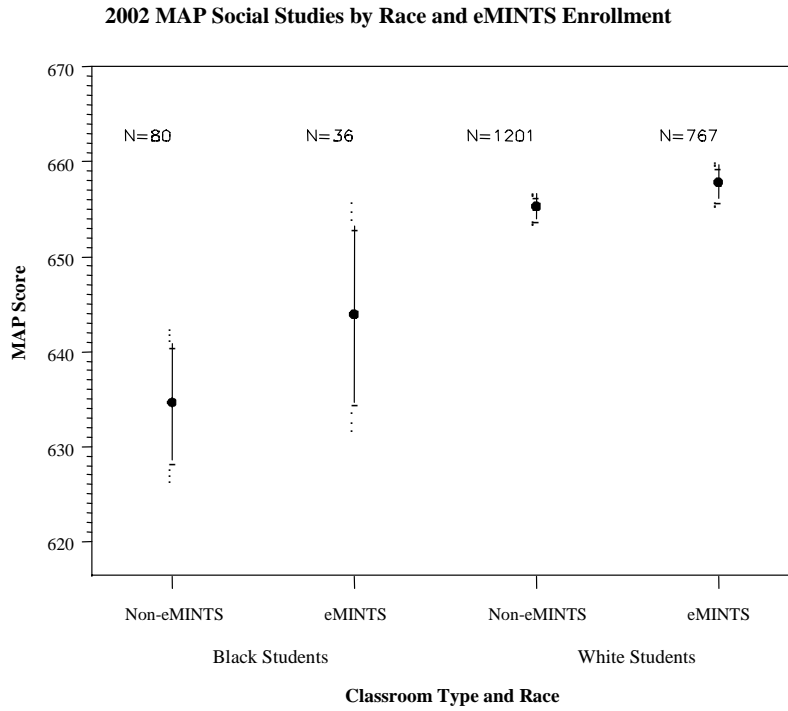


Figure 7  
2002 MAP Mathematics Model: eMINTS Enrollment and Race  
Two-level HLM Model



	<i>Model 1</i>				<i>Model 2</i>			
	Coefficient	Standard Error	Df	P-Value	Coefficient	Standard Error	Df	P-Value
Intercept	642.13	1.72	110	<0.0001	640.53	1.98	109	<0.0001
Black Student								
<i>No</i>								
Yes					-30.21	4.39	2012	<0.0001
Student Enrolled in an eMINTS Classroom								
<i>No</i>								
Yes					9.32	3.16	109	0.0040
Interaction					-4.86	7.84	2012	0.5358
Model P-Value	<0.0001				<0.0001			
Residual Variance	1107.95				1078.73			
% Improvement					2.64			
Number of Black & White Students	2125				2125			
Number of Classrooms	111				111			

**Figure 8**  
**2002 MAP Social Studies Model: eMINTS Enrollment and Race**  
**Two-level HLM Model**



	<i>Model 1</i>				<i>Model 2</i>			
	Coefficient	Standard Error	Df	P-Value	Coefficient	Standard Error	Df	P-Value
Intercept	655.03	1.14	110	<0.0001	654.80	1.42	109	<0.0001
Black Student								
<i>No</i>								
Yes					-15.78	3.01	1971	<0.0011
Student Enrolled in an eMINTS Classroom								
<i>No</i>								
Yes					3.23	2.27	109	0.1567
Interaction					-4.33	5.42	1971	0.4251
Model P-Value	<0.0001				<0.0001			
Residual Variance	478.53				469.56			
% Improvement					1.87			
Number of Black & White Students	2084				2084			
Number of Classrooms	111				111			

Figure 8 presents the model for the 2002 MAP test in social studies. Because the interaction term was not significant, Black students did not receive a performance effect that was different from White students when enrolled in an eMINTS classroom. In other words the achievement gap between Black and White students was not reduced in a statistically significant way when students were enrolled in an eMINTS class. Moreover, Black students scored 15.78 points less on average than White students. Students in an eMINTS classroom scored 3.23 points on average higher than other students, controlling for the effect of race.

The overall fit of Model 2 was improved by 1.87 percent over Model 1 (i.e., the unconditional model), when including race (Black or White) and eMINTS classroom enrollment.

#### *FY01 Cohort: Summary and Discussion*

This cohort analysis of total MAP scores according to race and eMINTS enrollment for the 2001-2002 school year suggests that Black student performance in an eMINTS classroom was considerably and consistently higher when compared to the performance of Black students not enrolled in an eMINTS classroom. Results for White students were mixed. Keep in mind that the small numbers of Black students and the relatively large percentages of students eligible for the federal free or reduced lunch program likely impacted the findings from the statistical analyses; accordingly, those findings should be viewed cautiously.

The average performance of Black students enrolled in an eMINTS classroom was higher in each subject area compared to the average performance of Black students not enrolled; the average difference ranged from 7.60 points in communication arts to 19.60 points in mathematics. The latter was the only subject area where statistical significance was found. In addition to statistical significance, that difference had practical significance, as 7 percent of the variance in total MAP scores was explained by eMINTS enrollment.

