

Math Corps Evaluation

2010-11 Findings Report

Contains three separate reports for these Math Corps regions:

Central Minnesota

Metro (St. Paul School District)

St. Croix River Education District

Prepared by:

UpFront Consulting

December 15, 2011

INTRODUCTION

This report describes the findings from the evaluation of three Math Corps regions in Minnesota for the 2010-11 school year.

The regions are as follows:

- Central—14 schools in the St. Cloud Area School District and Sauk Rapids/Rice School district. 287 students in grades four through eight participated in the program.
- Metro—10 schools in the St. Paul School District. 310 students in grades seven and eight participated during the year.
- St. Croix River Education District—Seven schools in the District participated, with 143 students in grade four through six.

Each of the three regions are reported separately. The evaluators and Math Corps staff determined at the beginning of the year that no attempt would be made to combine the data or to compare the three regions against each other. The rationale for this is as follows:

- Each of the three regions used a different math curriculum (described more fully in the individual reports).
- As noted above, the grade levels tutored differed in each of the three regions.
- While the selection criteria for students was similar across the regions (based on the 2009-10 MCA-II scores, described in each of the three reports), the distribution of these scores for students entering tutoring was different in each of the three regions.
- Each of the regions is different demographically. The Central region contains a mix of white middle class schools and schools with a growing number of students of color, especially Somali, in a mid-sized community. The Metro region is made up of largely urban schools with students representing many cultures and races. The St. Croix River schools are largely in small communities; nearly all students are Caucasian.

For all these reasons, the evaluators and staff believed that any comparison of regions would be of little use to the program and could even be misleading. Similarly, combining the data to create a “Minnesota average” would also be of little use to the program.



UpFront
Consulting

Math Corps Evaluation

*2010-11 Findings Report
in Central Minnesota Math Corps Region*

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KEY POINTS SUMMARY

Math Corps tutored 287 students in 14 schools in 2010-11, in grades four through eight. Key findings from the evaluation of this program are as follows:

- About two in ten students tutored achieved proficiency on the MCA-III exam across all grades. This exam replaced the MCA-II and is more difficult; scores on the MCA-III were lower statewide compared to the MCA-II given the previous year.
- On the MAP achievement tests, given three times yearly, about seven in ten tutored students across all grades met or exceeded their growth target for the year.
- According to both MCA-III and MAP data, students make similar progress in tutoring no matter where they start. However, this means that students closer to proficiency are more likely to achieve proficiency; students who start further from proficiency are less likely to arrive there because the distance they have to go is greater.
- Tutored students who are living in poverty are less likely to achieve proficiency and less likely to meet their MAP growth targets. Students of color were less likely than their white peers to achieve proficiency on MCA-III. This difference was not seen in MAP, however, students from both groups were equally likely to meet their growth targets.
- For a variety of reasons, students often don't receive the full amount of tutoring for which they are scheduled. Those who receive less than 55% of scheduled time are less likely to achieve proficiency and less likely to meet their MAP targets. In general, the closer the program gets to providing the full amount of tutoring time, the better students do by both MCA-III and MAP measures.
- Because of the change to the MCA-III test this year it is difficult to compare performance between the first two years of the program and the 2010-11 year. However, based on the percent of students meeting MAP growth targets, it appears that both 2009-10 and 2010-11 were improvements over the first year of the program.
- The data shows that student proficiency in the year they were tutored may be predictive of achieving proficiency in later years. Among 2009-10 students, 91% of those who were proficient that year achieved full or partial proficiency in 2010-11, in spite of the different test. Among 2008-09 students, 84% who achieved proficiency that year achieved partial or full proficiency in 2010-11, in spite of the higher difficulty of the test.

More information about each of these points is in the main body of the report, following the description of the program and the student profile.

PROGRAM OVERVIEW

Minnesota Math Corps began working in four elementary and one junior high in St. Cloud Area School District 742 in 2008-09. The program was expanded in 2009-10 to include all eight elementary schools, both junior highs, and the junior high students at the Area Learning Center and at Kennedy (Kennedy Community School is a K-8 building).

Math Corps works with students in grades four through eight who scored just below proficiency on the state's No Child Left Behind (NCLB) exam, the Minnesota Comprehensive Assessment II (MCA-II) or the Minnesota Test of English Language Learners (MTELL). Two other criteria for student selection are 1) the student is not receiving special education services, and 2) the student's teacher has recommended the student for participation.

In 2008-09, the five District 742 buildings were served by twelve tutors, supported by one Master Coach. In 2009-10, ten district 742 buildings were served by 22 tutors and the Master Coach.

In 2010-11, four buildings in Sauk Rapids-Rice School District also participated. Between the two districts, there were 14 buildings participating, served by 24 tutors in 2010-11.

In 2008-09, 160 students participated in the program. In 2009-10, there were 256 participants. In 2010-11, there were 287 students.

In addition to the Master Coach, the program also has Internal Coaches at each site. For the first year all schools had one Internal Coach. For the second and third years all schools had one Internal Coach, except for North Junior High which had two.

The tutoring process

In 2008-09, the tutors provided between 60 and 90 minutes of one-on-one tutoring to each participating student each week. In 2009-10, the program set a minimum of 90 minutes per week per elementary student; junior high students were generally scheduled for more minutes per week.

Tutoring sessions took place during the school day, outside of the classroom, and at times that did not conflict with regular Language Arts or Mathematics instruction.

Tutoring was individualized to meet student needs identified by the previous MCA-II (MTELL) test substrands and by the strands of the Measures of Academic Progress (MAP) Mathematics test, produced by Northwest Evaluation Association (NWEA).

Members began the tutoring process with each student by administering a diagnostic test. Results of the test were used to determine which lessons would be taught.

After each lesson (generally from one to three tutoring sessions) students would complete a related technology activity. If the student scored poorly on the activity, the Member would complete support activities and redo the original activity. If the student scored poorly the second time through the original technology activity, the Member would repeat the lesson.

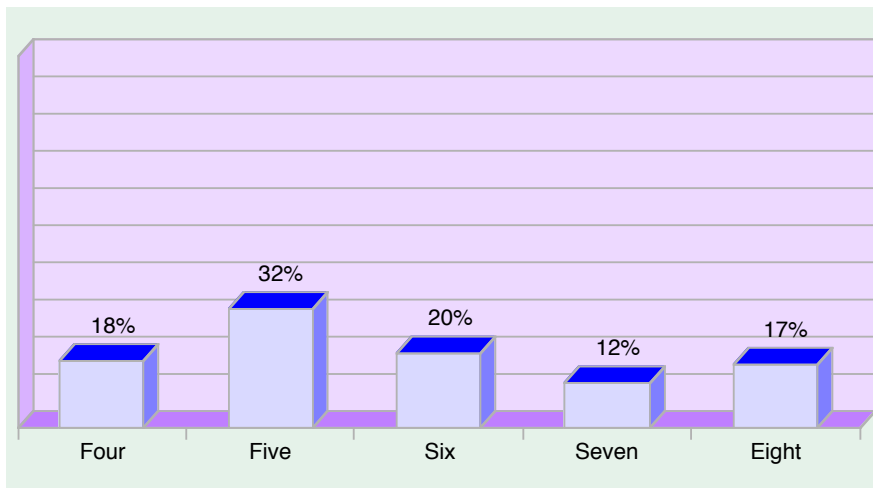
After completing all the selected lessons of the unit and the correspon-

ding technology activities, the student would complete a unit test. In 2008-09, if the student scored less than 75% on the unit test, the Member would repeat the lesson. In 2009-10, this was raised to 85%; if the student scored lower then the lesson was repeated.

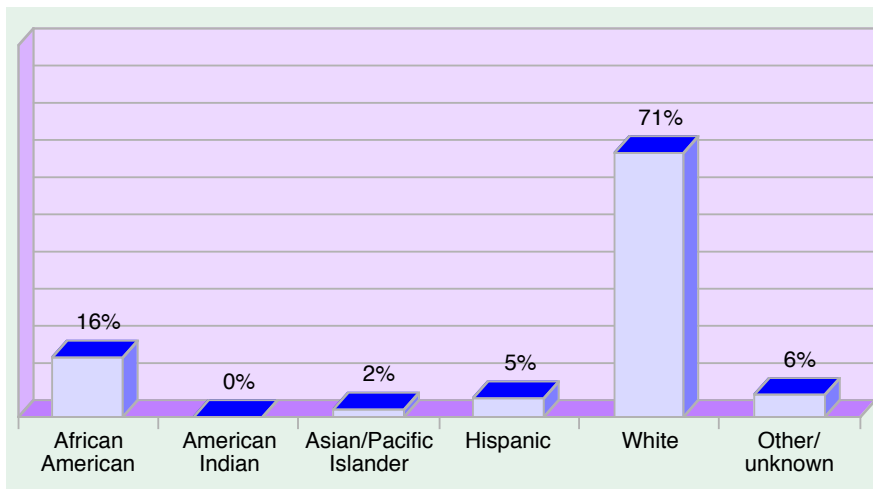
If the student scored above the threshold, the member would administer the diagnostic test for the next unit in the area of identified need. The member would repeat this process of diagnostic test, unit lessons and technology activities, then unit test, until all units were completed.

Student profile

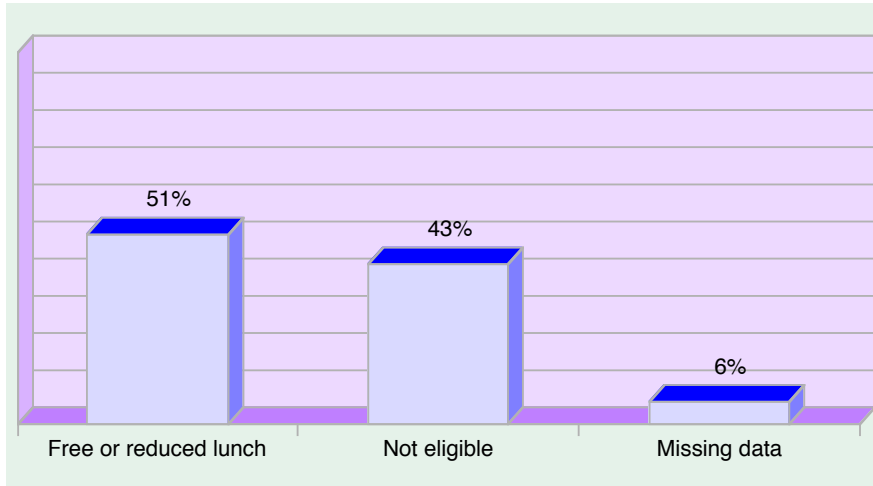
Demographic characteristics of the 256 students in the program in 2010-11 are shown in the charts below and on the subsequent pages.



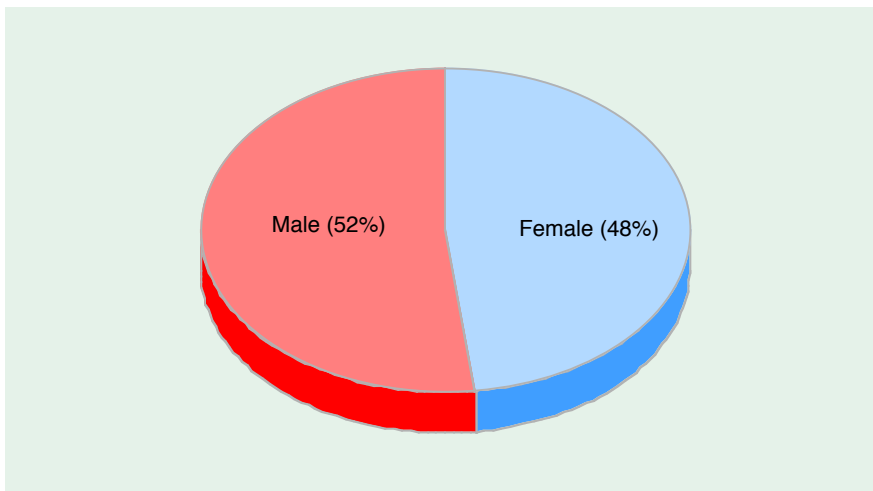
Number of students at each grade level served by the program in 2010-11.



More than seven in ten students tutored by Math Corps members are White; nearly two in ten are African American. Overall, the District is 72% White and 18% African American.



Shown is the percent of participating students eligible for free or reduced lunch (FRL). FRL is an indication of family poverty. Overall, 49% of students in District 742 are eligible for free or reduced lunch.



Shown is the gender of Math Corps students. The program serves slightly more males than females.

OVERALL OUTCOMES IN 2010-11

The charts and tables in this section provide some insight into overall program outcomes in 2010-11. This data is presented here as background to the research questions and findings presented later in this report.

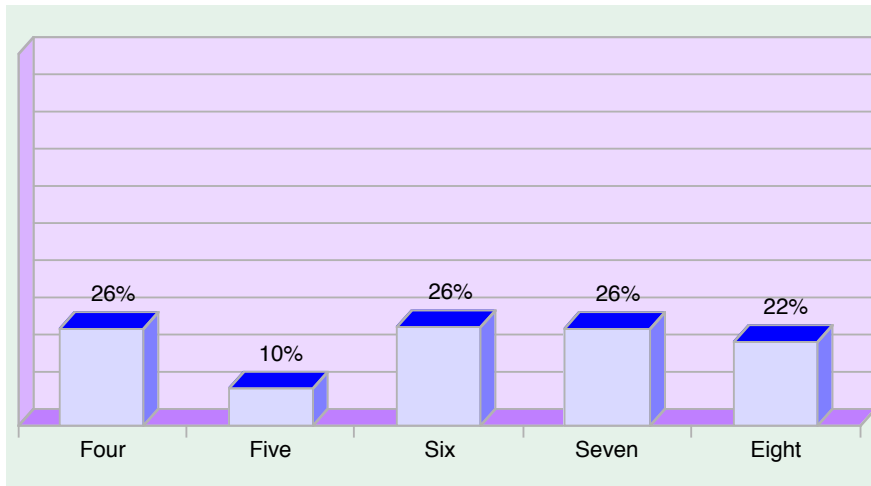
MCA-III findings

Students take the Minnesota Comprehensive Assessment late in each school year. This year the MCA-III test replaced the earlier MCA-II. The MCA-III is more difficult; statewide scores declined this year compared to 2009-10.

One measure of the program's overall success is the percent of students who achieve proficiency (a score of 50 or higher) at the end of the academic year.

The chart and table below show the results for all Math Corps students who took the MCA-III exams in the spring of 2011. Since many students would have scored from 40 to 49 the previous year, the percent of those who score 50 or higher (proficient) is one measure of program success.

All grades showed progress; the three higher grades had the highest percent of students who moved into proficiency. Again, note that the MCA-III is more difficult than the MCA-II exam used for student selection.



Percent of Math Corps students scoring 50 or above (proficient) on the MCA-III assessments in the spring of 2011, by grade level.

MCA-III, proficiency of Math Corps students, 2010-11

<i>Grade</i>	<i>n</i>	<i>Percent proficient (50 or higher)</i>	<i>Partially proficient (40 to 49)</i>
Four	.50	26%	32%
Five	.89	10%	55%
Six	.53	26%	47%
Seven	.31	26%	65%
Eight	.45	22%	60%

Percent of Math Corps students scoring 50 or above (proficient) on the MCA-III assessments in the spring of 2011, by grade level. Also shown is the percent who scored between 40 and 49 (partially proficient).

MAP scores

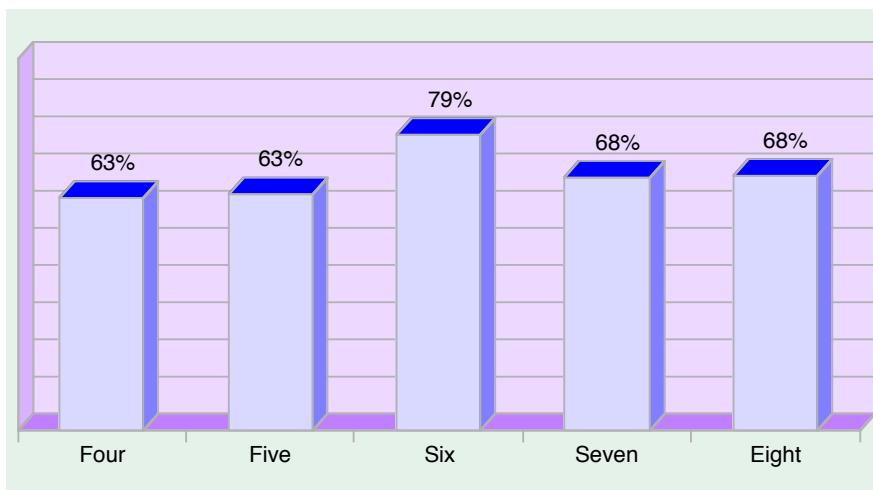
The chart and table show Math Corps student performance on the Measures of Academic Progress (MAP) mathematics test, produced by Northwest Evaluation Association (NWEA).

Students take the MAP test three times per year, in fall, winter and spring. Based on nationwide data, NWEA provides growth targets or norms for each student's score. The data described in this report is the student's actual progress between fall and spring assessments compared to the progress he or she is expected to achieve, based on the nationwide norms. Note that the norms vary by grade level and by starting (fall) score. For this report, the researchers examined the percent of students who equaled or bested their growth target, as well as the mean gain between fall and spring tests.

A high percentage of Math Corps students met or exceeded the growth target for their beginning score and grade level, as shown below.

Because the MAP scores are normed based on the student's starting point (the fall test), they are perhaps a slightly more robust measure of success than the MCA data shown on the previous page.

The norms table used for determining the amount of progress students should be expected to make, taken from a national database of MAP scores, varies based on the number of instructional weeks between the Fall and Spring tests. In analysis for this report we have used the norms for 28 instructional weeks.



Percent of Math Corps students who met or exceeded the MAP growth target for their grade level and starting score. Data includes only those students who took both the fall and spring MAP tests.

Percent who met or exceeded their MAP growth target

<u>Grade</u>	<u>n</u>	<u>Percent at or above norm</u>
Four .....	.48	63%
Five .....	.87	63%
Six .....	.48	79%
Seven .....	.31	68%
Eight .....	.42	68%

Number of Math Corps students by grade and percent who met or exceeded the MAP growth target for their grade level and starting score. Data includes only those students who took both the fall and spring MAP tests

SUCCESS BASED ON SELECTION CRITERIA

Research question—Students selected for the program score from 40 to 49 on the MCA II math achievement test. Is there any difference in the success rate (as judged by both the MCA II/III and MAP tests) between students who score 45 to 49 and students who score 40 to 44? Is the difference large enough to suggest that the program concentrate on one group?

Selection criteria

Although the program in the past has tended to work with students who are quite close to MCA proficiency (45 and above), there were some students in 2010-11 who scored 44 or below on the 2010 MCA-II. The chart below shows that 11% of students were in this category for 2010-11. For this analysis, we eliminated the five students who scored 39 and below or 50 and above (these may have been data entry errors) and only considered the 269 students in the 40 to 44 and 45 to 49 groups.

We examined these two groups of students to see what progress they made, on both the MCA-III and MAP. The charts showing the results are on the next two pages.

Overall, the MCA-III findings suggest that students in both groups make similar progress. The mean for the two groups were 38.37 and 43.70, very close to where one might expect the difference to be (if both groups showed identical progress, one would expect the difference in mean to be about 5, or the distance between the midpoints of each group).

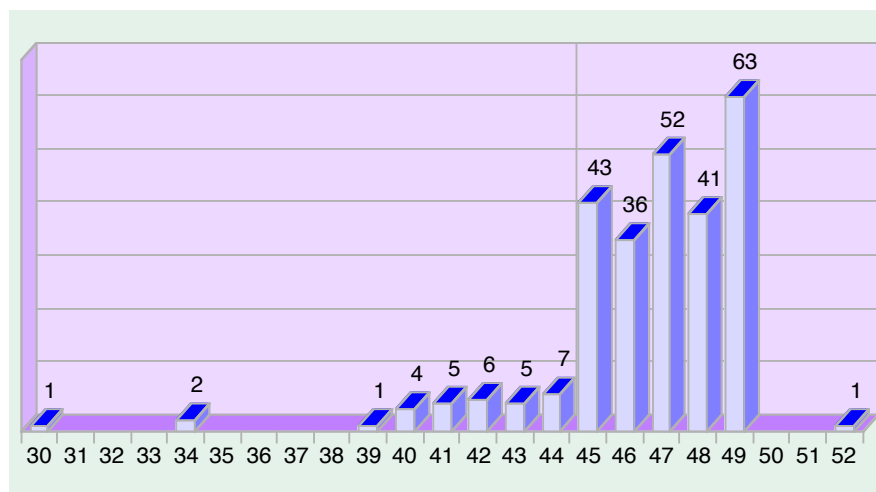
However, because the students in the 40 to 44 category start further from proficiency, they are significantly less likely to achieve proficiency the following year. Overall, 11.1% of the 40 to 44 group achieved proficiency on the MCA-III compared to 21.7% of the 45 to 49 group. The difference is statistically significant.

The MAP data further suggests that students in each group make similar progress. This data is perhaps more robust because it takes into account

The change to the MCA-III test in 2010-11 from the MCA-II in 2009-10 makes comparison between the two years difficult. This analysis only compares the scores of each group within the same year, not year-to-year.

Analysis of the difference in mean between the two groups used a t-test. The difference has a probability of .002.

The Pearson Chi-Square Test suggests that the differences between the two groups are statistically significant ($p = .046$).