With regard to White students, the findings suggested that eMINTS enrollment positively impacted their performance in mathematics and social studies; those average scores were statistically significantly higher than the average scores of White students not enrolled. For communication arts and science, however, no statistically significant difference was found. Put differently, there was a different effect in the fourth grade than in the third grade. In mathematics, the performance of White students in an eMINTS classroom was almost 8 points higher than the performance of those not enrolled, but this accounted for only about 1 percent of the variance in total MAP scores. In social studies, the difference was only about 2.5 points, and the amount of variance explained was less than 1 percent. Note that the average performance for students enrolled in an eMINTS classroom for communication arts or science was slightly lower than the performance of students not enrolled.

Concerning the gap in performance between Black and White students, for all subject areas the HLM models showed that Black students did not receive a performance effect

that was statistically significantly different from White students when enrolled in an eMINTS classroom. The difference in average scores for Black students enrolled in eMINTS classrooms compared to Black students not enrolled, however, was considerably greater than the difference in average scores for White students enrolled compared to those White students not enrolled.

In communication arts and science, the performance of students in an eMINTS class had an average score similar to other students. For mathematics and social studies, however, scores were higher (ranging from 3.23 to 9.32 points higher) when enrolled in an eMINTS classroom.

### **FY02 Cohort (2003 MAP Results)**

#### *Third Grade Performance: Communication Arts and Science*

Table 15 shows that Black students enrolled in an eMINTS classroom for communication arts during the 2002-2003 school year scored over 13 points higher on average than Black students who were not enrolled in an eMINTS classroom. The difference in means, however, was not statistically significant. For science, Black students enrolled in an eMINTS classroom also scored more than 13 points higher on average than those students who were not enrolled. Again, the difference was not statistically significant. Because statistical significance was not found, effect size estimates are not presented.

Table 15  
2003 Mean MAP Score Values by eMINTS Enrollment  
Black Students, 3<sup>rd</sup> Grade Tests

Student Enrollment	Number of Students	Mean	Standard Deviation	Lower 95% Confidence Limit for Mean	Upper 95% Confidence Limit for Mean
<i>Communication Arts</i>					
Non-eMINTS Students	43	635.95	36.67	624.67	647.24
eMINTS Students	74	649.47	40.44	640.10	658.84
All Black Students	117	644.50	39.48	637.27	651.73
<u>Differences in Means</u>			P-Value		
eMINTS vs. Non-eMINTS Students		13.52	0.0740		
<i>Science</i>					
Non-eMINTS Students	46	632.87	46.10	619.18	646.56
eMINTS Students	75	646.21	42.05	636.54	655.89
All Black Students	121	641.14	43.93	633.23	649.05
<u>Differences in Means</u>			P-Value		
eMINTS vs. Non-eMINTS Students		13.34	0.1051		

Table 16  
2003 Mean MAP Score Values by eMINTS Enrollment  
White Students, 3<sup>rd</sup> Grade Tests

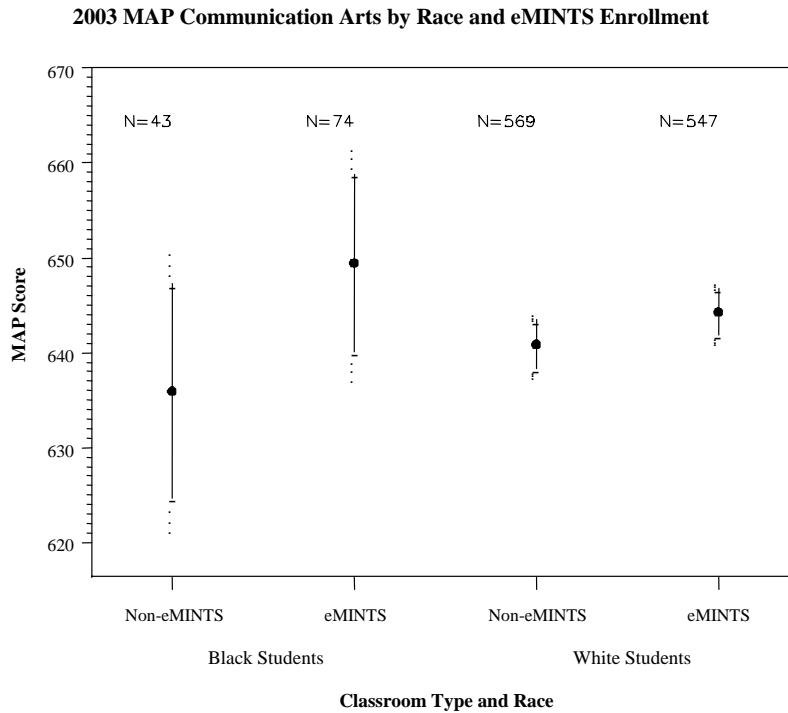
Student Enrollment	Number of Students	Mean	Standard Deviation	Lower 95% Confidence Limit for Mean	Upper 95% Confidence Limit for Mean
<i>Communication Arts</i>					
Non-eMINTS Students	569	640.89	31.13	638.32	643.45
eMINTS Students	547	644.30	29.07	641.86	646.74
All White Students	1116	642.56	30.18	640.79	644.33
<u>Differences in Means</u>			P-Value		
eMINTS vs. Non-eMINTS Students		3.41	0.0589		
<i>Science</i>					
Non-eMINTS Students	552	640.81	31.66	638.16	643.45
eMINTS Students	547	640.45	30.19	637.91	642.98
All White Students	1099	640.63	30.92	638.80	642.46
<u>Differences in Means</u>			P-Value		
eMINTS vs. Non-eMINTS Students		-0.36	0.8463		

Table 16 shows that White students enrolled in an eMINTS classroom for communication arts during the 2002-2003 school year scored more than 3 points higher on average than White students who were not enrolled in an eMINTS classroom. The difference was not statistically significant. For science, White students enrolled in an eMINTS classroom scored slightly lower on average than those students who were not enrolled. Again, the difference was not statistically significant. Because statistical significance was not found, effect size estimates are not presented.

Figure 9 presents the model for the 2003 MAP test in communication arts. While no statistical significance was found for the effect of race, the effect of eMINTS enrollment, or the interaction term, the biplot shows that Black student performance in an eMINTS classroom was on average greater than the performance of White students. Moreover, the average performance of Black students in eMINTS versus non-eMINTS classrooms was considerably greater than it was for White students.

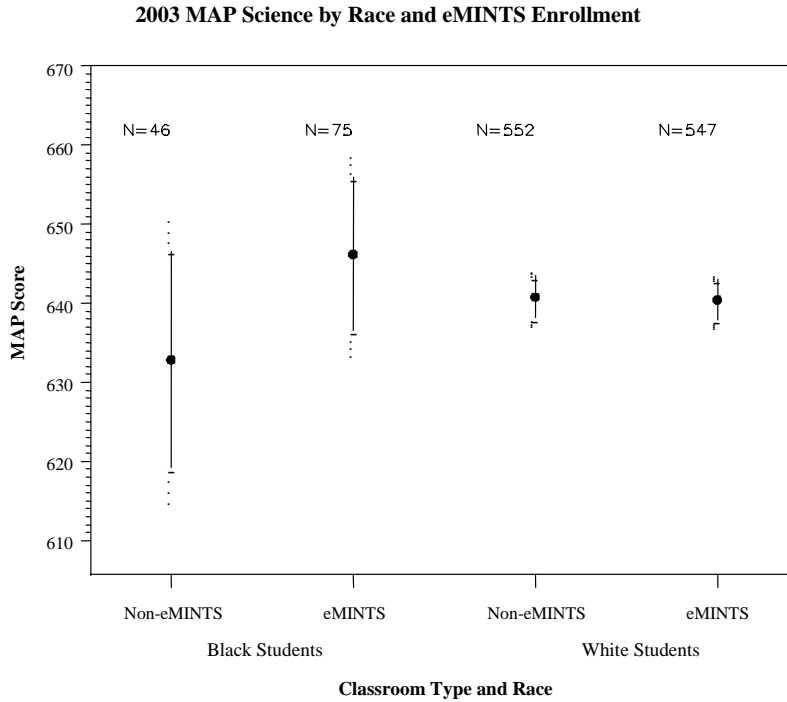
Similar to the analysis of performance in communication arts using HLM, the analysis of performance in science for 2003 found no statistical significance for the effect of race, the effect of eMINTS enrollment, or the interaction term. The model for the MAP test in science is presented in Figure 10. Again, the biplot shows that the average performance of Black students enrolled in an eMINTS classroom was considerably greater than those not enrolled. White students in an eMINTS classroom, on the other hand, performed slightly lower on average than White students not enrolled.

**Figure 9**  
**2003 MAP Communication Arts Model: eMINTS Enrollment and Race**  
**Two-level HLM Model**



	<i>Model 1</i>				<i>Model 2</i>			
	Coefficient	Standard Error	Df	P-Value	Coefficient	Standard Error	Df	P-Value
Intercept	642.99	1.49	72	<0.0001	640.75	1.73	71	<0.0001
Black Student								
<i>No</i>								
Yes					-12.24	9.02	1158	0.1750
Student Enrolled in an eMINTS Classroom								
<i>No</i>								
Yes					3.63	2.49	71	0.1487
Interaction					14.71	12.22	1158	0.2290
Model P-Value	<0.0001				<0.0001			
Residual Variance	867.24				856.88			
% Improvement					1.19			
Number of Black & White Students	1233				1233			
Number of Classrooms	73				73			

**Figure 10**  
**2003 MAP Science Model: eMINTS Enrollment and Race**  
**Two-level HLM Model**



	<i>Model 1</i>				<i>Model 2</i>			
	Coefficient	Standard Error	Df	P-Value	Coefficient	Standard Error	Df	P-Value
Intercept	640.76	2.00	71	<0.0001	640.25	2.43	70	<0.0001
Black Student								
<i>No</i>								
Yes					-17.97	10.19	1146	0.0780
Student Enrolled in an eMINTS Classroom								
<i>No</i>								
Yes					0.96	3.47	70	0.7824
Interaction					10.71	14.08	1146	0.4470
Model P-Value	<0.0001				<0.0001			
Residual Variance	831.58				800.59			
% Improvement					3.73			
Number of Black & White Students	1220				1220			
Number of Classrooms	72				72			

Table 17 shows that Black students enrolled in an eMINTS classroom for mathematics during the 2002-2003 school year scored almost 13 points higher on average than Black students who were not enrolled in an eMINTS classroom. This difference in means was statistically significant. The effect size was fairly small with 3.4 percent of the variance in total MAP scores explained by eMINTS enrollment. For social studies, Black students enrolled in an eMINTS classroom scored about 12 points higher on average than those students who were not enrolled. The difference here was statistically significant. The effect size was slightly larger, with 4.6 percent of the variance in total MAP scores explained by eMINTS enrollment.