Distribution of student scores on the 2010 MCA-II. The analysis reported on these pages considers two groups, those scoring 40 to 44 and those scoring 45 to 49.

the student's starting point. The charts on page 11 show the relationship.

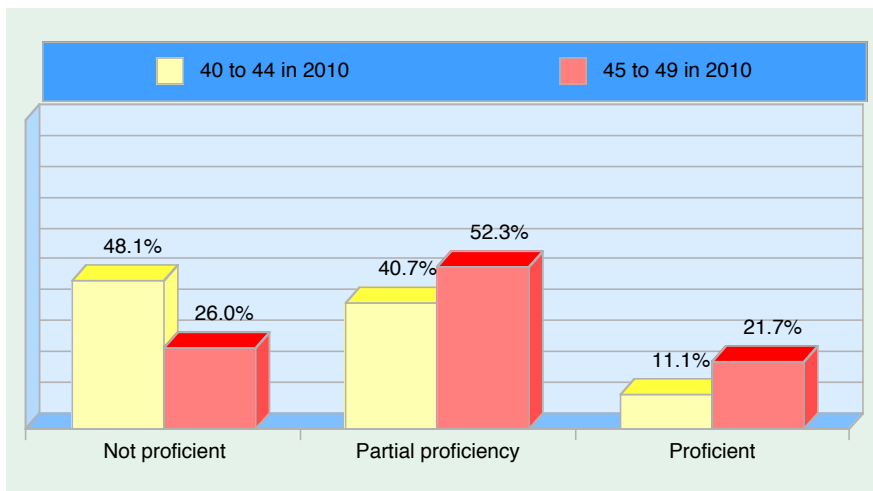
On the MAP tests, an analysis of the mean gain scores (Fall to Spring; above or below expected growth) yields no statistical significance, with the 40 to 44 group showing an average gain of 11.33 and the 45 to 49 group just slightly lower at 11.15.

Looking strictly at whether students met or exceeded their target again yielded no significant differences between groups. 70.4% of students in the 40 to 44 group met their target, compared to 67.1% of those in the 45 to 49 group.

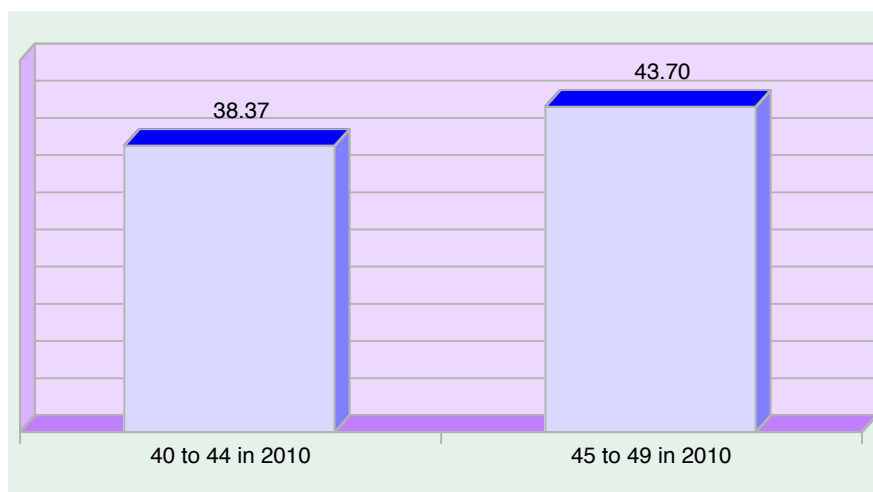
Overall the data suggests that students in both groups make similar progress.

Analysis of the mean gain above or below expected growth used a t-test to look at the means of the 40 to 44 group and the 45 to 49 group. The difference has a probability of .913.

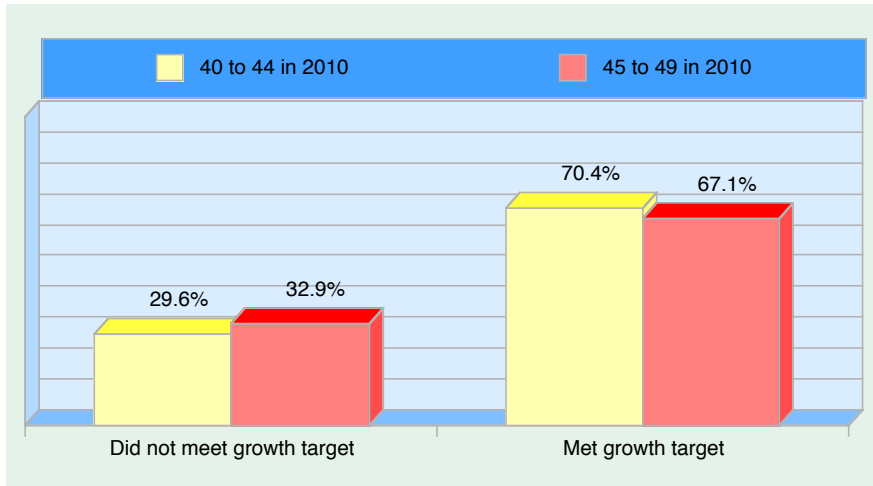
The Pearson Chi-Square Test suggests that the differences between the two groups are not statistically significant ($p = .732$).



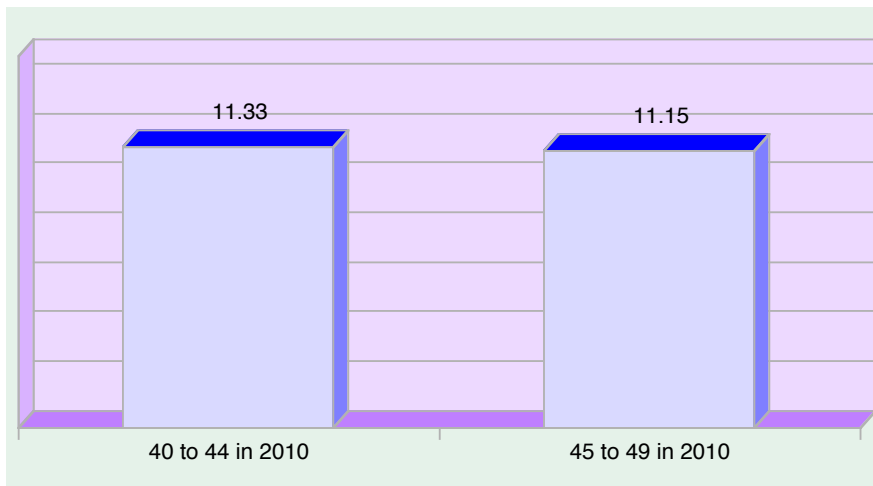
Percent of students achieving proficiency on the MCA-III in groupings based on their 2010 MCA-II scores. The differences shown are statistically significant.



Mean score on the MCA-III in groupings based on their 2010 MCA-II scores. The difference in mean is significant.



Percent of students who met their MAP growth target in 2010-11, sorted by their score on the 2010 MCA-II. The small difference shown is not significant.



Mean growth score on 2010-11 MAP, sorted by student's score on the 2010 MCA-II. The small difference shown is not significant.

CULTURAL AND SOCIO-ECONOMIC FACTORS

Research question—What are cultural factors that significantly influence achievement? Does socio-economic background significantly affect achievement? Do students of a specific ethnicity do better than others? How is achievement different for students for whom English is a second language?

Socio-economic background

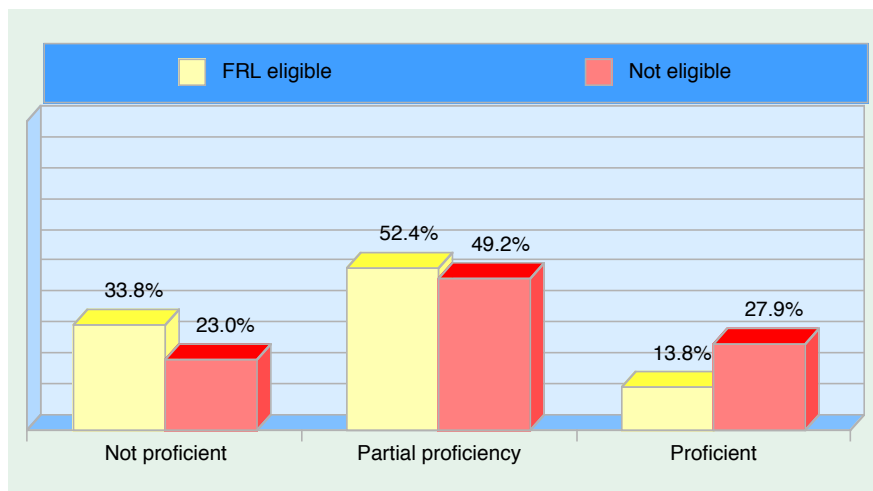
Schools typically use student eligibility for Free or Reduced Lunch (FRL) as a marker of lower socio-economic status. As shown earlier, 51% of Math Corps students are eligible. This is very close to the 49% percent of FRL students in District 742 schools. In Sauk Rapids/Rice schools fewer than 30% of students are eligible.

The charts below show that data about FRL Math Corps students is mixed. Based on the MCA-III these students made less progress than their peers, although they started at virtually the same level. Overall, they were less likely than their peers of higher socio-economic status to achieve proficiency on the MCA-III. Overall, the average MCA-III score of FRL students was more than 3 points lower than their non-FRL peers, although they started in about the same place.

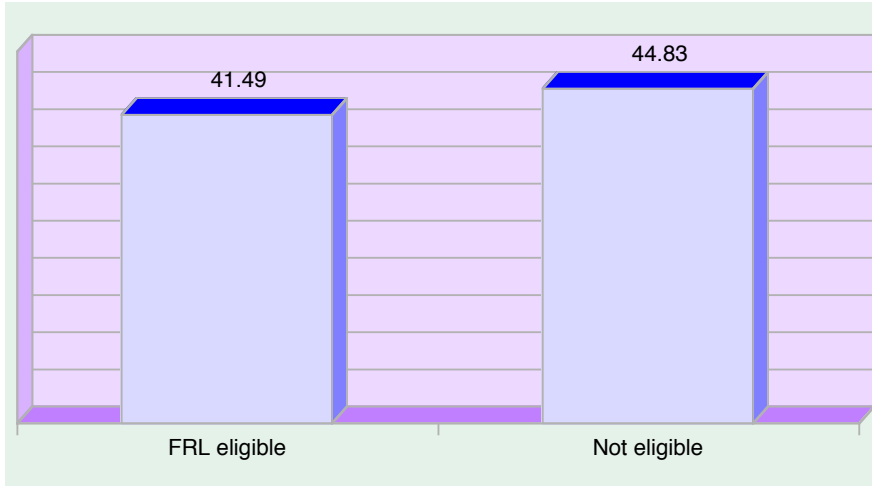
FRL students were much closer to their peers in MAP growth, however, and the small differences did not meet the test of significance. 64% of FRL students met or exceeded their MAP growth target, compared to 72% of their peers. The average growth shown by FRL students was 10.72, very close to the 11.79 shown by non-FRL students. Neither of these differences met a test of statistical significance.

The charts showing these relationships are below and on the next page.

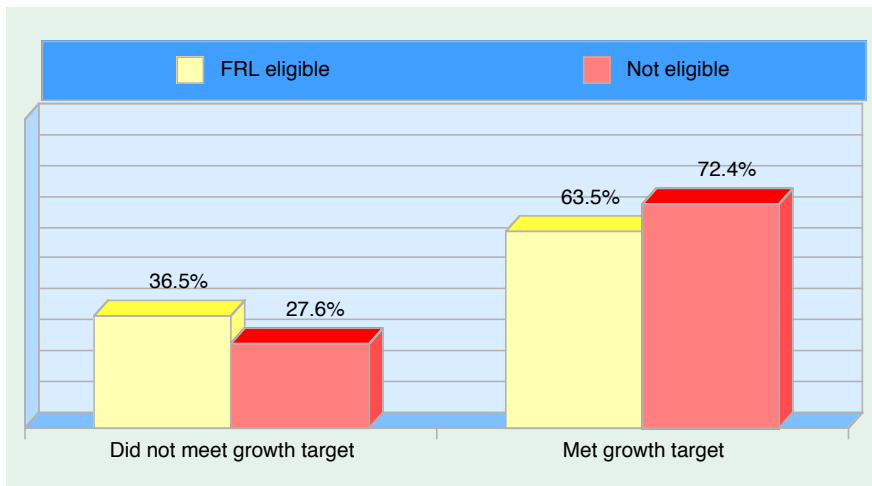
Data for English Language Learners was not captured this year, so that analysis has not been completed. The researchers also looked at gender, but found no significant difference in either MCA-III or MAP performance based on gender.



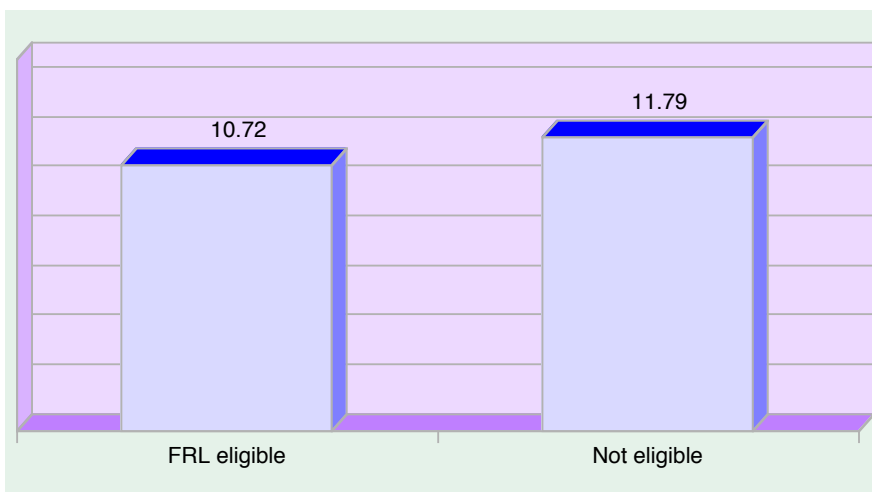
Percent of students who achieved proficiency or partial proficiency on the MCA-III exam, sorted by eligibility for Free or Reduced Lunch. The differences shown are statistically significant ($p = .009$).



Mean MCA-III score of students, sorted by eligibility for Free or Reduced Lunch. The difference shown is statistically significant ($p = .001$).



Percent of students who met their MAP growth target, sorted by eligibility for Free or Reduced Lunch. The difference shown is not statistically significant ($p = .127$).



Mean MAP growth of students, sorted by eligibility for Free or Reduced Lunch. The difference shown is not statistically significant ($p = .308$).

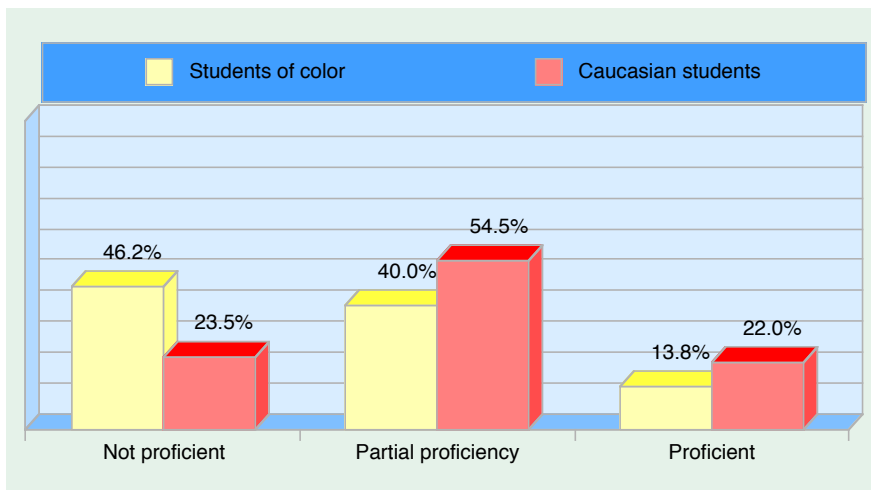
Ethnicity

Overall, 29% of 2010-11 Math Corps participants were non-Caucasian. For this analysis, we grouped these students into a category Students of Color; this included African American, Asian American, and Latino/a students. This was done in order to have a large enough sample size to produce usable conclusions.

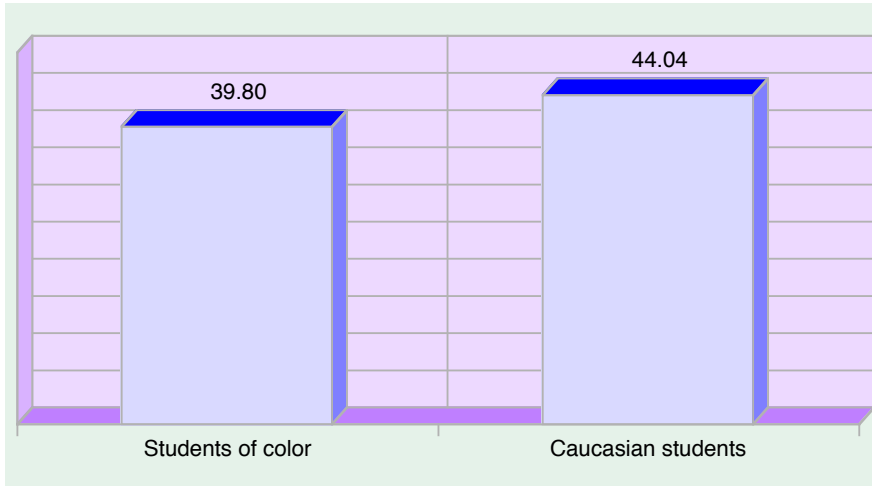
Overall the findings are similar to the socio-economic status findings reported in the previous pages. Students of color did not perform as well as their peers on the MCA-III exams, but were nearly equal in performance as measured by MAP.

As shown below, students of color were significantly less likely to achieve proficiency in the MCA-III compared to their peers, even though there was little difference in 2010 MCA-II scores between the two groups. The chart at the top of the next pages shows the mean scores on the MCA-III; students of color averaged more than 4 points lower than Caucasian students.

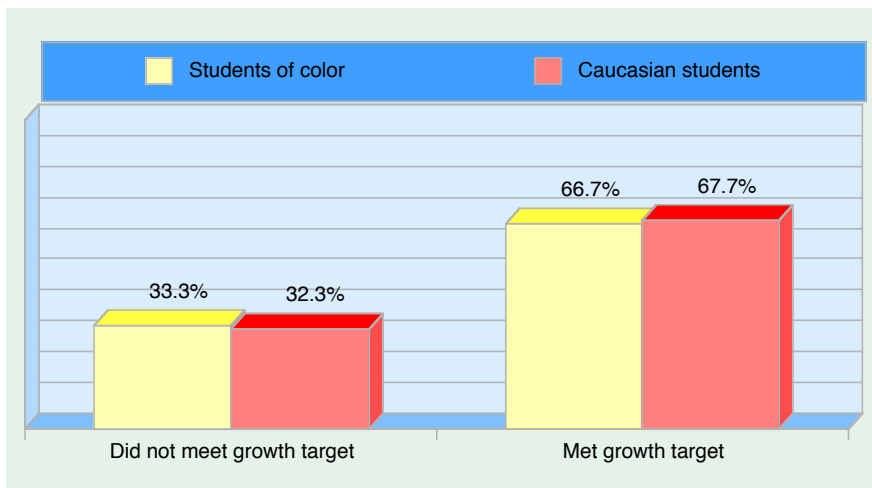
However, the MAP results show the two groups made equal progress. Students in both groups were equally likely to have met their growth target (66.7% of students of color met their target compared to 67.7% of Caucasian students). In the mean growth score, less than 1 point separated the two groups; the difference was not significant.



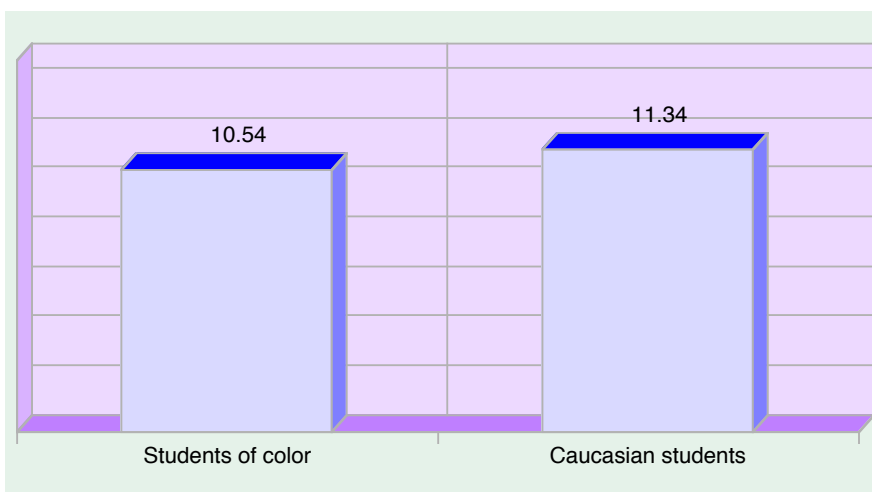
Percent of students who achieved proficiency or partial proficiency on the MCA-III exam, sorted by ethnicity. The differences shown are statistically significant ($p = .002$).



Mean MCA-III score of students, sorted by ethnicity. The difference shown is statistically significant ($p = .000$).



Percent of students who met their MAP growth target, sorted by ethnicity. The difference shown is not statistically significant ($p = .880$).



Mean MAP growth of students, sorted by ethnicity. The difference shown is not statistically significant ($p = .502$).