Table 17  
2003 Mean MAP Score Values by eMINTS Enrollment  
Black Students, 4<sup>th</sup> Grade Tests

Student Enrollment	Number of Students	Mean	Standard Deviation	Lower 95% Confidence Limit for Mean	Upper 95% Confidence Limit for Mean
<i>Mathematics</i>					
Non-eMINTS Students	57	624.60	35.37	615.21	633.98
eMINTS Students	120	637.35	32.10	631.55	643.15
All Black Students	177	633.24	33.62	628.26	638.23
<u>Differences in Means</u>			P-Value		
eMINTS vs. Non-eMINTS Students		12.75	0.0179		
<u>Effect Size Estimates</u>		Estimate	Variance		
Cohens D		0.373	0.027		
Hedges G		0.371	0.026		
<i>Social Studies</i>					
Non-eMINTS Students	59	644.58	26.41	637.69	651.46
eMINTS Students	122	656.63	30.27	651.21	662.06
All Black Students	181	652.70	29.55	648.37	657.04
<u>Differences in Means</u>			P-Value		
eMINTS vs. Non-eMINTS Students		12.05	0.0097		
<u>Effect Size Estimates</u>		Estimate	Variance		
Cohens D		0.437	0.026		
Hedges G		0.435	0.026		

Table 18 shows that White students enrolled in an eMINTS classroom for mathematics during the 2002-2003 school year scored more than 8 points higher on average than White students who were not enrolled in an eMINTS classroom. While the difference in means was statistically significant, the effect size was small. An effect size of 0.249 meant that 1.5 percent of the variance in total MAP scores was explained by eMINTS enrollment. For social studies, White students enrolled in an eMINTS classroom scored more than 3 points higher on average than those students who were not enrolled. The



Table 18  
2003 Mean MAP Score Values by eMINTS Enrollment  
White Students, 3<sup>rd</sup> Grade Tests

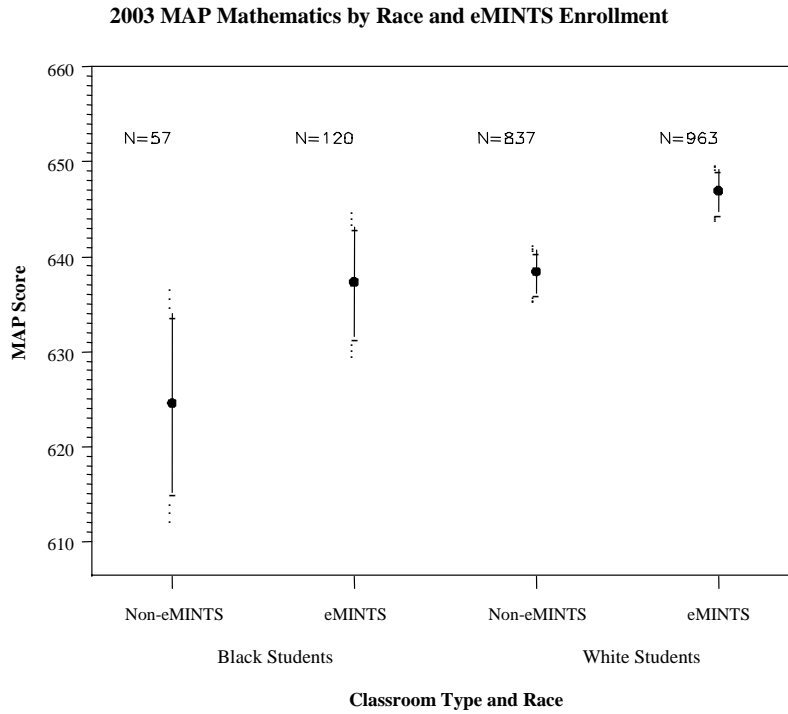
Student Enrollment	Number of Students	Mean	Standard Deviation	Lower 95% Confidence Limit for Mean	Upper 95% Confidence Limit for Mean
<i>Mathematics</i>					
Non-eMINTS Students	837	638.46	33.07	636.21	640.70
eMINTS Students	963	646.98	35.66	644.72	649.23
All White Students	1800	643.02	34.73	641.41	644.62
<u>Differences in Means</u>			P-Value		
eMINTS vs. Non-eMINTS Students		8.52	0.0001		
<u>Effect Size Estimates</u>			Estimate	Variance	
Cohens D			0.249	0.002	
Hedges G			0.249	0.002	
<i>Social Studies</i>					
Non-eMINTS Students	835	655.25	24.39	653.59	656.90
eMINTS Students	904	658.88	25.64	657.20	660.55
All White Students	1739	657.13	25.10	655.95	658.31
<u>Differences in Means</u>			P-Value		
eMINTS vs. Non-eMINTS Students		3.63	0.0026		
<u>Effect Size Estimates</u>			Estimate	Variance	
Cohens D			0.145	0.002	
Hedges G			0.145	0.002	

difference was statistically significant. The effect size was 0.145, and therefore less than 1 percent of the variance was explained by eMINTS enrollment.

Figure 11 presents the model for the 2003 MAP test in mathematics. Because the interaction term was not significant, Black students did not receive a performance effect that was different from White students when enrolled in an eMINTS classroom. In other words the achievement gap between Black and White students was not reduced in a statistically significant way when students were enrolled in an eMINTS class. Moreover, Black students scored 17.00 points less on average than White students, controlling for the effect of eMINTS enrollment. Students in an eMINTS classroom, however, scored 8.76 points on average higher than other students, controlling for the effect of race.

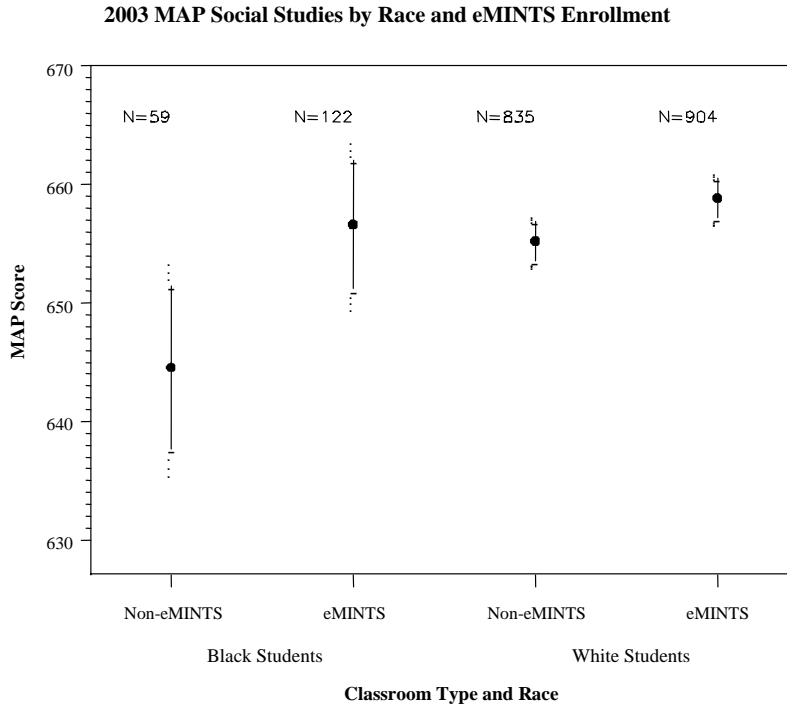
The overall fit of Model 2 was improved by 2.39 percent over Model 1 (i.e., the unconditional model), when including race (Black or White) and eMINTS classroom enrollment.

Figure 11  
2003 MAP Mathematics Model: eMINTS Enrollment and Race  
Two-level HLM Model



	<i>Model 1</i>				<i>Model 2</i>			
	Coefficient	Standard Error	Df	P-Value	Coefficient	Standard Error	Df	P-Value
Intercept	642.34	1.2713	106	<0.0001	638.71	1.89	105	<0.0001
Black Student								
<i>No</i>								
Yes					-17.00	7.20	1868	0.0182
Student Enrolled in an eMINTS Classroom								
<i>No</i>								
Yes					8.76	2.58	105	0.0010
Interaction					1.46	9.14	1868	0.8729
Model P-Value	<0.0001				<0.0001			
Residual Variance	1098.60				1072.36			
% Improvement					2.39			
Number of Black & White Students	1977				1977			
Number of Classrooms	107				107			

**Figure 12**  
**2003 MAP Social Studies Model: eMINTS Enrollment and Race**  
**Two-level HLM Model**



	<i>Model 1</i>				<i>Model 2</i>			
	Coefficient	Standard Error	Df	P-Value	Coefficient	Standard Error	Df	P-Value
Intercept	656.79	0.9869	103	<0.0001	655.43	1.39	102	<0.0001
Black Student								
<i>No</i>								
Yes					-12.96	5.87	1814	0.0273
Student Enrolled in an eMINTS Classroom								
<i>No</i>								
Yes					3.82	1.89	102	0.0466
Interaction					2.99	7.70	1814	0.6981
Model P-Value	<0.0001				<0.0001			
Residual Variance	588.66				573.87			
% Improvement					2.51			
Number of Black & White Students	1920				1920			
Number of Classrooms	104				104			

Figure 10 presents the model for the 2003 MAP test in social studies. Because the interaction term was not significant, Black students did not receive a performance effect that was different from White students when enrolled in an eMINTS classroom. In other words the achievement gap between Black and White students was not reduced in a statistically significant way when students were enrolled in an eMINTS class. Moreover, Black students scored 12.96 points less on average than White students, controlling for the effect of eMINTS enrollment. Students in an eMINTS classroom, however, scored 3.82 points on average higher than other students, controlling for the effect of race.