PERCENT OF TUTORING TIME RECEIVED

Research question—How does the number of hours students are tutored impact performance? What is the point (in terms of percent of scheduled time actually delivered) at which students are more likely to succeed?

Time actually received

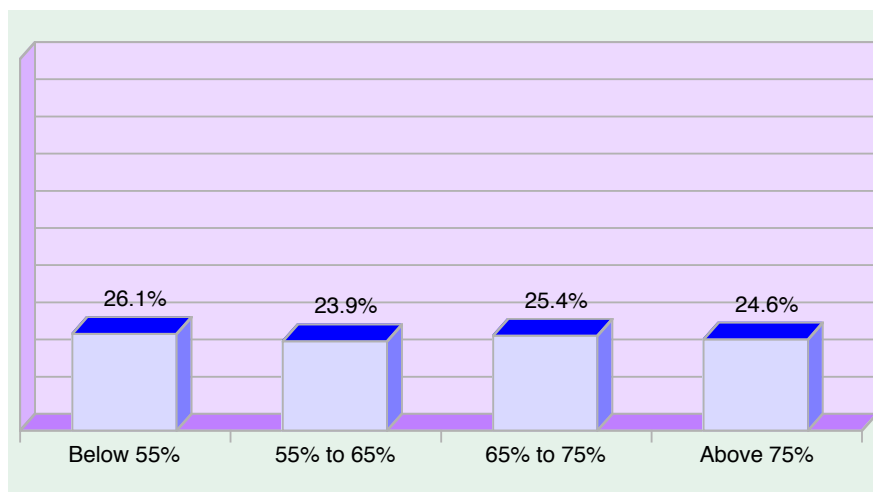
The program intends that students receive 90 minutes of tutoring each week they are in the program. However, for a variety of reasons (student absences, school programs and events, field trips, etc.) students don't always receive the full 90 minutes each week. The mean across all students is about 62% of scheduled tutoring time that is actually received.

In this analysis, we have removed the few students that were in the program for less than 12 weeks. This was only 19 students out of the 287 in the program the entire year.

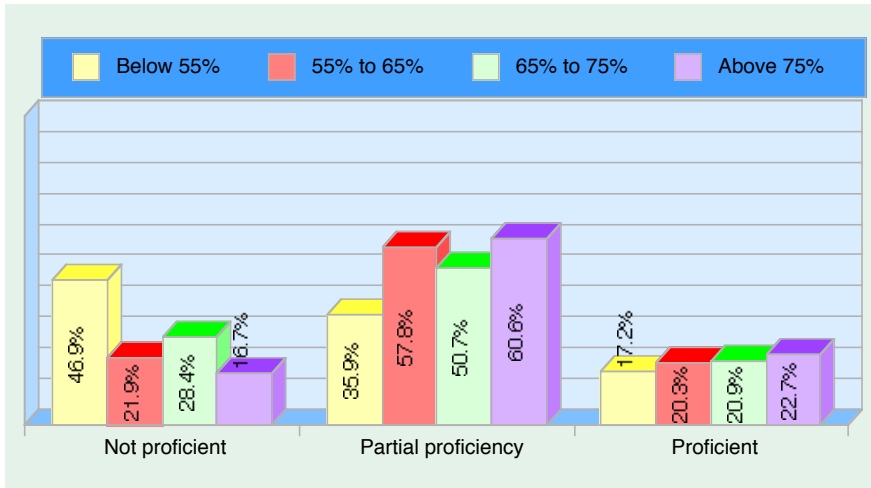
However, this varies widely by student. An examination of the data shows that the percent of expected tutoring received can be grouped into four relatively equal categories (quartiles). The chart below shows the four groups and the percent of students in each. Note that about one-quarter of students received less than 55% of the tutoring they were scheduled for, while another quarter received more than 75% of scheduled.

The MCA and MAP data shows slightly different points at which students are more likely to succeed. In the MCA-III, once students are above the 55% threshold, they are much more likely to achieve proficiency or partial proficiency. For a student in the program all year (at the median level of 36 weeks of tutoring), this would mean a minimum of 30 hours of tutoring during the school year. Note that among students who received 75% or more of scheduled tutoring (a minimum of 40.5 hours), more than 80% achieved at least partial proficiency.

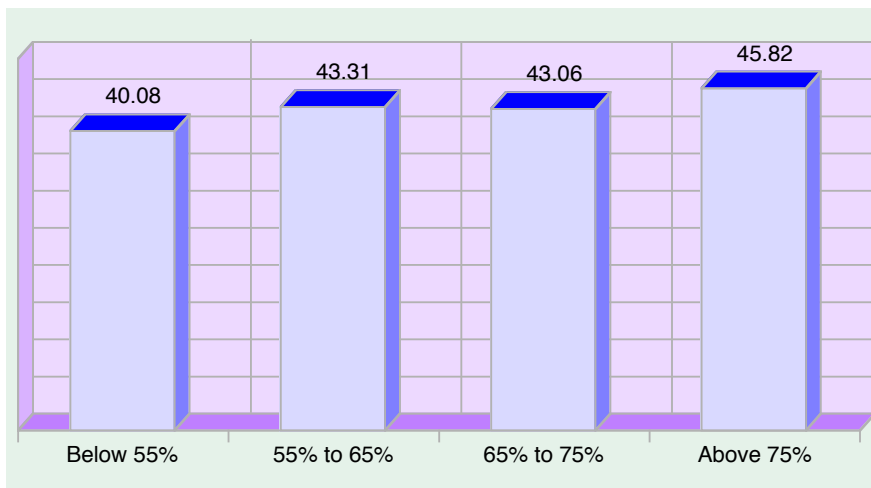
The MAP data suggests a steady progression, with students more likely to reach their growth target with each increase in tutoring time. However, note that this data, shown on the next two pages, does not meet the test of statistical significance.



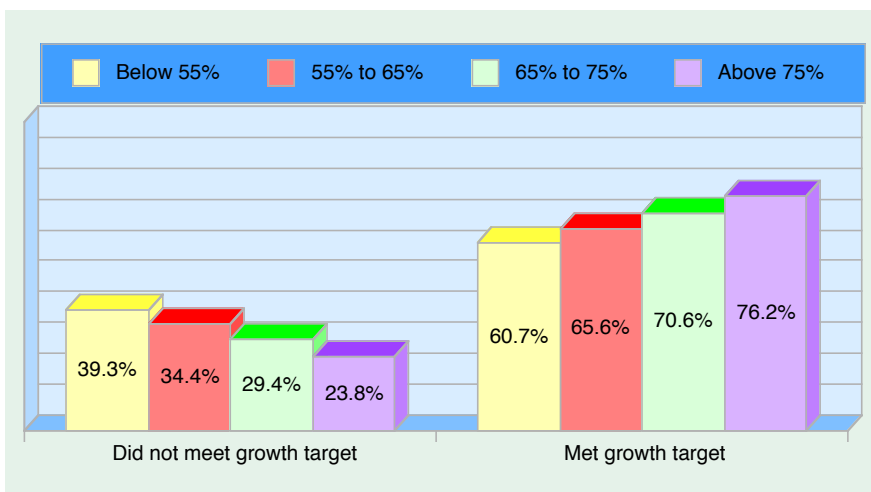
Percent of expected tutoring time that student actually received, in quartiles.



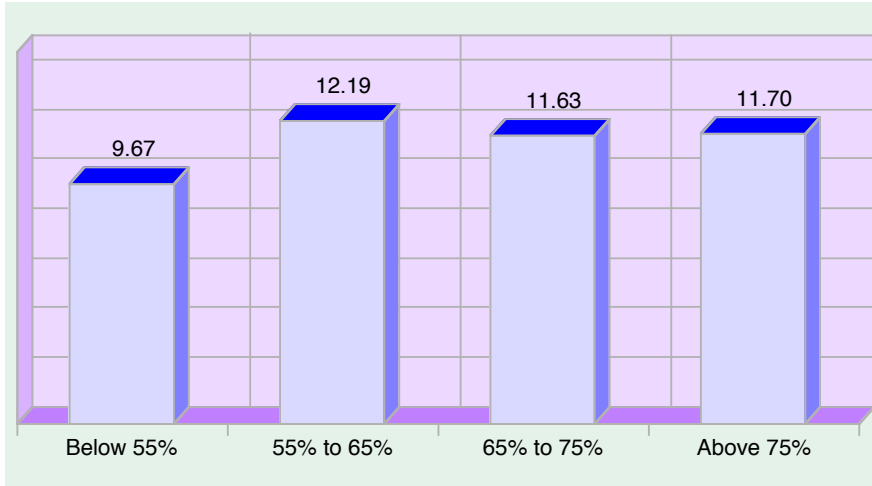
Percent of students who achieved proficiency or partial proficiency on the MCA-III exam, sorted by percent of tutoring time. The differences shown are statistically significant ($p = .009$).



Mean MCA-III score of students, sorted by percent of tutoring time. The difference shown is statistically significant ($p = .002$).



Percent of students who met their MAP growth target, sorted by percent of tutoring time. The difference shown is not statistically significant ($p = .280$).



Mean MAP growth of students, sorted by percent of tutoring time. The difference shown is not statistically significant ($p = .343$).

DIFFERENCE BETWEEN YEARS

Research question—How do results seen in the program in 2010-11 compare to results in the previous two years? What changes that have occurred over the years might impact changes in performance? Can any of these changes be quantified? Has the fact that members received slightly less training in 2010-11 compared to earlier years had any impact?

Number of students

The number of students tutored has grown over the three years of the program, as additional schools and members have been added. The chart below shows the number students used for the analysis in this section.

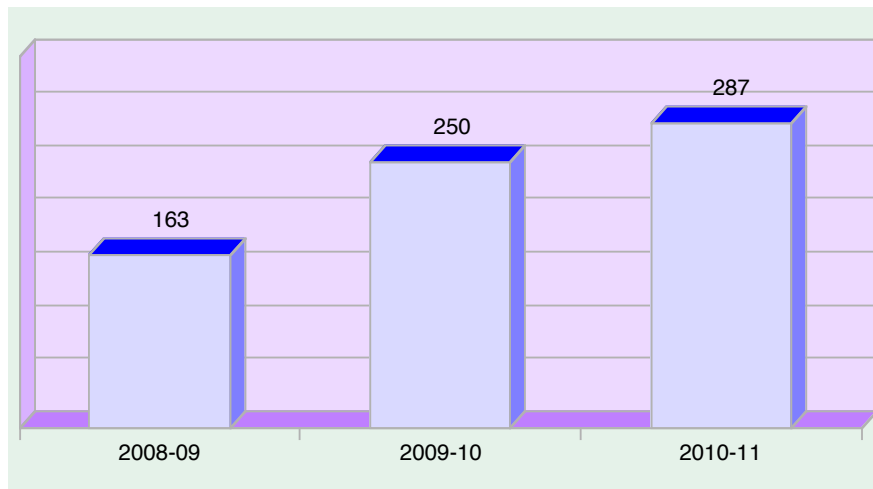
Overall results by year, MCA

The charts at the bottom of the next page show the overall results. Because of the change from MCA-II to MCA-III test, the year-to-year comparison of the Minnesota standardized test is not particularly useful. The 2010-11 results can be seen as a benchmark for the coming years. Note the big jump in the percent who achieved proficiency between the first and second years of the program.

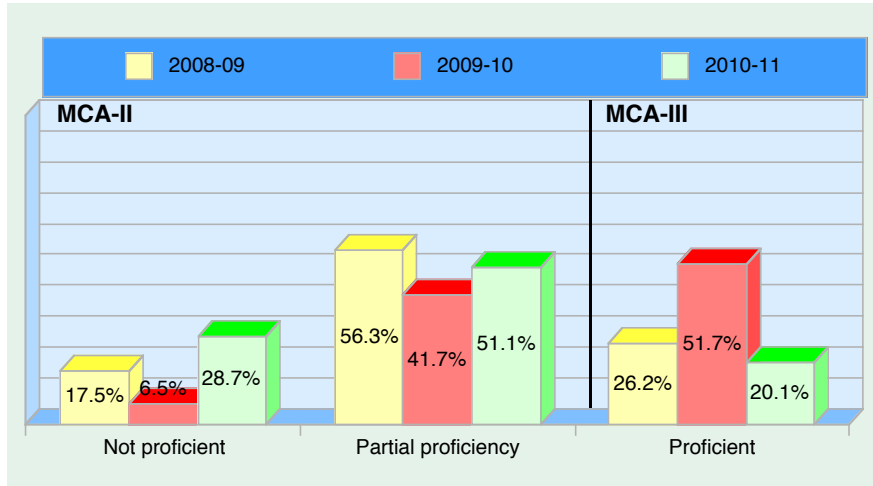
The MCA overall score (50 and above equals proficiency) is shown on the next page as well).

Overall results by year, MAP

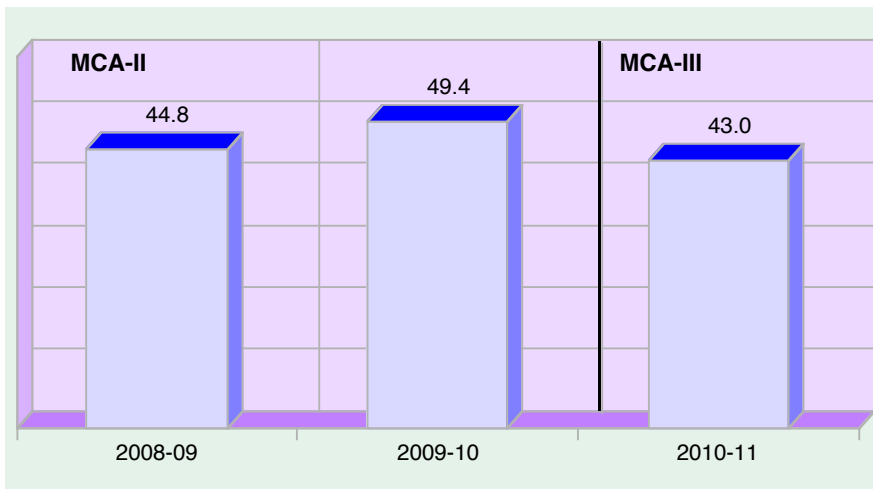
The charts on page 21 show the MAP results by year. The percent of students who met their growth target jumped after 2008-09, and stayed at close to the same level this year. In the overall growth rate (from Fall to Spring, approximately 28 weeks), students this year showed a slight increase over the previous two years. Note that neither of these differences are statistically significant, but the difference in percent meeting target approaches significance ($p = .096$).



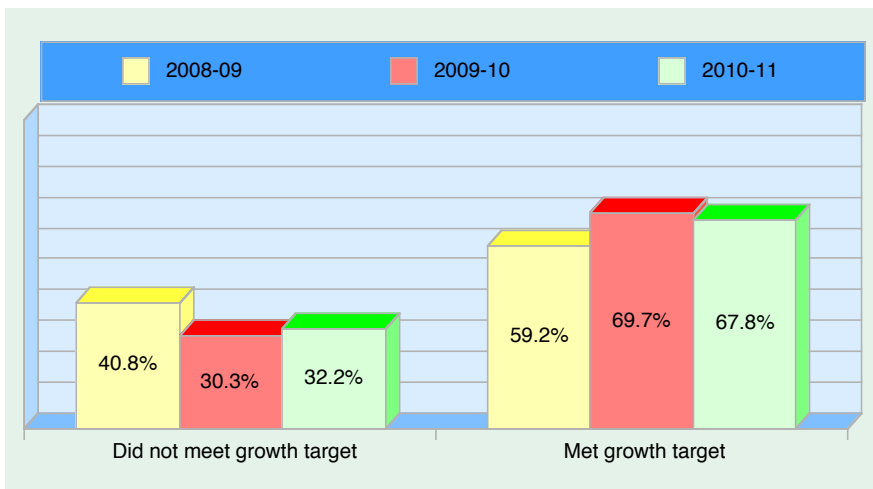
The number of students tutored by the program in each of the three years.



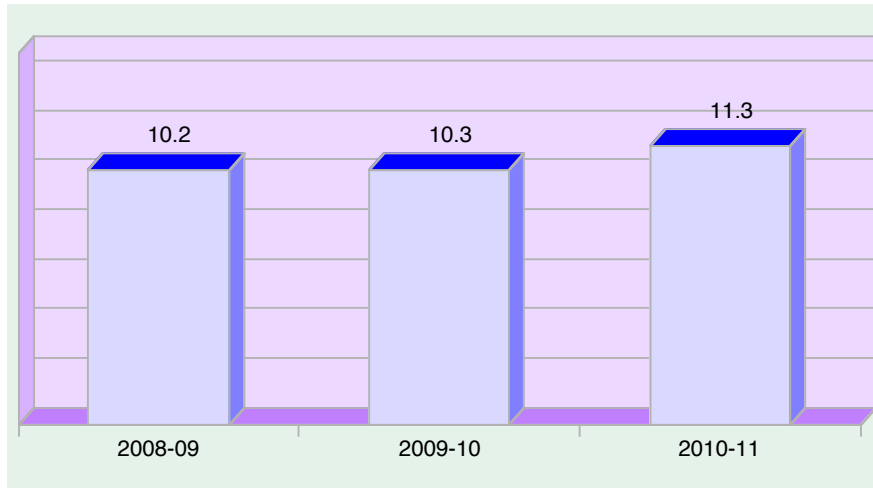
MCA proficiency by year. Note the sharp drop in proficiency between the MCA-II and the MCA-III. Scores declined statewide with the introduction of the MCA-III.



MCA-II and MCA-III raw score, by year.



Percent of students who met MAP growth target by year. The difference between the first years and the other two years approaches statistical significance.



Mean growth from Fall to Spring for each of the past three years. The difference between the first two years and the third year is not significant.

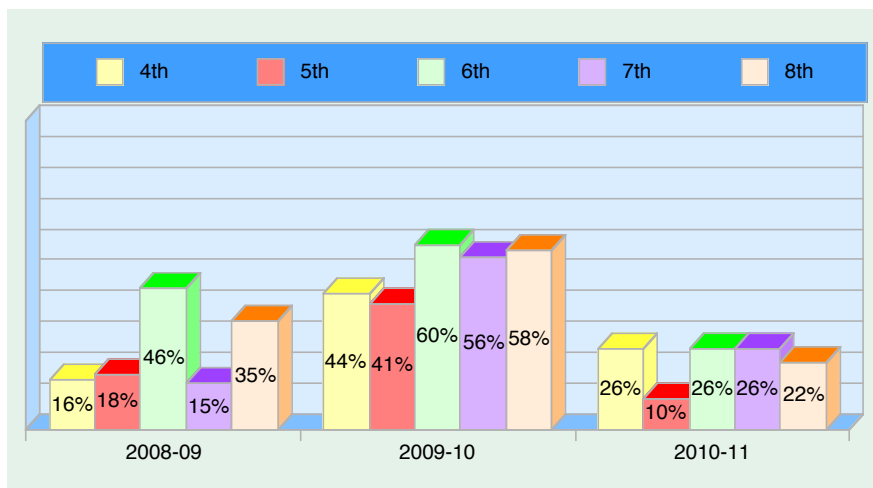
Other factors

The charts on the following pages show other factors separated by year.

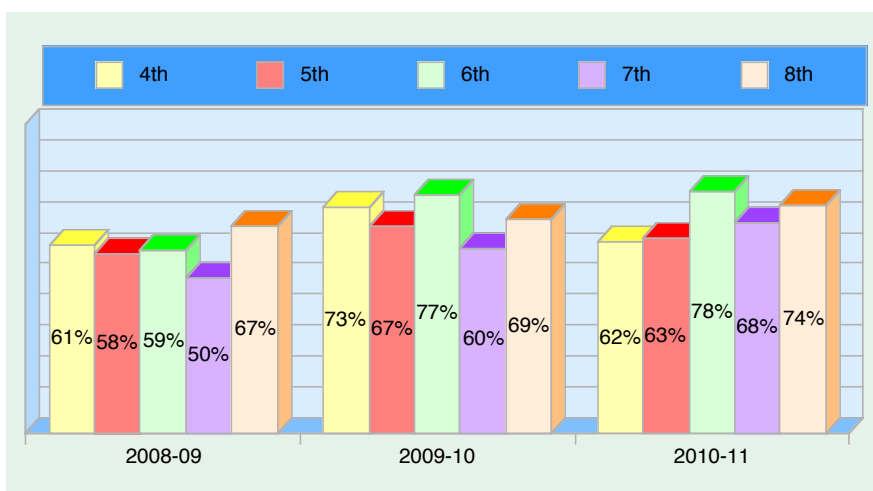
Findings from these analyses include:

- The charts on the next page show the results by grade level for each year. As shown by the MAP scores, in 2010-11 the percent of 7th grade students who met their growth target, although lower than 6th grade, did not fall below the 4th and 5th grades as they had the previous two years. Also note that in two of the three MCA years and two of the three MAP years 6th grade had the highest performing students.
- The charts on the top of page 23 show tutoring time, broken down for each of the three years. In 2008-09 students who received the most tutoring time were much more likely to achieve MCA-II proficiency, but that effect is less clear in subsequent years. Adding in results from MAP, it appears that 2,000 or more minutes of tutoring (equal to just less than one hour per week) is the level at which students are more likely to show progress.
- The charts at the bottom of page 23 and the top of page 24 show the findings for students who are eligible for Free or Reduced Lunch (an indication of low socio-economic status) and students who are not. There was little difference between the two groups in 2009-10 (data is missing for 2008-09). In 2010-11 students not eligible appeared to do slightly better in both MCA-III and MAP. The difference is not statistically significant, but bears watching.
- The two charts at the bottom of page 24 show the results sorted by student ethnicity. All students other than Caucasian are grouped in the “Students of color” category in order to have a large enough sample

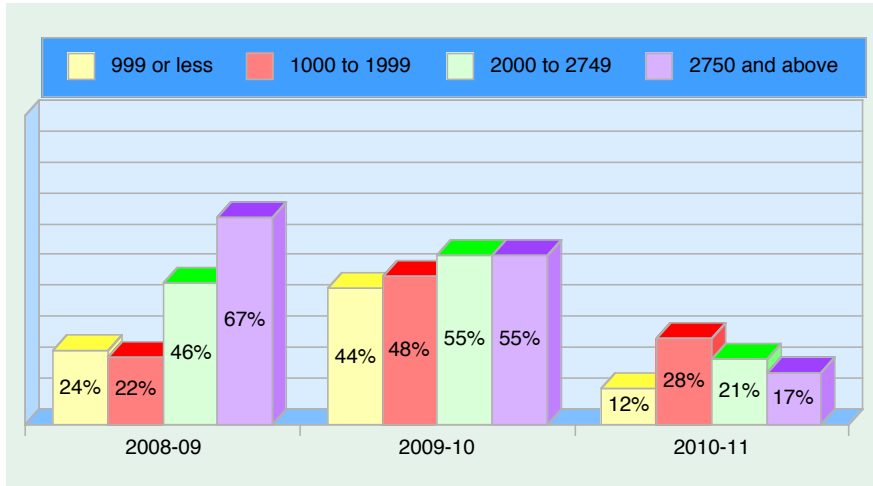
size for analysis. Students of color did not fare as well this year in achieving proficiency in the MCA-III, but the percentage of these students who met their MAP growth target is virtually identical to White students.