The overall fit of Model 2 was improved by 2.51 percent over Model 1 (i.e., the unconditional model), when including race (Black or White) and eMINTS classroom enrollment.

### *FY02 Cohort: Summary and Discussion*

This cohort analysis of total MAP scores according to race and eMINTS enrollment for the 2002-2003 school year suggests that Black student performance in an eMINTS classroom was considerably and consistently higher than the performance of Black students not enrolled. The performance of White students was mixed. Keep in mind that the small numbers of Black students and the relatively large percentages of students eligible for the federal free or reduced lunch program likely impacted the findings from the statistical analyses; accordingly, those findings should be viewed cautiously.

Average performance in the third grade for Black students enrolled in an eMINTS classroom was around 13 points higher than for those Black students not enrolled. Similarly, the average score in the fourth grade for Black students enrolled in an eMINTS classroom was about 12 points higher than for other Black students. The differences in mathematics and social studies were statistically significant, but only a small amount of the variance (1.5 percent for mathematics and less than 1 percent for social studies) in total MAP scores was explained.

Similar to the FY01 cohort, the effect of eMINTS enrollment on the performance of White students was found to be statistically significant for mathematics and social studies, but not for communication arts and science. While average performance for eMINTS-enrolled White students was more than 3 points higher than the average performance of White students not enrolled for communication arts, for science the performance of those students enrolled was slightly lower. In mathematics, the average performance of White students in an eMINTS classroom was almost 9 points higher than the performance of those not enrolled, but this accounted for only about 1.5 percent of the variance in total MAP scores. The average performance in social studies of White students enrolled in an eMINTS classroom was more than 12 points higher than the average performance of White students not enrolled. This effect size was also small, explaining less than 1 percent of the variance in total MAP scores.

Concerning the gap in performance between Black and White students, for all subject areas the HLM models showed that Black students did not receive a performance effect

that was statistically significantly different from White students when enrolled in an eMINTS classroom. The difference in average scores for Black students enrolled in eMINTS compared to Black students not enrolled, however, was considerably greater than the difference between average scores for White students.

In communication arts and science, the performance of students in an eMINTS class was not statistically significantly different, but scores for those students were greater on average than for those students not enrolled. For mathematics and social studies, however, scores were statistically significantly higher (ranging from almost 4 to almost 9 points higher) when enrolled in an eMINTS classroom.

### **Discussion and Conclusion**

Although questions remain regarding which policies, programs, and practices of schools may reduce the achievement gap between Black and White students and sustain this reduction, this analysis presented evidence that enrollment in an eMINTS classroom may improve performance on the MAP achievement examinations for both Black and White students as well as decrease the gap. The following discussion and conclusion summarize and analyze Black and White student performance across the three cohorts.

As discussed above, the findings from the statistical analyses in this study were undoubtedly impacted in two important ways. First, the small numbers of Black students may have increased the likelihood of a Type II error (i.e., finding no statistical significance when in fact there was significance), as presumptively seen in the effect of eMINTS enrollment on the performance of Black students in some analyses. Second, the effect of FRL eligibility may have increased the possibility of a Type I error (i.e., finding statistical significance when in fact there was not significance); a likely example of this was the impact of race in the HLM analyses. Accordingly, those findings should be viewed cautiously. Further research with an increased number of Black students should explore these issues.

Table 19 shows that the average performance of Black students enrolled in an eMINTS classroom in the FY01 and FY02 cohorts was considerably higher across all subject areas than the average performance of Black students not enrolled, while the results for Black students in the FY00 cohort were mixed. In the FY01 cohort, those differences in average total MAP score ranged from 7.6 points higher in communication arts to 19.6 points in mathematics, and in the FY02 cohort, they ranged from about 12 to 13 points higher depending on the subject.

Moreover, the average differences between Black students enrolled in an eMINTS classroom and Black students not enrolled were found to be statistically significant in mathematics for FY01 and FY02 and in social studies for FY02. The effect size for mathematics for FY01 was determined to be medium, with 7 percent of the variance in total MAP scores explained by eMINTS enrollment. For FY02, the amount of variance explained was a bit smaller: in mathematics 3.4 percent was explained; in social studies 4.6 percent was explained. Regarding the other subject areas in FY01 and FY02, it is

worth noting again that the lack of statistical significance may have been due to the small numbers of Black students.

Together these findings suggest that eMINTS enrollment had both a statistically significant and practical impact on the performance of Black students in the FY01 and FY02 cohorts. For the FY00 cohort, however, it had a mixed impact.

Table 19  
Differences in the Mean Performance of Black Students  
in eMINTS Classrooms Compared to Those Not In eMINTS Classrooms

	FY00		FY01		FY02	
	Mean Difference	Number of Students	Mean Difference	Number of Students	Mean Difference	Number of Students
<i>Communication Arts</i>	6.05	85	7.60	137	13.52	117
<i>Science</i>	-5.16	91	12.60	134	13.34	121
<i>Mathematics</i>	1.88	235	19.60*	138	12.75*	177
<i>Social Studies</i>	-0.70	235	9.27	116	12.05*	181

\* $p < .05$

Table 20  
Differences in the Mean Performance of White Students  
in eMINTS Classrooms Compared to Those Not In eMINTS Classrooms

	FY00		FY01		FY02	
	Mean Difference	Number of Students	Mean Difference	Number of Students	Mean Difference	Number of Students
<i>Communication Arts</i>	5.29*	1838	-1.91	1475	3.41	1116
<i>Science</i>	4.95*	1807	-2.52	1468	-0.36	1099
<i>Mathematics</i>	8.65*	3471	7.94*	1987	8.52*	1800
<i>Social Studies</i>	7.26*	3543	2.56*	1968	3.63*	1739

\* $p < .05$

Table 20 shows that White student average performance was higher in eMINTS classrooms across all subject areas for FY00. Those differences in average performance ranged from 4.95 to 8.65 points higher than the average performance of students not in eMINTS classes. For FY01 and FY02, the results were mixed. White students in an eMINTS classroom for FY01 scored higher on average in mathematics and social studies, but lower on average in communication arts and science. Average score differences ranged from -2.52 to 7.94. Student performance in eMINTS classrooms for FY02 was higher in communication arts, mathematics, and social studies, but slightly lower in science. Those average score differences ranged from -0.36 to 8.52 points.

Table 20 also shows that statistical significance was found in all subject areas for FY00, but only in the fourth grade for FY01 and FY02. While almost 3 percent of the variance in total MAP scores was explained by eMINTS enrollment for White students in social studies for FY00, only about 1 percent or less was explained in the other subject areas in this and the other cohorts.

For White students across all three cohorts, then, these findings suggest that eMINTS had a statistically significant impact but limited practical impact on average performance of students in the fourth grade. There was a mixed impact, however, on the performance of those in the third grade.

Although Black students did not receive a performance effect that was statistically significantly different from White students when enrolled in an eMINTS classroom (which may be seen in the interaction terms presented in the HLM models), for FY01 and FY02 the difference in average scores for Black students enrolled in an eMINTS classroom compared to those not enrolled was considerably greater than the difference in average performance of White students enrolled compared to those White students not enrolled across all subject areas; the performance of eMINTS-enrolled Black students in those cohorts was considerably higher than the performance of Black students not enrolled. For FY00 the difference in average scores for White students enrolled in an eMINTS classroom compared to those White students not enrolled was greater for mathematics and social studies than the difference in average scores between enrolled and not enrolled Black students. For communication arts and science, those differences were smaller. One possible explanation for finding no significance in the interaction may be the small numbers of Black students in the study. Worth noting is the high MAP performance of Black students in the fourth grade in the FY02 cohort; it essentially equalized the performance between Black students in eMINTS classrooms and White students who were not. Indeed, Black students in eMINTS classrooms had a slightly higher average score in social studies for FY02 than White students not enrolled in those classrooms, and in mathematics, the average performance between these two groups was almost identical.

Finally, Table 21 presents the differences in the average performance of students (Black and White) enrolled in an eMINTS classroom compared to the performance of those not enrolled. These findings suggest that the impact of eMINTS enrollment on average performance was strongest for the FY00 and FY02 cohorts, but mixed for FY01. For FY00, students enrolled in an eMINTS classroom scored on average 3.69 to 9.71 point higher than students not enrolled. The range for FY02 was 0.96 to 8.76 points. For the FY01 cohort, the average performance in communication arts and science was slightly lower for students in an eMINTS class, ranging from -0.85 to -0.60. In Mathematics and science, however, those students scored higher on average than those students not in an eMINTS class; the range was 3.23 to 9.32 points higher. Looking at those differences from the perspective of grade level, while the third grade results were mixed, in fourth grade the average performance of those enrolled was higher across all cohorts than the average performance of those not enrolled. The difference in performance was

Table 21  
Differences in the Mean Performance of Students in eMINTS Classrooms  
Compared to the Performance Those Not In eMINTS Classrooms

	FY00		FY01		FY02	
	Mean Difference	Number of Students	Mean Difference	Number of Students	Mean Difference	Number of Students
<i>Communication Arts</i>	4.59	1923	-0.85	1612	3.63	1233
<i>Science</i>	3.69	1898	-0.60	1602	0.96	1220
<i>Mathematics</i>	9.71*	3706	9.32*	2125	8.76*	1977
<i>Social Studies</i>	8.23*	3778	3.23	2084	3.82*	1920

\* $p < .05$

statistically significant in mathematics for all three cohorts, and it was statistically significant in social studies for FY00 and FY02.



## Appendix A

Table A1  
FY00 FRL Eligible Students by eMINTS Enrollment and Race  
(in Percent)

	eMINTS Students		Non-eMINTS Students	
	Black	White	Black	White
<i>Communication Arts</i>				
FRL Yes	64.9	40.3	83.3	45.0
FRL No	35.1	59.7	16.7	55.0
Total	100.00	100.00	100.00	100.00
Number of Students	37	454	48	1384
<i>Science</i>				
FRL Yes	63.9	39.9	81.8	45.3
FRL No	36.1	60.1	18.2	54.7
Total	100.00	100.00	100.00	100.00
Number of Students	36	446	55	1361
<i>Mathematics</i>				
FRL Yes	53.9	34.8	50.4	37.0
FRL No	46.1	65.2	49.6	63.0
Total	100.00	100.00	100.00	100.00
Number of Students	104	1117	131	2354
<i>Social Studies</i>				
FRL Yes	54.8	34.8	51.9	37.4
FRL No	45.2	65.2	48.1	62.6
Total	100.00	100.00	100.00	100.00
Number of Students	104	1137	131	2406