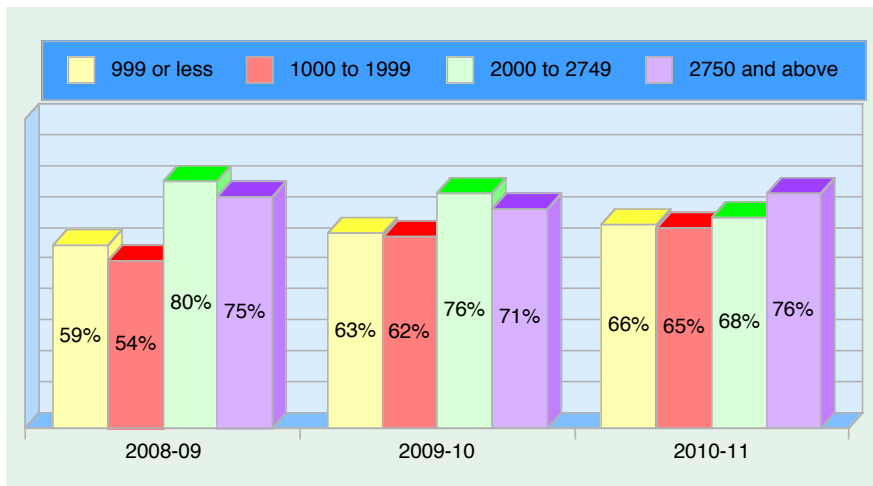
Percent of students achieving proficiency on the MCA series by grade level, all three years.



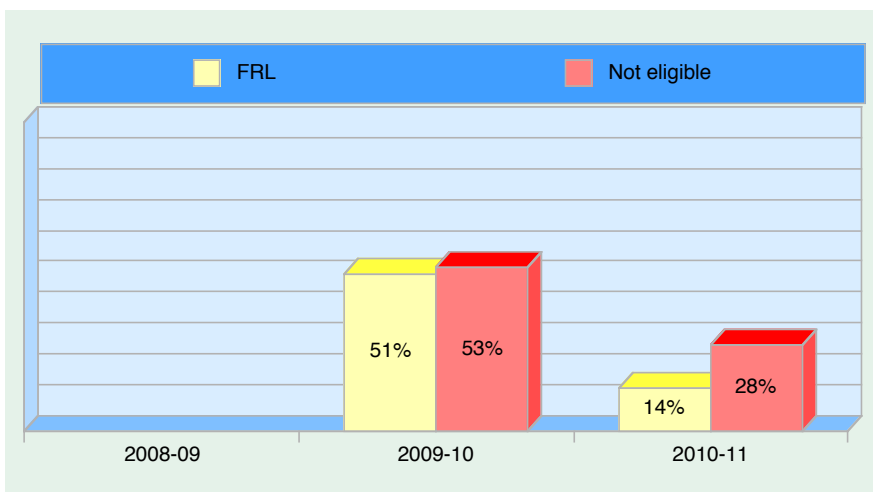
Percent of students meeting their MAP growth targets by grade level, all three years.



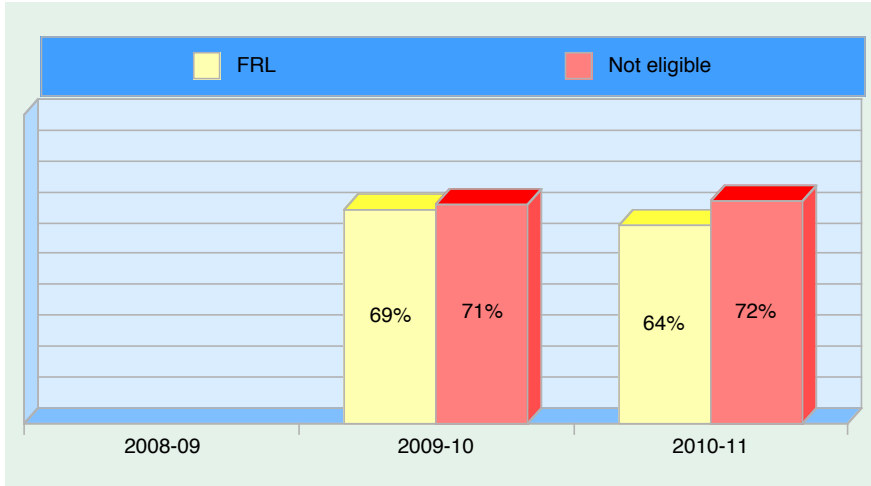
Percent of students achieving proficiency on the MCA series by total minutes of tutoring time, all three years.



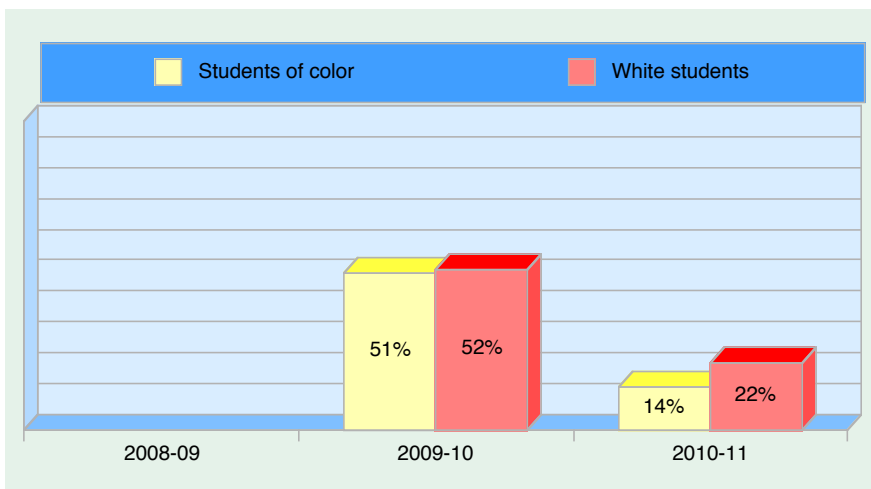
Percent of students meeting their MAP growth targets by total minutes of tutoring time, all three years.



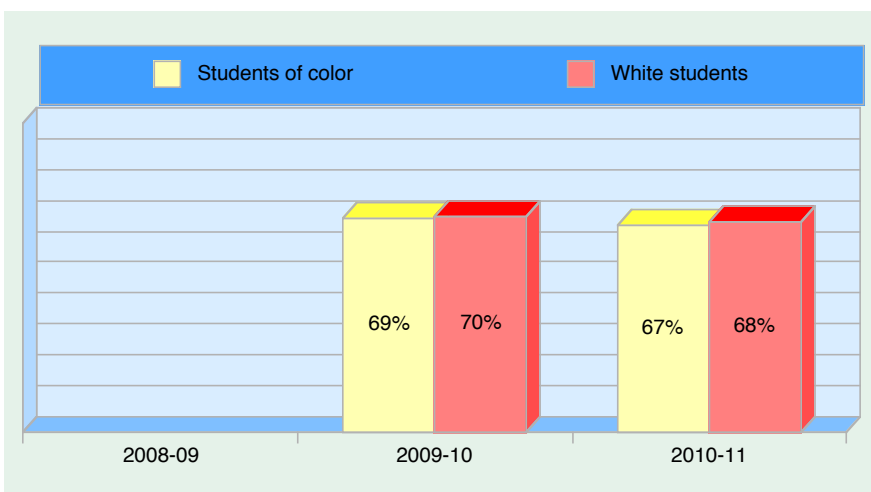
Percent of students achieving proficiency on the MCA series by eligibility for Free or Reduced Lunch, last two years (data was not captured for 2008-09).



Percent of students meeting their MAP growth targets by eligibility for Free or Reduced Lunch, last two years (data was not captured for 2008-09).



Percent of students achieving proficiency on the MCA series by ethnicity, last two years (data was not captured for 2008-09).



Percent of students meeting their MAP growth targets by ethnicity, last two years (data was not captured for 2008-09).

PERFORMANCE OF PAST STUDENTS

Research question: Are students tutored in 2009-10 who then scored proficient on MCA II sustaining and/or improving their proficiency in 2010-11?

Number of students

In addition to looking at 2009-10, we also looked at students who were tutored in 2008-09. The total number of students who can be analyzed for this question is lower than the number who actually participated. Some of these students are at grade levels where the MCA-III or MAP are not used; others did not take one or more of the tests and so are not included. Still others may have moved from the school where they were previously enrolled.

Overall, there were 90 students tutored in 2008-09 and 166 students tutored in 2009-10 who took the MCA-III exam in the spring of 2011. For the MAP series, there were 87 from 2008-09 and 144 from 2009-10 who took the exams in both the Fall of 2010 and Spring of 2011.

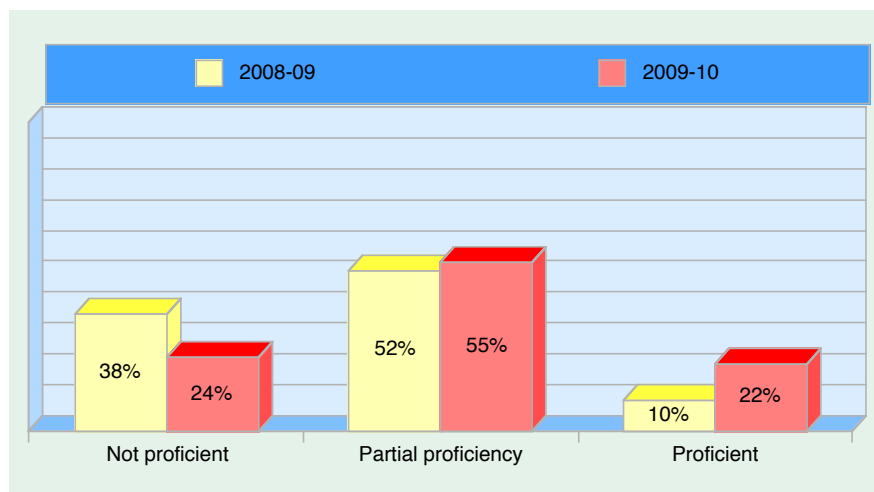
Overall performance of past students

The chart below shows how these two groups of students performed on this year's MCA-III exam. The data shows that students who were tutored in the previous year were more likely to achieve proficiency than students tutored two years earlier.

The chart at the bottom of page 26 shows, however, that performance on the 2010-11 MAP series is very similar for students in each year.

Performance based on earlier year's proficiency

The charts beginning on page 27 show the data for the actual research question, comparing students' performance in 2010-11 based on their proficiency level the year they were tutored.



Proficiency on the 2010-11 MCA-III, of students tutored in 2008-09 (yellow bars) and 2009-10 (red bars).

The data shows that student proficiency in the year they were tutored may be predictive of achieving proficiency the next year. Among 2008-09 students, 84% who achieved proficiency that year achieved partial or full proficiency in 2010-11, in spite of the higher difficulty of the test.

Among 2009-10 students, 91% of those who were proficient that year achieved full or partial proficiency in 2010-11, in spite of the different test.

Both of these figures compare favorably with the proficiency of students who were tutored in the 2010-11 year. Overall, 71% of student tutored in 2010-11 achieved full or partial proficiency. The data from the previous two years suggests that nine in ten of those should maintain their performance in the following year, and eight in ten the year after that.

Interestingly, however, proficiency in one year does not seem to impact performance on MAP in the next year or two. Among both 2008-09 and 2009-10 students, those who were not proficient during the year they were tutored appear a little more likely to have met their MAP growth target in 2010-11. Note that the difference is not significant, so we cannot say that with assurance. But the data does suggest that even students who do not achieve proficiency during the tutoring year benefit from the program, since many are able to meet their MAP growth targets in succeeding years.

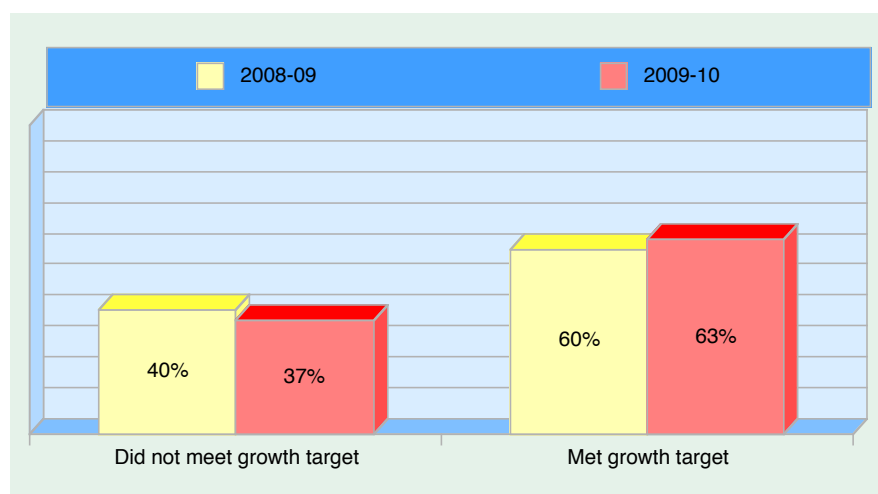
It is also worth noting that a few students who did not achieve proficiency during the year they were tutored then achieve partial or even full proficiency in the following year or two.

The difference in performance on the 2010-11 MCA-III based on earlier proficiency level is significant, according to the Pearson Chi Square test, for both 2008-09 and 2009-10.

The difference in performance on the 2010-11 MAP series based on earlier proficiency level is not significant, according to the Pearson Chi Square test, for either 2008-09 or 2009-10.

Factors that influence continued proficiency

The 2009-10 data contains demographic information. When looking at performance in the following year, students of color who achieved proficiency performed virtually the same as their white peers.

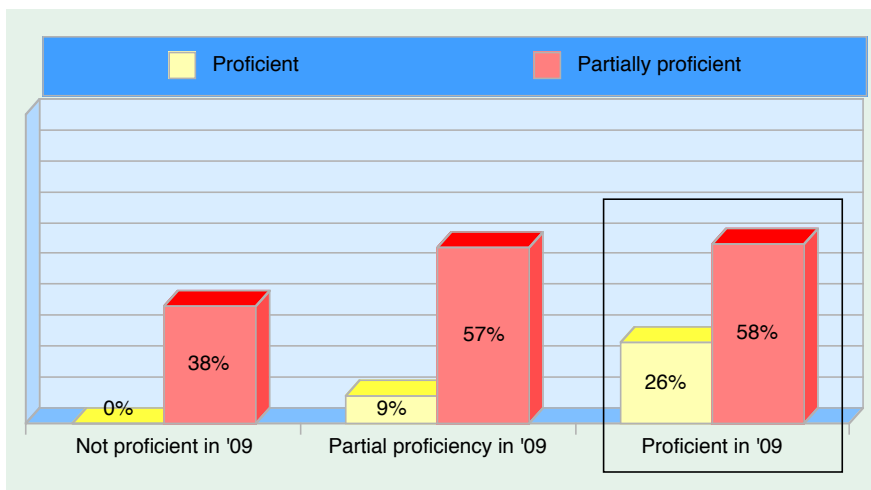


Percent of students from 2008-09 (yellow bars) and 2009-10 (red bars) who met their MAP growth target in 2010-11.

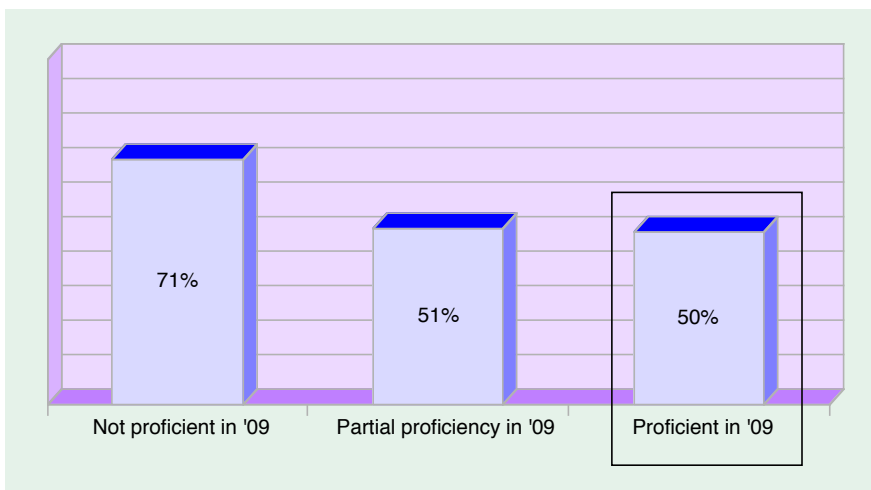
One significant difference, however, is in poverty status. Free and Reduced Lunch (FRL) students who achieved proficiency in 2009-10 were significantly less likely to maintain that performance in the following year, compared to their more well-off peers. And the FRL students who achieved proficiency in 2009-10 were also less likely to meet their MAP growth target in the following year.

The chart showing the FRL data is at the bottom of page 28.

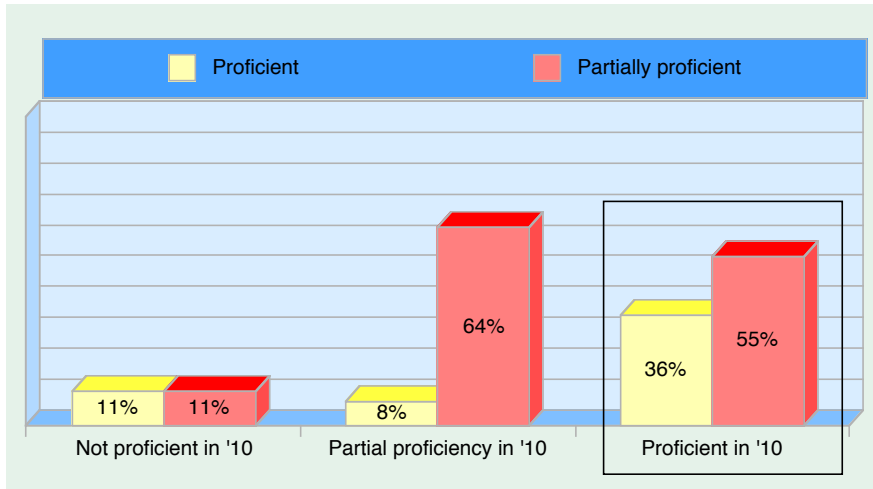
The percent of scheduled tutoring time students received did not have an impact on performance in the following year. Those who received less than 55% of scheduled tutoring time in 2009-10 appear less likely to achieve proficiency the following year, but the difference does not meet a significance test.



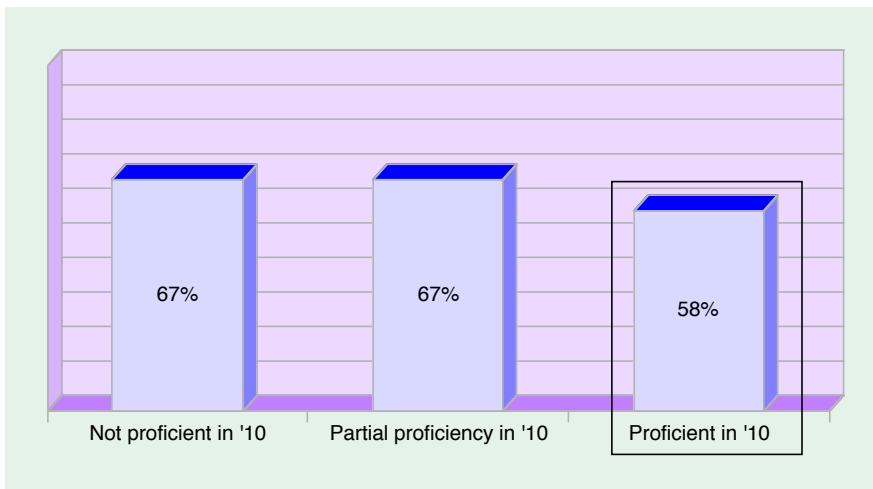
Performance on the 2010-11 MCA-III exam by students who were tutored in 2008-09, sorted by their proficiency in that year.