Table A2  
FY01 FRL Eligible Students by eMINTS Enrollment  
(in Percent)

	eMINTS Students		Non-eMINTS Students	
	Black	White	Black	White
<i>Communication Arts</i>				
FRL Yes	30.4	43.6	48.3	41.3
FRL No	69.6	56.4	51.7	58.7
Total	100.00	100.00	100.00	100.00
Number of Students	23	532	114	943
<i>Science</i>				
FRL Yes	33.3	43.9	47.3	41.5
FRL No	66.7	56.1	52.7	58.5
Total	100.00	100.00	100.00	100.00
Number of Students	24	538	110	930
<i>Mathematics</i>				
FRL Yes	31.6	41.9	48.0	43.8
FRL No	68.4	58.1	52.0	56.2
Total	100.00	100.00	100.00	100.00
Number of Students	38	774	100	1213
<i>Social Studies</i>				
FRL Yes	27.8	41.7	37.5	44.1
FRL No	72.2	58.3	62.5	55.9
Total	100.00	100.00	100.00	100.00
Number of Students	36	767	80	1201

Table A3  
FY02 FRL Eligible Students by eMINTS Enrollment  
(in Percent)

	eMINTS Students		Non-eMINTS Students	
	Black	White	Black	White
<i>Communication Arts</i>				
FRL Yes	86.5	44.2	83.7	48.3
FRL No	13.5	55.8	16.3	51.7
Total	100.00	100.00	100.00	100.00
Number of Students	74	547	43	569
<i>Science</i>				
FRL Yes	86.7	45.0	84.8	48.7
FRL No	13.3	55.0	15.2	51.3
Total	100.00	100.00	100.00	100.00
Number of Students	75	547	46	552
<i>Mathematics</i>				
FRL Yes	82.5	42.2	82.5	43.7
FRL No	17.5	57.8	17.5	56.3
Total	100.00	100.00	100.00	100.00
Number of Students	120	963	57	837
<i>Social Studies</i>				
FRL Yes	82.8	42.7	79.7	43.4
FRL No	17.2	57.3	20.3	56.6
Total	100.00	100.00	100.00	100.00
Number of Students	122	904	59	835

## Appendix B

Table B1  
2001 Total MAP Score Values  
by FRL Eligibility, eMINTS Enrollment, and Race

	eMINTS Students		Non-eMINTS Students	
	Black	White	Black	White
<i>Communication Arts</i>				
FRL Yes	627.21	638.54	620.05	635.30
FRL No	629.77	654.20	632.13	648.58
Number of Students	37	454	48	1384
<i>Science</i>				
FRL Yes	608.04	636.46	617.09	633.00
FRL No	625.00	652.10	629.40	647.45
Number of Students	36	446	55	1361
<i>Mathematics</i>				
FRL Yes	614.32	646.36	616.59	633.89
FRL No	634.60	656.60	627.09	650.54
Number of Students	104	1117	131	2354
<i>Social Studies</i>				
FRL Yes	638.14	657.40	638.49	647.46
FRL No	646.64	666.63	647.21	661.35
Number of Students	104	1137	131	2406

Table B2  
2002 Total MAP Score Values  
by FRL Eligibility, eMINTS Enrollment, and Race

	eMINTS Students		Non-eMINTS Students	
	Black	White	Black	White
<i>Communication Arts</i>				
FRL Yes	618.14	634.94	608.62	637.73
FRL No	629.69	653.71	627.86	654.25
Number of Students	23	532	114	943
<i>Science</i>				
FRL Yes	609.50	628.53	586.94	634.52
FRL No	619.56	651.69	618.55	650.82
Number of Students	24	538	110	930
<i>Mathematics</i>				
FRL Yes	610.25	641.28	593.58	634.66
FRL No	625.42	654.92	607.90	646.41
Number of Students	38	774	100	1213
<i>Social Studies</i>				
FRL Yes	636.60	651.70	638.83	649.88
FRL No	646.77	662.29	632.18	659.61
Number of Students	36	767	80	1201

Table B3  
2003 Total MAP Score Values  
by FRL Eligibility, eMINTS Enrollment, and Race

	eMINTS Students		Non-eMINTS Students	
	Black	White	Black	White
<i>Communication Arts</i>				
FRL Yes	650.45	638.20	638.06	635.84
FRL No	643.20	649.13	625.14	645.61
Number of Students	74	547	43	569
<i>Science</i>				
FRL Yes	647.74	634.25	634.15	635.33
FRL No	636.30	645.51	625.71	646.02
Number of Students	75	547	46	552
<i>Mathematics</i>				
FRL Yes	635.60	637.70	621.92	632.41
FRL No	645.62	653.75	637.20	643.16
Number of Students	120	963	57	837
<i>Social Studies</i>				
FRL Yes	657.83	651.82	640.94	649.21
FRL No	650.86	664.13	658.83	659.87
Number of Students	122	904	59	835

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