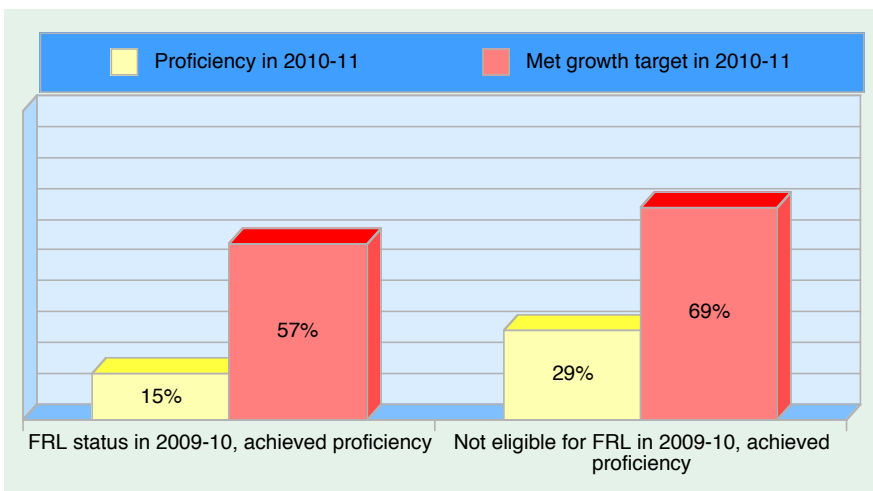
Percent of 2008-09 students who met their MAP growth target in 2010-11, sorted by their proficiency in 2008-09.



Performance on the 2010-11 MCA-III exam by students who were tutored in 2010-11, sorted by their proficiency in that year.



Percent of 2008-09 students who met their MAP growth target in 2010-11, sorted by their proficiency in 2009-10.



Subset of students who achieved proficiency in 2009-10 sorted by their FRL (poverty) status.



UpFront
Consulting

Math Corps Evaluation

*2010-11 Findings Report
in Metro Math Corps Region*

Prepared by:
UpFront Consulting
October 24, 2011

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KEY POINTS SUMMARY

Math Corps tutored 310 students in ten schools in 2010-11. About eight in ten of these students were in 7th grade; the remainder were in 8th grade. Key findings from the evaluation of this program are as follows:

- About one in seven students achieved proficiency on the MCA-III exam in both 7th and 8th grade. This exam replaced the MCA-II and is more difficult; scores on the MCA-III were lower statewide compared to the MCA-II given the previous year.
- On the MAP achievement tests, given three times yearly, about six in ten 7th grade students met or exceeded their growth target for the year. Slightly more than four in ten 8th grade student met or exceeded their target.
- Students who were closer to proficiency on the 2009-10 MCA-II exam (scoring 45 to 49) were significantly more likely to achieve proficiency or partial proficiency on the 2010-11 MCA-III when compared to students farther from proficiency (scoring 40 to 44). However, both groups showed similar progress when measured by MAP. MAP might be considered a more robust measure of progress since it is given three times per year and the scoring takes into account the student's starting point.
- As measured by the MCA-III, students of color (African American, Asian American, and Latino/a) achieved proficiency at about the same rate as White students. In MAP, African American and Asian American students were more likely to meet the growth targets than were Latino/a and White students.
- Because of a variety of personal and school conflicts, students don't usually receive the full amount of tutoring time for which they are scheduled. More than one-quarter of students received less than 35% of the tutoring time they had scheduled; another one quarter received more than 65% of their scheduled time. The data is unclear about the percentage of tutoring time received at which students show more progress. This is partly because some of the students who had less than 35% of tutoring started from a higher point in the previous year.

More information about each of these points is in the main body of the report, following the description of the program and the student profile.

PROGRAM OVERVIEW

Metro Math Corps works with 7th and 8th grade students in 10 schools St. Paul School District.

Math Corps works with students in grades four through eight who scored just below proficiency on the state's No Child Left Behind (NCLB) exam, the Minnesota Comprehensive Assessment II (MCA-II) or the Minnesota Test of English Language Learners (MTELL). Two other criteria for student selection are 1) the student is not receiving special education services, and 2) the student's teacher has recommended the student for participation.

In 2010-11, there were 310 students served.

The tutoring process

The program intends to tutor students 90 minutes per week.

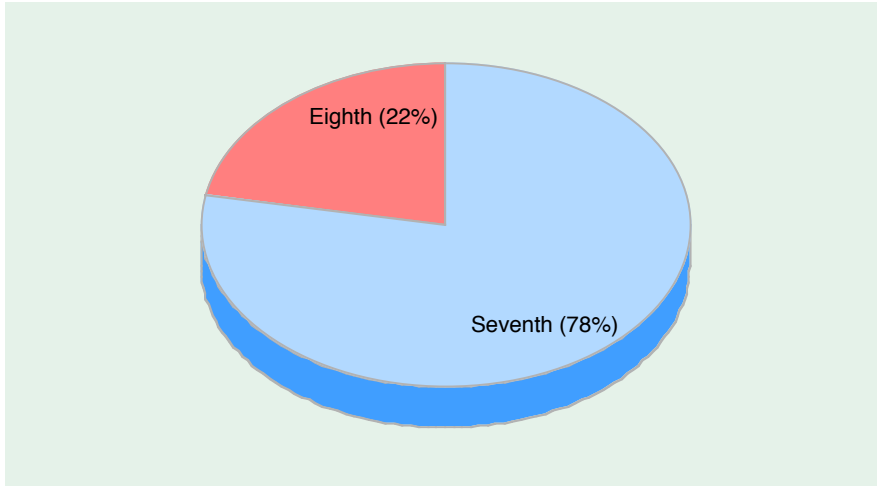
Tutoring sessions took place during the school day, outside of the classroom, and at times that did not conflict with regular Language Arts or Mathematics instruction.

Teachers in the St. Paul School District designed a curriculum for the tutors, aligned to the 2003 Minnesota Math Standards. Math Corps tutors were encouraged to use MAP and MCA scores as measures of student progress; there were no other diagnostic tests or pre- and post-tests.

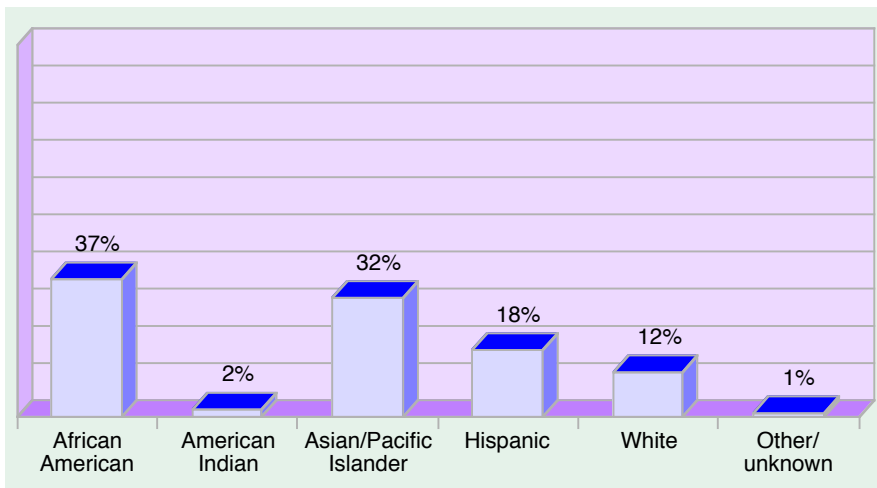
Unlike other sites, this program did not include a technology component for students.

Student profile

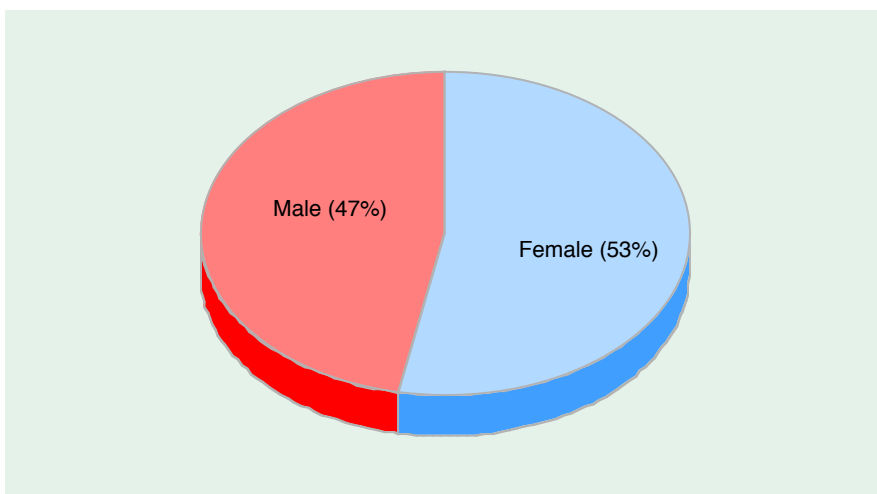
Demographic characteristics of the 310 students in the program in 2010-11 are shown in the charts on the next two pages. Note that data on students in poverty, based on the percent of students eligible for free or reduced lunch, was not provided this year, nor was data on whether students were English Language Learners (ELL).



Number of students at each grade level served by the program in 2010-11.



Ethnicity/cultural heritage of students tutored by Math Corps in 2010-11. Overall, the District is 33% Asian, 28% African American, 27% White, and 11% Hispanic.



Shown is the gender of Math Corps students. The Metro region serves slightly more females than males.

OVERALL OUTCOMES IN 2010-11

The charts and tables in this section provide some insight into overall program outcomes in 2010-11. This data is presented here as background to the research questions and findings presented later in this report.

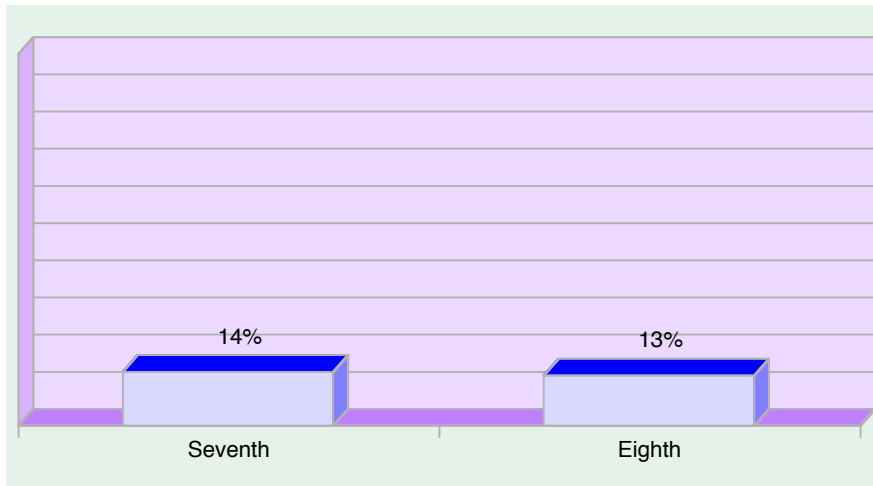
MCA-III findings

Students take the Minnesota Comprehensive Assessment late in each school year. This year the MCA-III test replaced the earlier MCA-II. The MCA-III is more difficult; scores declined an average of 9% statewide this year compared to the 2009-10 MCA-II.

One measure of the program's overall success is the percent of students who achieve proficiency (a score of 50 or higher on the MCA series) at the end of the academic year.

The chart and table below show the results for all Math Corps students who took the MCA-III exams in the spring of 2011. Since nearly all of these students would have scored from 40 to 49 the previous year, the percent of those who score 50 or higher (proficient) is one measure of program success.

Both grades showed progress as shown below. Again, note that the MCA-III is more difficult than the MCA-II exam used for student selection.



Percent of Math Corps students scoring 50 or above (proficient) on the MCA-III assessments in the spring of 2011, by grade level.

MCA-II, proficiency of Math Corps students, 2010-11

<u>Grade</u>	<u>n</u>	<u>Percent proficient (50 or higher)</u>	<u>Partially proficient (40 to 49)</u>
Seventh	189	14%	54%
Eighth	30	13%	43%

Percent of Math Corps students scoring 50 or above (proficient) on the MCA-III assessments in the spring of 2011, by grade level. Also shown is the percent who scored between 40 and 49 (partially proficient).

MAP scores

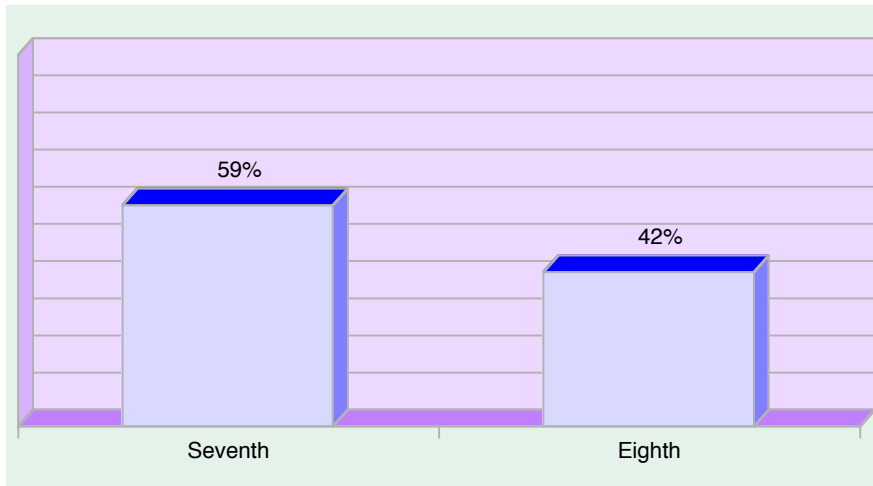
The chart and table show Math Corps student performance on Measures of Academic Progress (MAP) mathematics test, produced by Northwest Evaluation Association (NWEA).

Students take the MAP test three times per year, in fall, winter and spring. Based on nationwide data, NWEA provides growth targets or norms for each student's score. The data described in this report is the student's actual progress between fall and spring assessments compared to the progress he or she is expected to achieve, based on the nationwide norms. Note that the norms vary by grade level and by starting (fall) score. For this report, the researchers examined the percent of students who equaled or bested their growth target, as well as the mean gain between fall and spring tests.

A high percentage of Math Corps students met or exceeded the growth target for their beginning score and grade level, as shown below.

Because the MAP scores are normed based on the student's starting point (the fall test), they are perhaps a slightly more robust measure of progress than the MCA data shown on the previous page.

The norms table used for determining the amount of progress students should be expected to make, taken from a national database of MAP scores, varies based on the number of instructional weeks between the Fall and Spring tests. In analysis for this report we have used the norms for 28 instructional weeks.



Percent of Math Corps students who met or exceeded the MAP growth target for their grade level and starting score. Data includes only those students who took both the fall and spring MAP tests.

<i>Percent who met or exceeded their MAP growth target</i>		
<u>Grade</u>	<u>n</u>	<u>Percent at or above norm</u>
Seventh	191	59%
Eighth	53	42%

Number of Math Corps students by grade and percent who met or exceeded the MAP growth target for their grade level and starting score. Data includes only those students who took both the fall and spring MAP tests.

SUCCESS BASED ON SELECTION CRITERIA

Research question—Students selected for the program score from 40 to 49 on the MCA II math achievement test. Is there any difference in the success rate (as judged by both the MCA II/III and MAP tests) between students who score 45 to 49 and students who score 40 to 44? Is the difference large enough to suggest that the program concentrate on one group?

Selection criteria

Although the program in the past has tended to work with students who are quite close to MCA proficiency (45 and above), there were some students in 2010-11 who scored 44 or below on the 2010 MCA-II. The chart below shows that about 10% of students were in this category for 2010-11. For this analysis, we eliminated the 27 students who scored 39 and below or 50 and above and only considered the 283 students in the 40 to 44 and 45 to 49 groups.

We examined these two groups of students to see what kind of progress they made, on both the MCA-III and MAP. The charts showing the results are on the next two pages.

Overall, the MCA-III findings suggest that students in both groups make similar progress. The mean for the two groups were 39.21 and 43.46, very close to where one might expect the difference to be (if both groups showed identical progress, one would expect the difference in mean to be about 5, or the distance between the midpoints of each group).

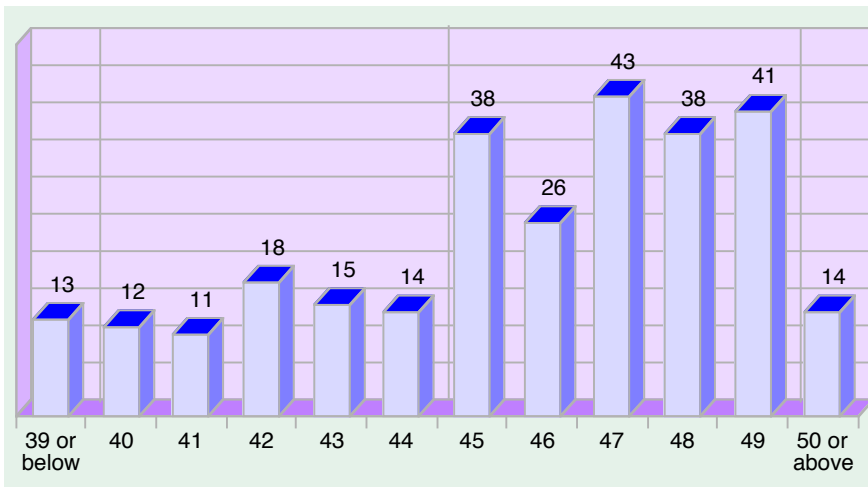
However, because the students in the 40 to 44 category start further from proficiency, they are significantly less likely to achieve proficiency the following year. Overall, only 1.9% of the 40 to 44 group achieved proficiency on the MCA-III compared to 19.3% of the 45 to 49 group. The difference is statistically significant.

The MAP data further suggests that students in each group make similar progress. This data is perhaps more robust because it takes into account

The change to the MCA-III test in 2010-11 from the MCA-II in 2009-10 makes comparison between the two years difficult. This analysis only compares the scores of each group within the same year, not year-to-year.

Analysis of the difference in mean between the two groups used a t-test. The difference has a probability of .001.

The Pearson Chi-Square Test suggests that the differences between the two groups are statistically significant ($p = .001$).



Distribution of student scores on the 2010 MCA-II. The analysis reported on these pages considers two groups, those scoring 40 to 44 and those scoring 45 to 49.

the student's starting point. The charts on page 10 show the relationship.

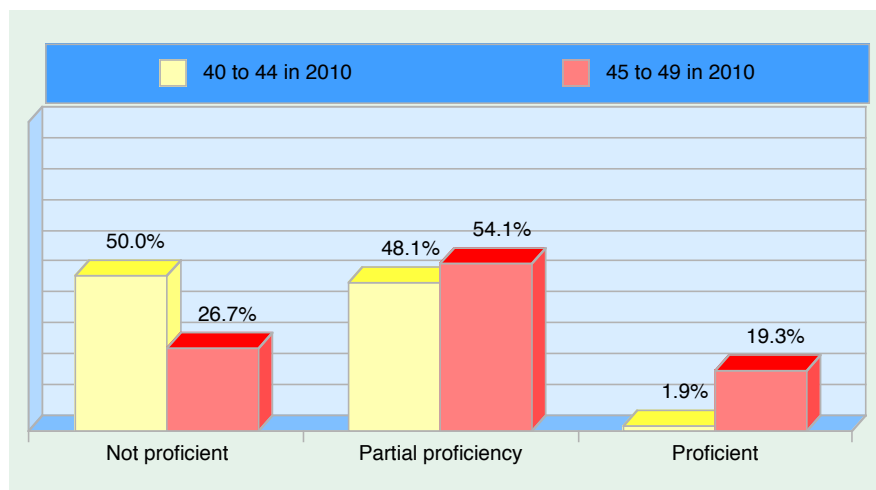
On the MAP tests, an analysis of the mean gain scores (Fall to Spring; above or below expected growth) yields no statistical significance, with the 40 to 44 group showing an average gain of 9.38 and the 45 to 49 group just slightly lower at 7.62.

Looking strictly at whether students met or exceeded their target again yielded no significant differences between groups. 55.0% of students in the 40 to 44 group met their target, compared to a virtually identical 55.1% of those in the 45 to 49 group.

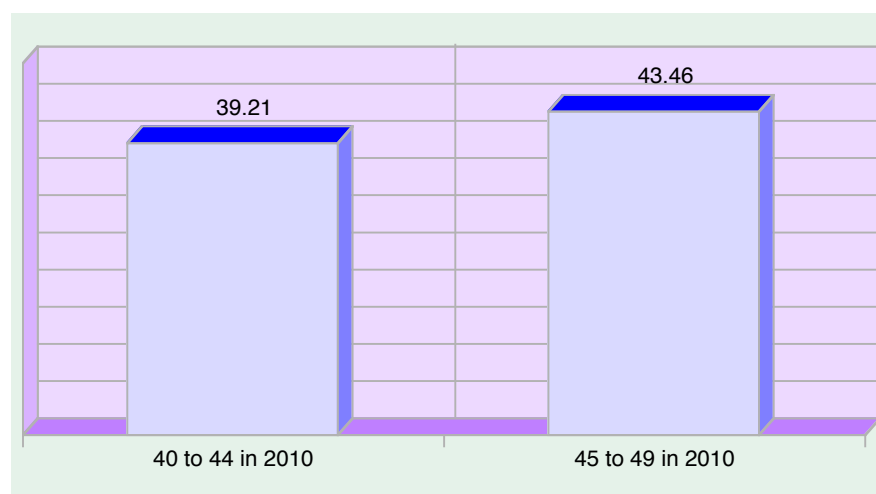
Overall the data suggests that students in both groups make similar progress.

Analysis of the mean gain above or below expected growth used a t-test to look at the means of the 40 to 44 group and the 45 to 49 group. The difference has a probability of .541.

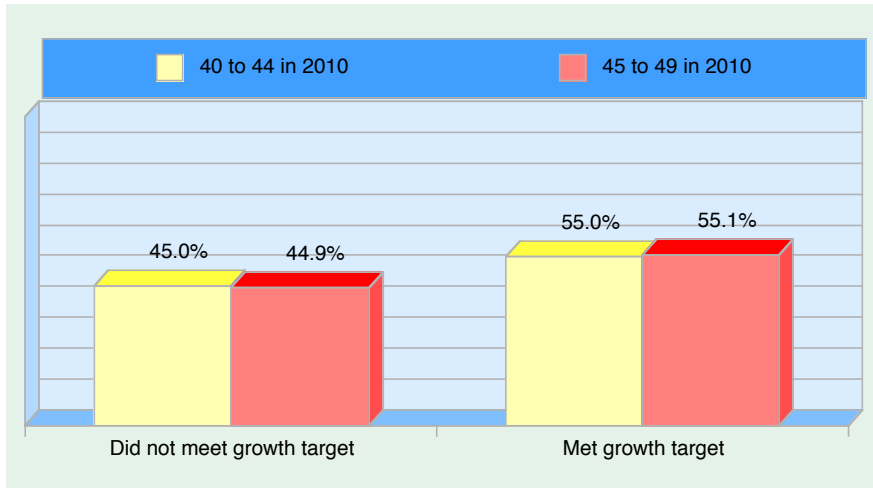
The Pearson Chi-Square Test suggests that the differences between the two groups are not statistically significant ($p = .986$).



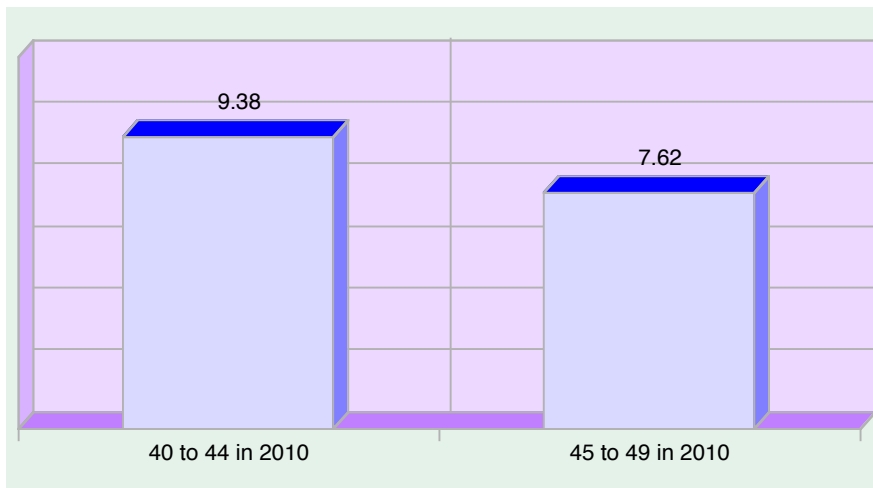
Percent of students achieving proficiency on the MCA-III in groupings based on their 2010 MCA-II scores. The differences shown are statistically significant.



Mean score on the MCA-III in groupings based on their 2010 MCA-II scores. The difference in mean is significant.



Percent of students who met their MAP growth target in 2010-11, sorted by their score on the 2010 MCA-II. The small difference shown is not significant.



Mean growth score on 2010-11 MAP, sorted by student's score on the 2010 MCA-II. The small difference shown is not significant.

CULTURAL AND SOCIO-ECONOMIC FACTORS

Research question—What are cultural factors that significantly influence achievement? Does socio-economic background significantly affect achievement? Do students of a specific ethnicity do better than others? How is achievement different for students for whom English is a second language?

Ethnicity

The group of Math Corps students was quite diverse, with four groups represented in enough numbers to provide an analysis of differences. These groups are African American, Asian American, Latino/a, and White.

Overall the findings are mixed, with all four groups of students performing similarly on the MCA-III exams. However, there were some significant differences in MAP performance.

As shown below, Latino/a students were most likely to achieve proficiency this year, but the small difference is not significant. The chart at the top of the next pages shows the mean scores on the MCA-III; the difference between the lowest and highest was only about 2 points and again did not meet a test of statistical significance.

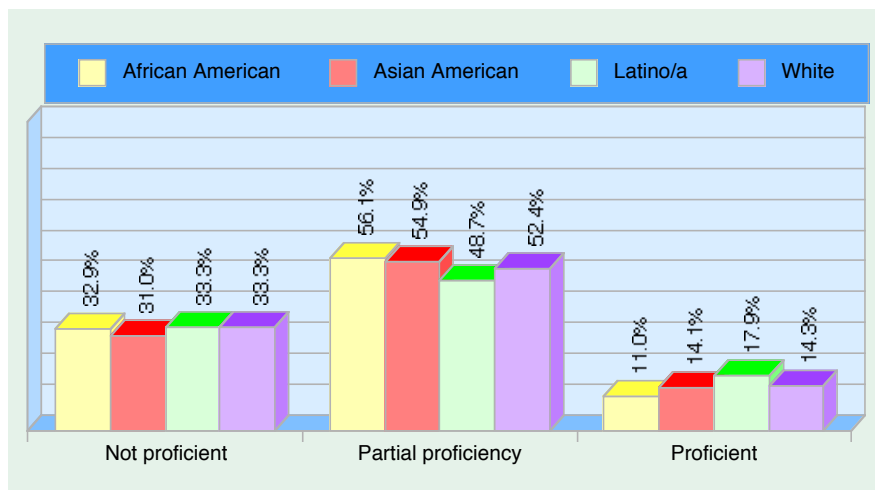
The MAP results paint a different picture, however. Asian American students were most likely to meet their growth targets, White students were significantly less likely.

Similarly, White and Latino/a students showed much less growth on MAP, compared to Asian American students. African American students were somewhere in the middle. An Analysis of Variance (ANOVA) procedure suggests these differences are significant, particularly the differences between Asian American students and the other groups.

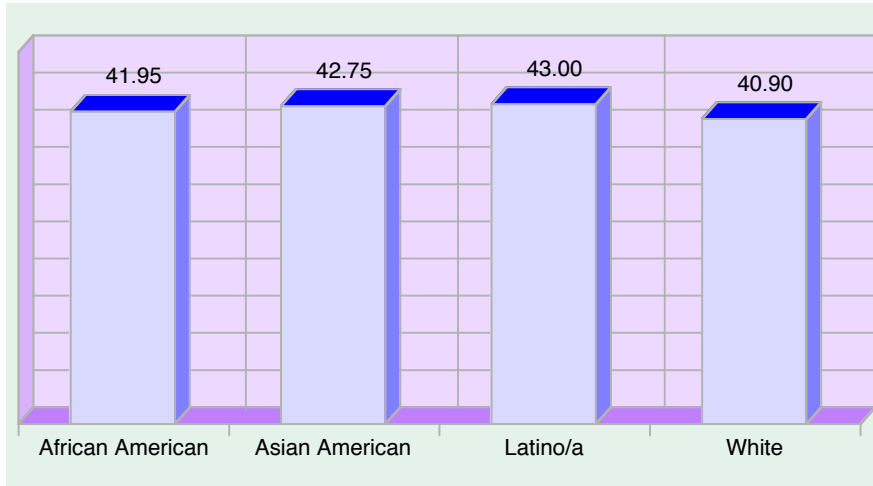
Note that this Math Corps region did not provide data on Free and Reduced Lunch status or English Language Learner status of students, so the analyses of socio-economic status and language ability could not be performed.

The researchers also looked at gender, but found no significant difference in either MCA-III or MAP performance based on gender.

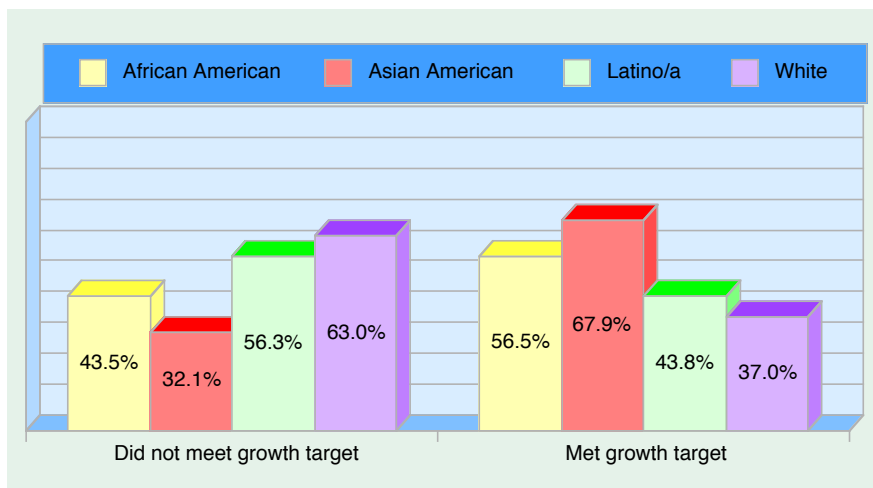
There were only five American Indian/Alaskan Native students, too small a sample to be included in this analysis. Two of these five students were proficient on MCA-III and three of the five met their MAP growth target.



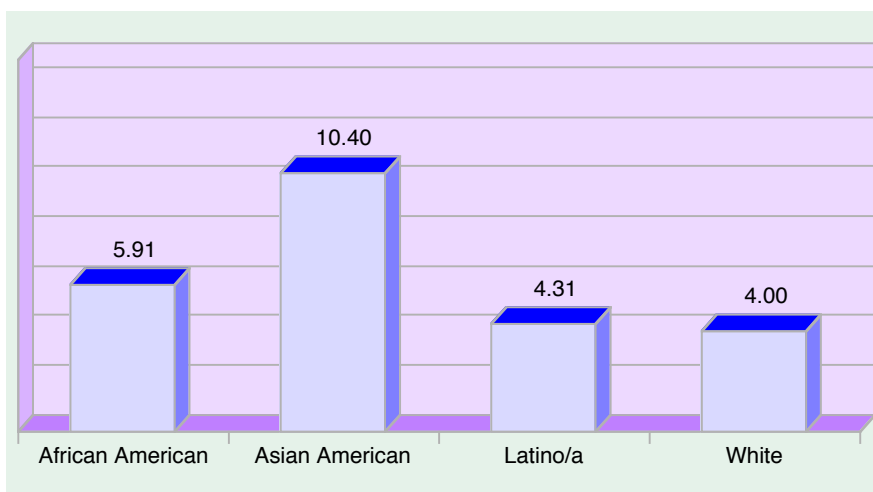
Percent of students who achieved proficiency or partial proficiency on the MCA-III exam, sorted by ethnicity. The differences shown are not statistically significant ($p = .970$).



Mean MCA-III score of students, sorted by ethnicity. The difference shown is not statistically significant ($p = .520$).



Percent of students who met their MAP growth target, sorted by ethnicity. The difference shown is statistically significant ($p = .010$).



Mean MAP growth of students, sorted by ethnicity. The between groups difference is statistically significant ($p = .012$).

PERCENT OF TUTORING TIME RECEIVED

Research question—How does the number of hours students are tutored impact performance? What is the point (in terms of percent of scheduled time actually delivered) at which students are more likely to succeed?

Time actually received

The program intends that students receive 90 minutes of tutoring each week they are in the program. However, for a variety of reasons (student absences, school programs and events, field trips, etc.) students don't always receive the full 90 minutes each week. The mean across all students is about 48% of scheduled tutoring time that is actually received.

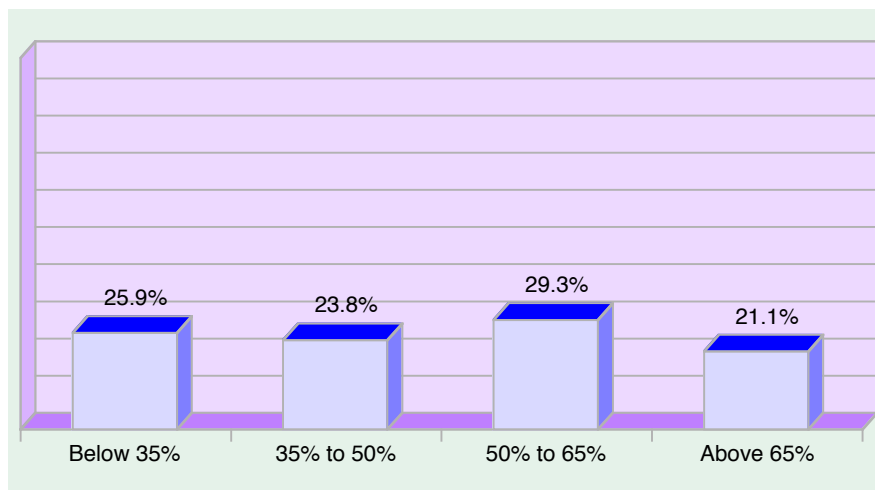
However, this varies widely by student. An examination of the data shows that the percent of expected tutoring received can be grouped into four relatively equal categories (quartiles). The chart below shows the four groups and the percent of students in each. Note that about one-quarter of students received less than 35% of the tutoring they were scheduled for, while another quarter received more than 75% of scheduled.

The MCA data is very unclear, however, on how this amount of tutoring time impacts performance. Initial examination suggests that the students who received the least amount of tutoring time were more likely to achieve proficiency. However, the statistical analysis shows this finding is not significant overall. Some groups, however, did show a significant difference from other groups in overall MCA-III score, according to an analysis of variance (ANOVA).

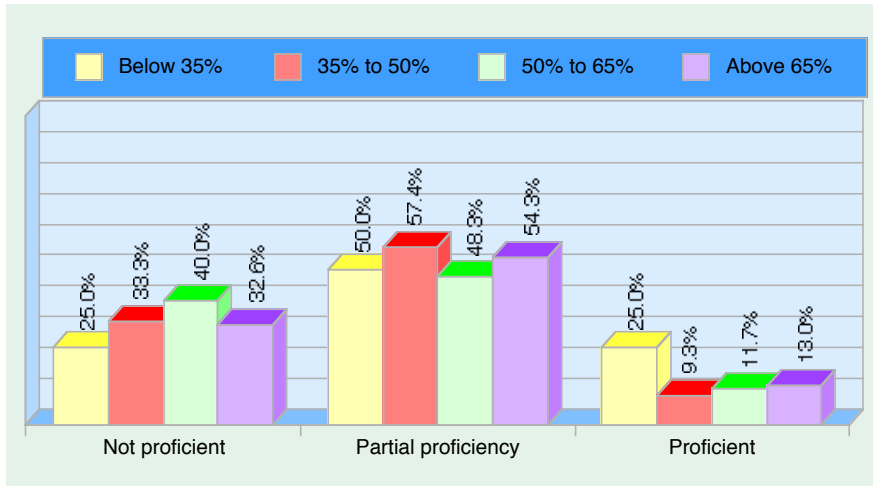
The MAP data suggests a fairly steady progression, with students more likely to reach their growth target with each increase in tutoring time. However, note that this data, shown on the next two pages, also does not meet the test of statistical significance.

In this analysis, we have removed the few students that were in the program for less than 12 weeks. This was only 16 students out of the 310 in the program the entire year.

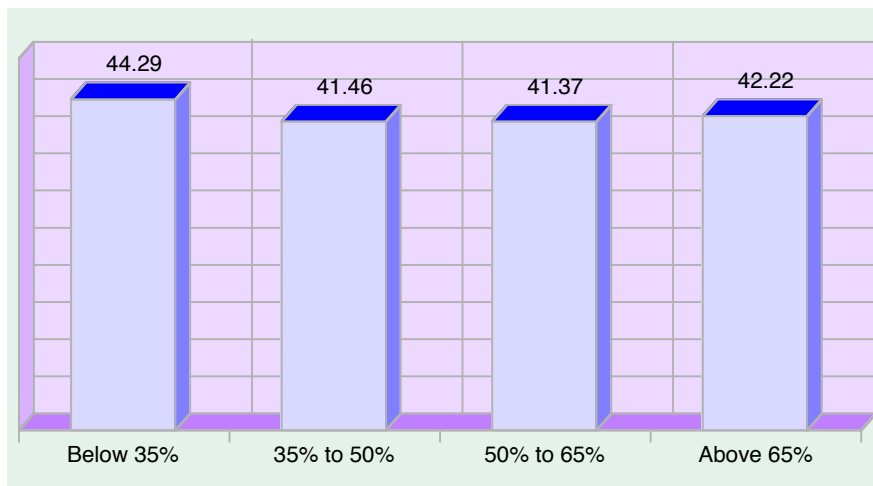
One explanation for the strong showing by students who received less than 35% of tutoring time is that this group actually had a higher mean and median on the 2009-10 MCA-II than students who received more tutoring.



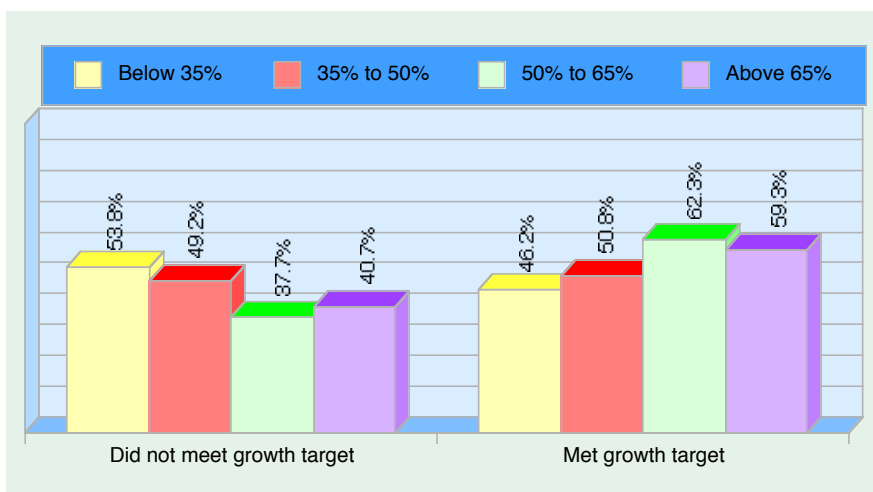
Percent of expected tutoring time that student actually received, in quartiles.



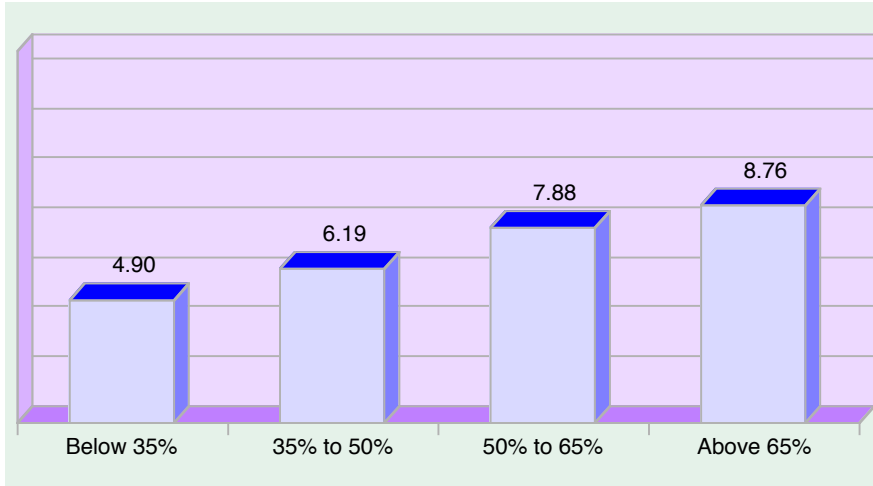
Percent of students who achieved proficiency or partial proficiency on the MCA-III exam, sorted by percent of tutoring time. The differences shown are not statistically significant ($p = .282$).



Mean MCA-III score of students, sorted by percent of tutoring time. The difference shown is not statistically significant ($p = .178$).



Percent of students who met their MAP growth target, sorted by percent of tutoring time. The difference shown is not statistically significant ($p = .249$).



Mean MAP growth of students, sorted by percent of tutoring time. The difference shown is not statistically significant ($p = .337$).



UpFront
Consulting

Math Corps Evaluation

*2010-11 Findings Report
in St. Croix River Education District
Math Corps Region*

Prepared by:
UpFront Consulting
October 24, 2011



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KEY POINTS SUMMARY

Math Corps tutored 143 students in seven schools in the St. Croix River Education District (SCRED) 2010-11. About four in ten of these students were in 4th grade; the remainder were in 5th or 6th grade. Key findings from the evaluation of this program are as follows:

- About five in ten students achieved proficiency on the MCA-III exam in both 4th and 5th grade; more than six in ten achieved proficiency in 6th grade. This exam replaced the MCA-II and is more difficult; scores on the MCA-III were lower statewide compared to the MCA-II given the previous year.
- On the MAP achievement tests, given three times yearly, more than eight in ten 4th grade students met or exceeded their growth target for the year. This compares to nearly seven in ten 5th graders and nearly eight in ten 6th graders.
- Students who were closer to proficiency on the 2009-10 MCA-II exam (scoring 45 to 49) were more likely to achieve proficiency or partial proficiency on the 2010-11 MCA-III when compared to students farther from proficiency (scoring 40 to 44). Although the difference is fairly large, the difference was not significant according to a standard statistical test.
- Overall, students in the 40 to 44 group showed progress similar to the 45 to 49 group when measured by MAP. A similar percent of students in both groups met their MAP growth target and their overall gain from Fall to Spring was similar. MAP might be considered a more robust measure of progress since it is given three times per year and the scoring takes into account the student's starting point.
- There was no difference in performance between the few students of color and Caucasian students in both MCA-III and MAP.
- Although the differences are not large, female students performed better on the MCA-III than did male students. On MAP, however, their performance was similar.
- Because of a variety of personal and school conflicts, students don't usually receive the full amount of tutoring time for which they are scheduled. SCRED prepared a separate analysis of the impact of differences in tutoring time on student performance; that data is not included in this report.

More information about each of these points is in the main body of the report, following the description of the program and the student profile.

PROGRAM OVERVIEW

The St. Croix River Education District (SCRED) participated in the Minnesota Math Corps for the first time during School Year 2010-11. Overall, 143 students across seven buildings in grades four, five, and six received tutoring.

Students were selected based on risk level for passing the state standards test for their grade level. From previous analysis, targets predicting the likelihood of passing the MCA-II Mathematics test were developed. Three categories (Tiers) of probability were established. Students with at least a 75% chance of passing the MCA-II were considered Tier 1 and had very little or no-risk in meeting grade level standards as measured by the MCA-II. Despite the state moving to a new version of the MCA, MCA-III, SCRED used the targets for the MCA-II because no other data was available to predict the MCA-III.

Students with a 26% to 74% chance of passing the MCA-II were considered Tier 2. Approximately half of these students go on to pass the MCA-II. Students at the higher end of this Tier are considered slightly at-risk and were the primary focus of selection for Math Corps.

Students with at best a 25% chance of passing the grade level MCA-II were considered Tier 3 and at significant risk for not meeting grade level standards. These students need instruction from a well-trained teacher.

In the selection process, student data was sorted by MCA-II score, MAP scores, Math Applications, and Math Facts. MAP and Math Applications are measures that predict performance on the MCA-II. Students with most of their scores in the Tier 2 range were selected for the program.

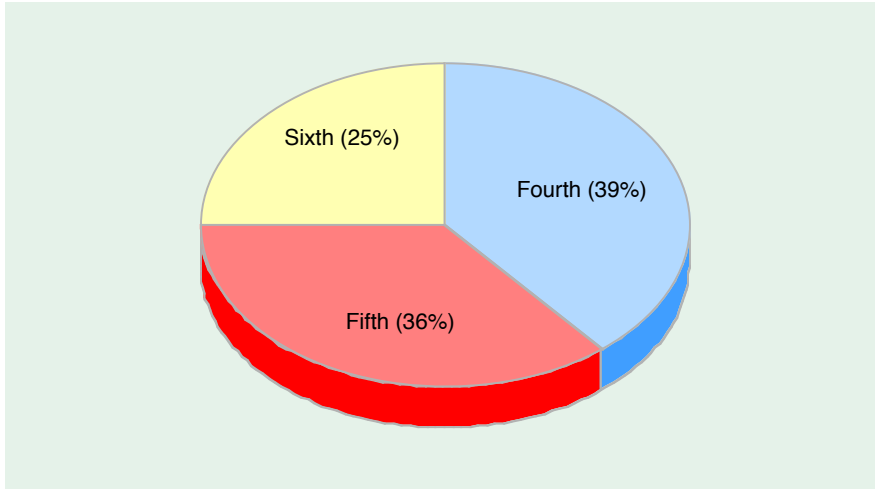
The tutoring process

Math Corps students participated in VMath lessons daily for 30 minutes in groups of 2 or 3. A few groups had 4 students. Overall, this resulted in tutoring time per week between 120 and 150 minutes.

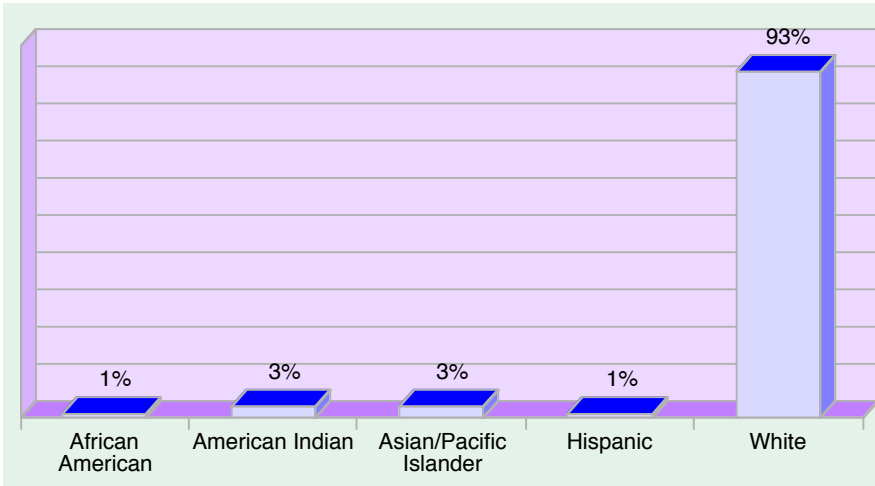
Members moved through the VMath curriculum exactly as it was laid out. There are eight modules with an assessment at the beginning of each for lesson planning. Pre and post-tests are taken within the modules. Students also completed a final assessment. Math Corps tutors conducted re-teaching in areas where students were not progressing, based on the pre and post-tests.

Student profile

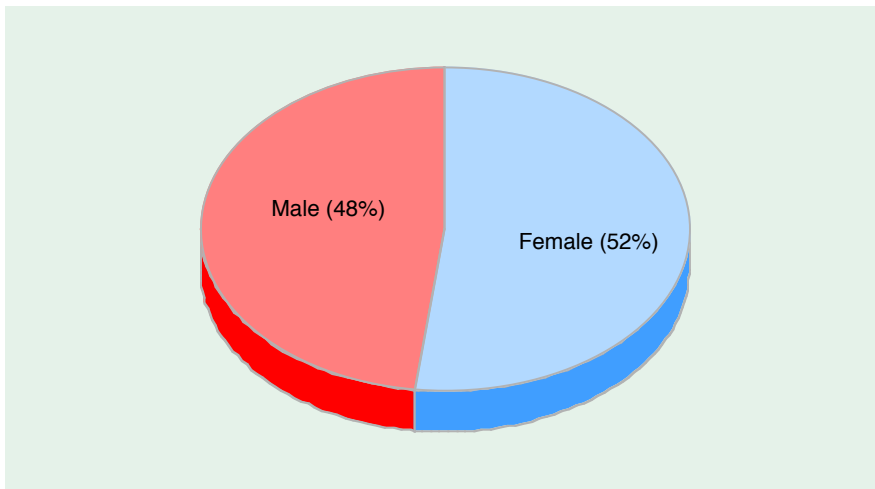
Demographic characteristics of the 143 students in the program in 2010-11 are shown in the charts on the next two pages.



Number of students at each grade level served by the program in 2010-11.



Ethnicity/cultural heritage of Math Corps students in 2010-11.



Gender of Math Corps students. The SCRED region Math Corps program serves slightly more females than males.

OVERALL OUTCOMES IN 2010-11

The charts and tables in this section provide some insight into overall program outcomes in 2010-11. This data is presented here as background to the research questions and findings presented later in this report.

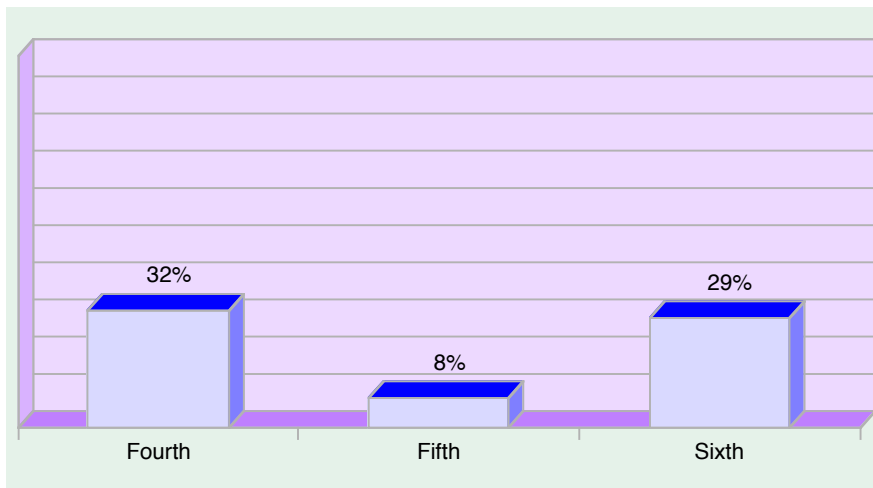
MCA-III findings

Students take the Minnesota Comprehensive Assessment late in each school year. This year the MCA-III test replaced the earlier MCA-II. The MCA-III is more difficult; scores declined statewide about 9% this year compared to 2009-10.

One measure of the program's overall success is the percent of students who achieve proficiency (a score of 50 or higher) at the end of the academic year.

The chart and table below show the results for all Math Corps students who took the MCA-III exams in the spring of 2011. Since many students would have scored from 40 to 49 the previous year, the percent of those who score 50 or higher (proficient) is one measure of program success.

All grades showed progress; fourth and sixth had the highest percent of students who achieved proficiency. Again, note that the MCA-III is more difficult than the 2010 MCA-II exam used for student selection.



Percent of Math Corps students scoring 50 or above (proficient) on the MCA-III assessments in the spring of 2011, by grade level.

MCA-II, proficiency of Math Corps students, 2009-10

<u>Grade</u>	<u>n</u>	<u>Percent proficient (50 or higher)</u>	<u>Partially proficient (40 to 49)</u>
Fourth .....	.54	31.5%	48.1%
Fifth .....	.52	7.7%	51.9%
Sixth .....	.34	29.4%	64.7%

Percent of Math Corps students scoring 50 or above (proficient) on the MCA-III assessments in the spring of 2011, by grade level. Also shown is the percent who scored between 40 and 49 (partially proficient).

MAP scores

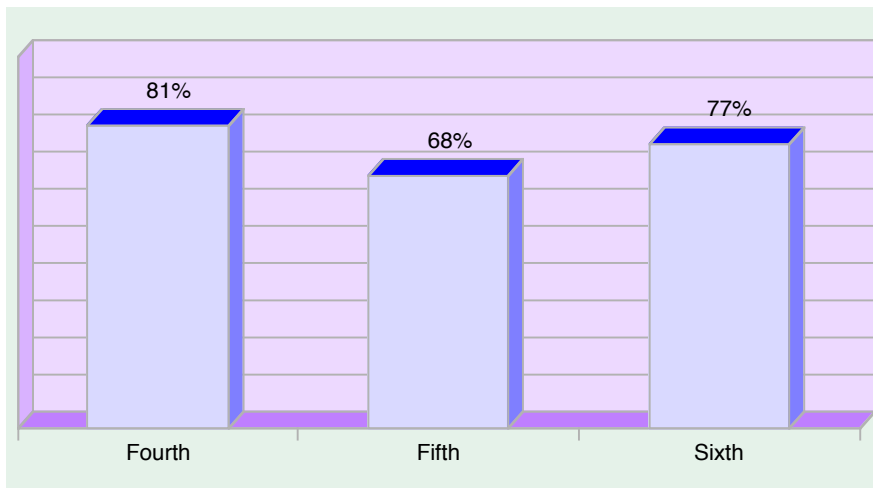
The chart and table show Math Corps student performance on Measures of Academic Progress (MAP) mathematics test, produced by Northwest Evaluation Association (NWEA).

Students take the MAP test three times per year, in fall, winter and spring. Based on nationwide data, NWEA provides growth targets or norms for each student's score. The data described in this report is the student's actual progress between fall and spring assessments compared to the progress he or she is expected to achieve, based on the nationwide norms. Note that the norms vary by grade level and by starting (fall) score. For this report, the researchers examined the percent of students who equaled or bested their growth target, as well as the mean gain between fall and spring tests.

A high percentage of Math Corps students met or exceeded the growth target for their beginning score and grade level, as shown below.

Because the MAP scores are normed based on the student's starting point (the fall test), they are perhaps a slightly more robust measure of success than the MCA data shown on the previous page.

The norms table used for determining the amount of progress students should be expected to make, taken from a national database of MAP scores, varies based on the number of instructional weeks between the Fall and Spring tests. In analysis for this report we have used the norms for 28 instructional weeks.



Percent of Math Corps students who met or exceeded the MAP growth target for their grade level and starting score. Data includes only those students who took both the fall and spring MAP tests.

<i>Percent who met or exceeded their MAP growth target</i>		
<u>Grade</u>	<u>n</u>	<u>Percent at or above norm</u>
Fourth .....	.53	81%
Fifth .....	.50	68%
Sixth .....	.34	77%

Number of Math Corps students by grade and percent who met or exceeded the MAP growth target for their grade level and starting score. Data includes only those students who took both the fall and spring MAP tests

SUCCESS BASED ON SELECTION CRITERIA

Research question—Students selected for the program score from 40 to 49 on the MCA II math achievement test. Is there any difference in the success rate (as judged by both the MCA II/III and MAP tests) between students who score 45 to 49 and students who score 40 to 44? Is the difference large enough to suggest that the program concentrate on one group?

Selection criteria

Overall, 62% of SCRED students scored between 40 and 49 on the 2010 MCA-II. The chart below shows the overall distribution of 2010 scores. For this analysis, we eliminated the students who scored 39 and below or 50 and above and only considered the 89 students in the 40 to 44 and 45 to 49 groups.

We examined these two groups of students to see what kind of progress they made, on both the MCA-III and MAP. The charts showing the results are on the next two pages.

Overall, the MCA-III findings suggest that students in both groups make similar progress. The mean for the two groups were 40.79 and 43.83, very close to where one might expect the difference to be (if both groups showed identical progress, one would expect the difference in mean to be about 5, or the distance between the midpoints of each group).

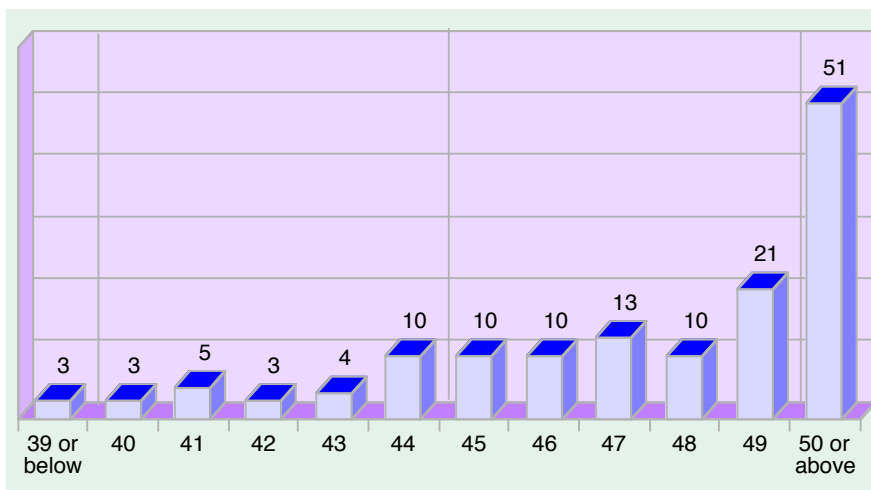
However, because the students in the 40 to 44 category start further from proficiency, one would expect them to be less likely to achieve proficiency the following year. The chart on the next page shows that this is the case; however, the difference does not meet the test of significance, so it is not possible to make this claim with assurance.

The MAP data further suggests that students in each group make similar progress. This data is perhaps more robust because it takes into account the student's starting point. The charts on page 10 show the relationship.

The change to the MCA-III test in 2010-11 from the MCA-II in 2009-10 makes comparison between the two years difficult. This analysis only compares the scores of each group within the same year, not year-to-year.

Analysis of the difference in mean between the two groups used a t-test. The difference has a probability of .132; not statistically significant.

The Pearson Chi-Square Test suggests that the difference between the two groups is not statistically significant ($p = .246$).



Distribution of student scores on the 2010 MCA-II. The analysis reported on these pages considers two groups, those scoring 40 to 44 and those scoring 45 to 49.

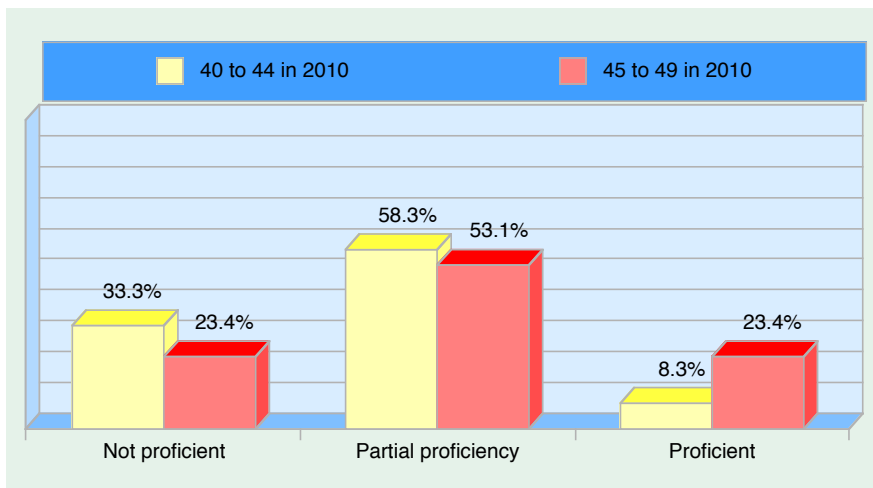
On the MAP tests, an analysis of the mean gain scores (Fall to Spring; above or below expected growth) yields no statistical significance, with the 40 to 44 group showing an average gain of 14.50 and the 45 to 49 group just slightly lower at 13.31.

Looking strictly at whether students met or exceeded their target again yielded no significant differences between groups. 75.0% of students in the 40 to 44 group met their target, compared to a virtually identical 75.8% of those in the 45 to 49 group.

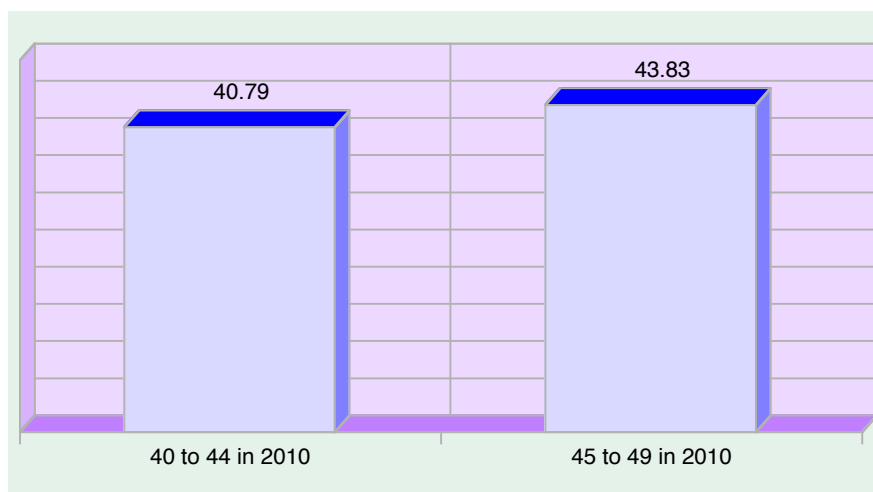
Overall the data suggests that students in both groups make similar progress.

Analysis of the mean gain above or below expected growth used a t-test to look at the means of the 40 to 44 group and the 45 to 49 group. The difference has a probability of .498.

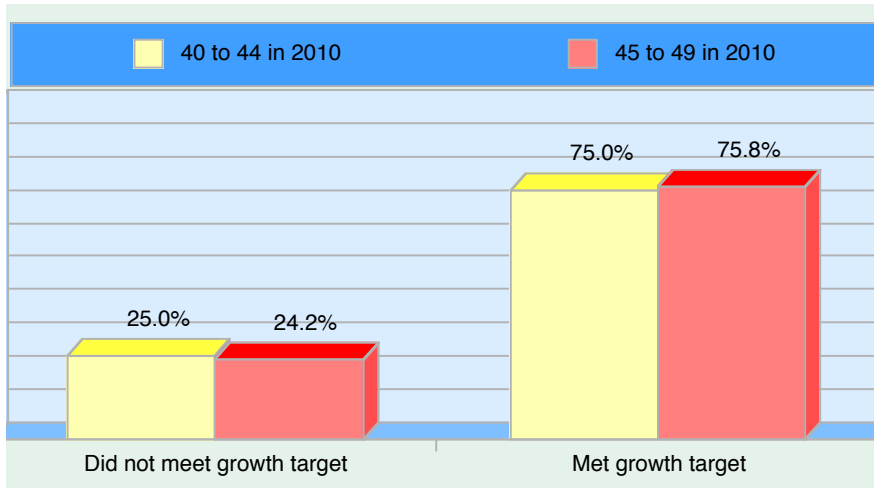
The Pearson Chi-Square Test suggests that the differences between the two groups are not statistically significant ($p = .938$).



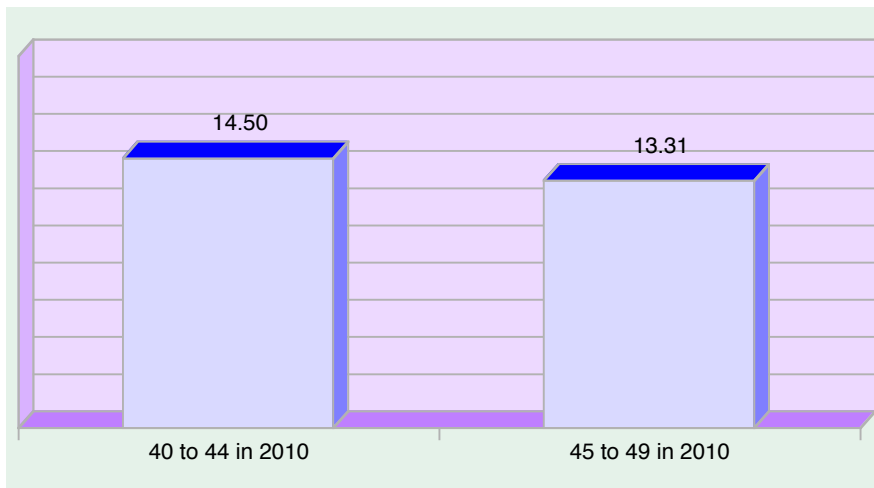
Percent of students achieving proficiency on the MCA-III in groupings based on their 2010 MCA-II scores. The differences shown are not statistically significant.



Mean score on the MCA-III in groupings based on their 2010 MCA-II scores. The difference in mean is not significant.



Percent of students who met their MAP growth target in 2010-11, sorted by their score on the 2010 MCA-II. The small difference shown is not significant.



Mean growth score on 2010-11 MAP, sorted by student's score on the 2010 MCA-II. The small difference shown is not significant.

CULTURAL AND SOCIO-ECONOMIC FACTORS

Research question—What are cultural factors that significantly influence achievement? Does socio-economic background significantly affect achievement? Do students of a specific ethnicity do better than others? How is achievement different for students for whom English is a second language?

Note that SCRED did not provide data on Free and Reduced Lunch status or English Language Learner status of students, so the analyses of socio-economic status and language ability could not be performed.

Ethnicity

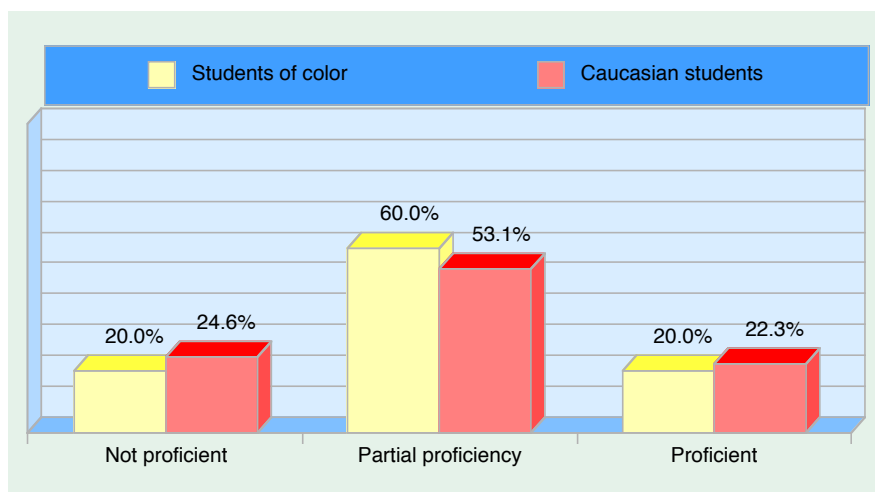
Overall, 7% of 2010-11 Math Corps participants were non-Caucasian. For this analysis, we grouped these students into the category Students of Color; this included African American, American Indian, Asian American, and Latino/a students. This was done in order to have a large enough sample size to produce usable conclusions.

The 7% students of color is a small sample size for analysis, only 10 students out of the 143 who participated in the program.

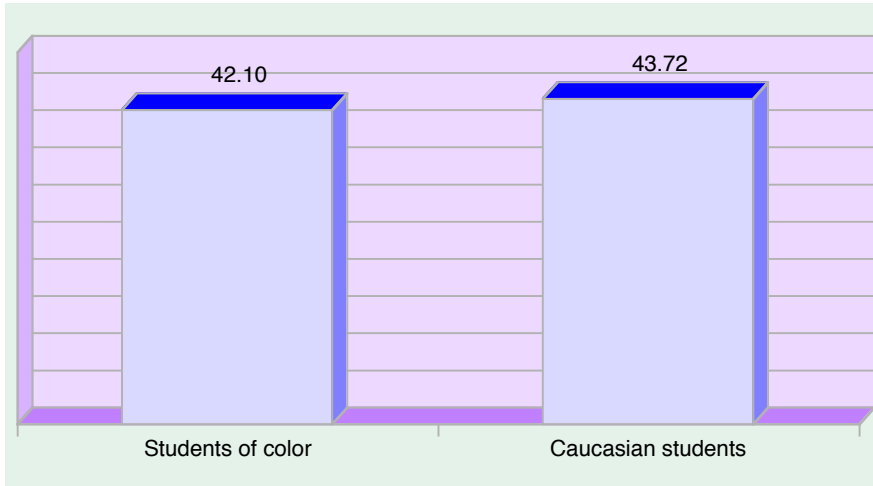
Overall the findings suggest that students of color performed as well as their peers on the MCA-III exams, and as measured by MAP.

As shown below, students of color were equally likely to achieve proficiency in the MCA-III compared to their peers. The chart at the top of the next pages shows the mean scores on the MCA-III; students of color averaged within two points of than Caucasian students, a difference too small to be significant, according to a standard test.

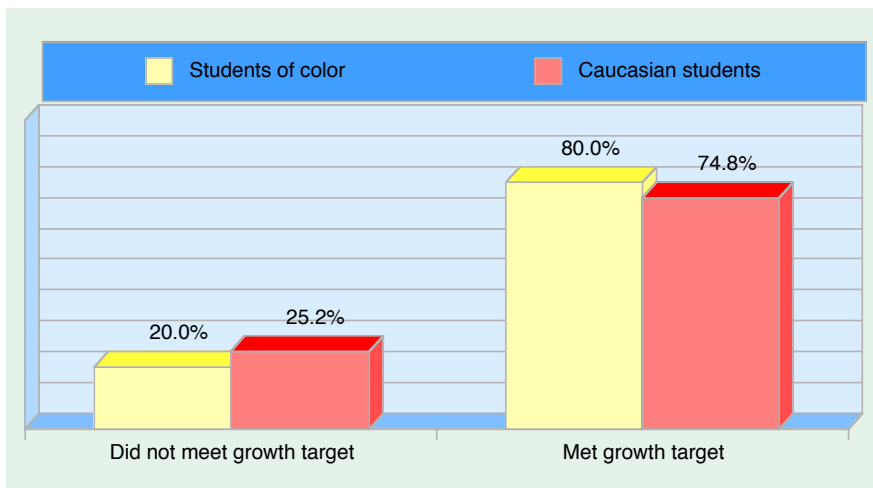
The MAP results also suggest the two groups made equal progress. Students in both groups were equally likely to have met their growth target (80.0% of students of color met their target compared to 74.8% of Caucasian students). In the mean growth score, about 1 point separated the two groups; the difference was not significant.



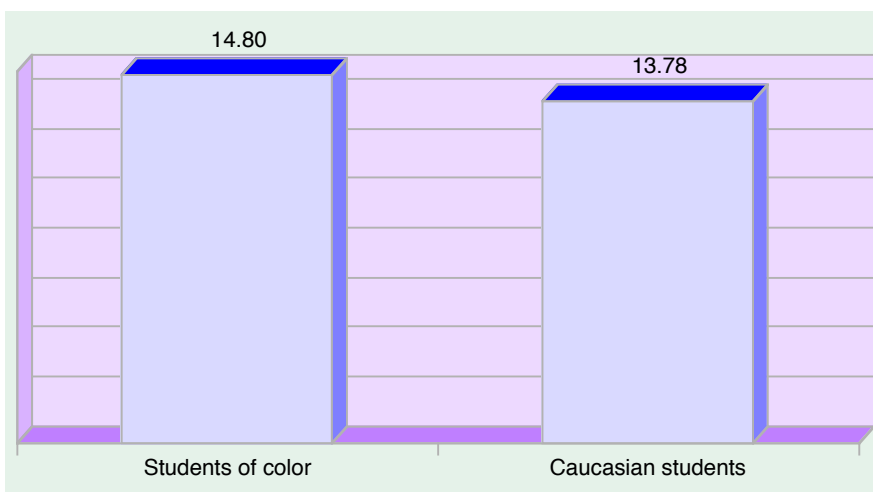
Percent of students who achieved proficiency or partial proficiency on the MCA-III exam, sorted by ethnicity. The small differences shown are not statistically significant ($p = .991$).



Mean MCA-III score of students, sorted by ethnicity. The difference shown is not statistically significant ($p = .575$).



Percent of students who met their MAP growth target, sorted by ethnicity. The difference shown is not statistically significant ($p = .714$).



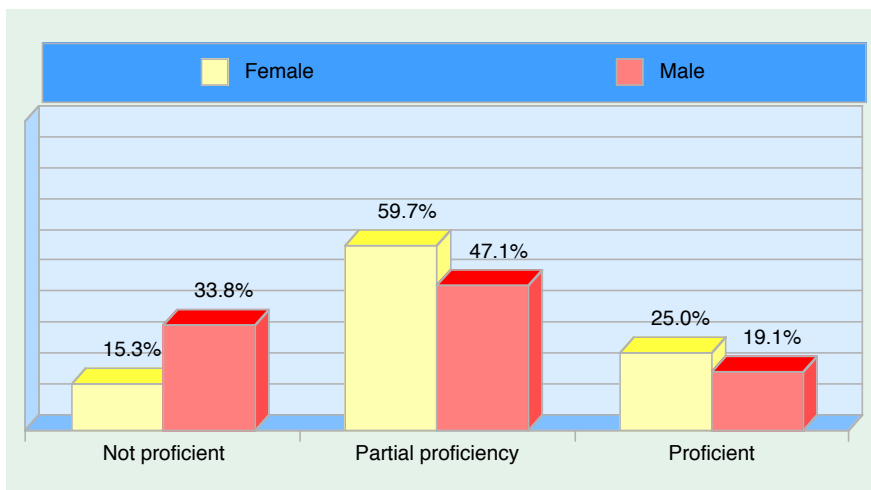
Mean MAP growth of students, sorted by ethnicity. The difference shown is not statistically significant ($p = .672$).

Gender

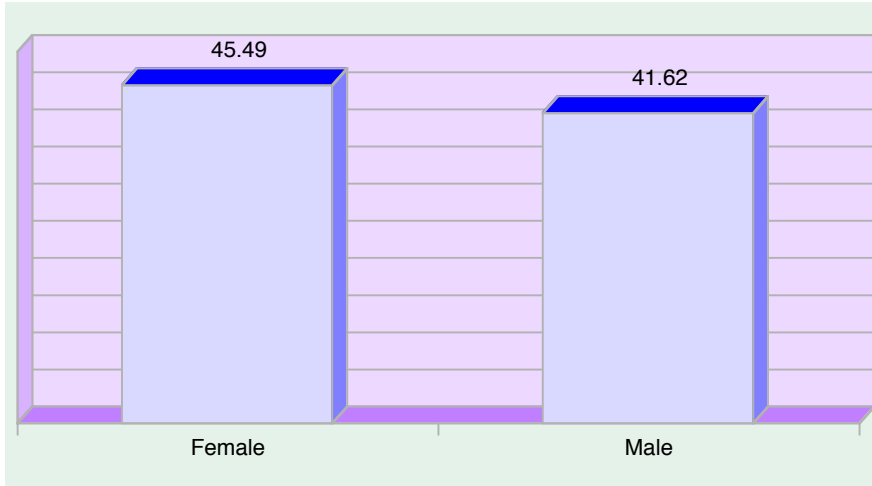
Although not part of the research question, the database included gender information for each student. An analysis of this data shows that girls did significantly better than boys on the MCA III exams. The MAP data, however, when sorted by gender, is inconclusive.

As shown below, female students were significantly more likely to achieve proficiency in the 2011 MCA-III, even though the mean for the two genders was virtually equal on the 2010 MCA-II. Further, the mean score for girls was nearly 4 points above that of boys for the MCA-III, again a significant difference.

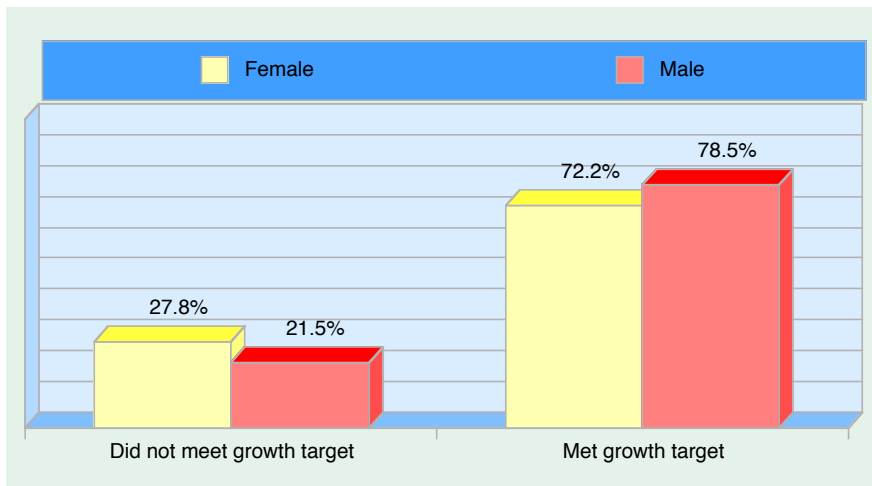
However, note that although the MAP data shows that girls had a slightly higher MAP growth score, the difference is not significant. Conversely, a higher percentage of boys achieved their MAP growth target; again the difference is not significant.



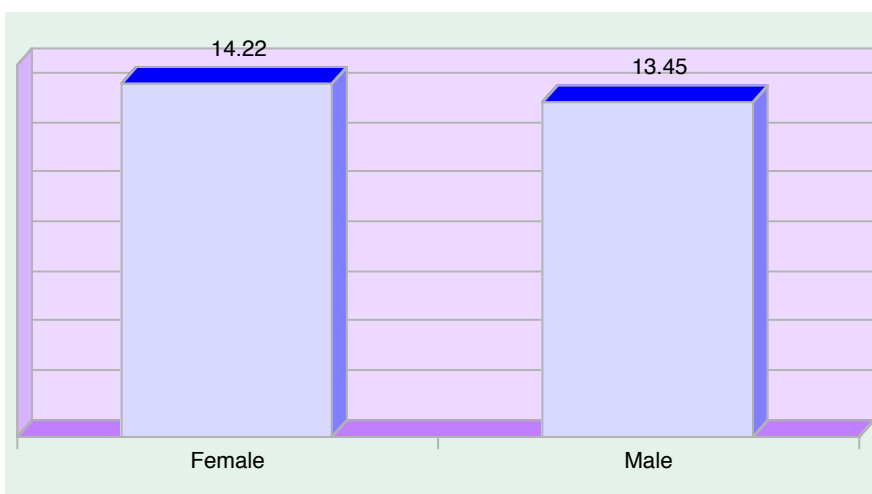
Percent of students who achieved proficiency or partial proficiency on the MCA-III exam, sorted by gender. The differences shown are statistically significant ($p = .038$).



Mean MCA-III score of students, sorted by gender. The difference shown is statistically significant ($p = .009$).



Percent of students who met their MAP growth target, sorted by gender. The difference shown is not statistically significant ($p = .399$).



Mean MAP growth of students, sorted by gender. The difference shown is not statistically significant ($p = .536$).

St. Croix River Education District- Experimental Design Results

Math Corps Results School Year 2011

The St. Croix River Education District (SCRED) participated in the Minnesota Math Corps for the first time during School Year 2010-11. One hundred, thirty-two students participated in grades 4, 5, and 6. Math Corps students participated in VMath lessons daily for 30 minutes in groups of 2 or 3. A few groups had 4 students.

The purpose of these analyses is to examine the effect on passing the MCA-III, growth on the Measures of Academic Progress (MAP: NWEA) and General Outcome Measures, and the effect time had on producing successful outcomes.

Students were selected based on risk level for passing the state standards test for their grade level. From previous analysis, targets predicting the likelihood of passing the MCA-II Mathematics test were developed. Three categories (Tiers) of probability were established. Students with at-least a 75% chance of passing the MCA-II were considered Tier 1 and had very little or no-risk in meeting grade level standards as measured by the MCA-II. Despite the state moving to a new version of the MCA, MCA-III, we used the targets for the MCA-II because no other data was available to predict the MCA-III.

Table 1. Example of Selection Table for Each Grade

School	Grade	MCA-II	MAP Fall 2009-10	MAP Winter 2009-10	MAP Spring 2009-10	Math Applications Fall 2009-10	Math Applications Winter 2009-10	Math Applications Spring 2009-10	Math Facts Fall 2009-10	Math Facts Winter 2009-10	Math Facts Spring 2009-10						
HES	3	351	187		199	6	14	17	8	16	19	M	Am				
HES	3	350	197		210	5	18	17	13	20	22	M	Am				
HES	3	350	188		199	10	17	15	9	14	20	F	Am				
HES	3	350			201		19	13		12	16	M	WF				
HES	3	344	192		201	12	13	19	13	19	23	M	WF				
HES	3	343	187		193	7	17	17	10	18	24	F	WF				
HES	3	343	176		192	9	12	15	8	10	17	M	Bla				
HES	3	344	191		186	5	13	15	5	7	20	F	Am				
HES	3	343	188		190	8	17	18	6	16	21	M	WF				
HES	3	343	184		190	3	15	15	7	12	11	F	Am				
HES	3	340	178		185	1	9	12	7	10	18	M	WF				
HES	3	347			194		12	18		12	22	F	Am				
HES	3	347	192		195	2	13	16	8	7	16	F	WF				
HES	3	346	195		197	7	15	17	13	18	21	M	Am				
HES	3	344	179		196	5	14	16	11	18	18	F	WF				
HES	3	346	188		200	6	14	20	9	10	17	F	WF				
HES	3	349	196		201	8	17	17	7	15	17	F	Am				
HES	3	348	180		196	5	10	16	5	7	16	F	WF				
HES	3	348	187		195	9	15	17	7	14	12	M	Am				
HES	3	346	179		197	8	14	19	5	13	16	F	WF				
HES	3	338	176		185	7	12	10	12	14	23	F	WF				
HES	3	336	192		178	4	14	10	7	8	8	M	WF				
HES	3	333	172		178	6	8	7	7	8	12	F	WF				
HES	3	326	186		181	8	13	14	8	14	17	F	WF				

Note. For MCA-II, MAP, and Math Applications: green indicates at least 75%, yellow indicates 50% chance of passing, and red indicates at best a 25% chance of passing the MCA-II. For Math Facts, green indicates meeting grade level and norm period goal, red indicates not meeting goal. Math Facts does not predict passing MCA-II.

Students with a 26% to 74% chance of passing the MCA-II were considered Tier 2. Approximately half of these students go on to pass the MCA-II. Students at the higher end of this Tier are considered slightly at-risk and were the primary focus of selection for Math Corps.

Students with at best a 25% chance of passing the grade level MCA-II were considered Tier 3 and at significant risk for not meeting grade level standards. These students need instruction from a well-trained teacher.

In the selection process, students data was sorted by MCA-II score, MAP scores, Math Applications, and Math Facts. MAP and Math Applications are measures that predict performance on the MCA-II. Students with most of their scores in the Tier 2 range were selected for the study. Students were paired based on similar performance on all of the measures.

A randomized control design was used to examine the effectiveness of the VMath Curriculum. Students were paired based on gender, ethnicity, and test performance from the 2009-10 school year. Students were selected during the summer of 2010 so Members could begin instruction as soon as the school year started. Performance on MCA-II Mathematics, MAP from Fall Winter and Spring, Math Applications from Fall Winter and Spring, and Math Facts from Fall Winter and Spring were used in the matching process. When two students were matched, a coin was flipped to determine which student would participate. There were 132 pairs or 264 students. Tables 2 through 4 show the similarity of paired students based on these measures.

Table 2. Comparison of 4th Grade Students

Average Scores on Measures from 2009-10:	Participants	Control
MCA-II GRADE 03 MATH	349.5	350.7
MAP Math Fall RIT	186.0	185.1
MAP Math Winter RIT	190.8	193.1
MAP Math Spring RIT	198.4	199.7
Math Applications Fall	6.7	6.1
Math Applications Winter	12.9	13.1
Math Applications Spring	16.9	17.5
Math Facts Fall	9.0	7.8
Math Facts Winter	13.6	12.4
Math Facts Spring	16.6	15.6

Table 3. Comparison of 5th Grade Students

Average Scores on Measures from 2009-10:	Participants	Control
MCA-II GRADE 04 MATH	547.5	547.9
MAP Math Fall RIT	208.5	207.9
MAP Math Winter RIT	210.1	213.0
MAP Math Spring RIT	219.0	219.1
Math Applications Fall	6.1	7.1
Math Applications Winter	9.3	9.9
Math Applications Spring	13.2	13.7
Math Facts Fall	14.2	15.6
Math Facts Winter	20.4	21.7
Math Facts Spring	28.7	28.2

Table 4. Comparison of 6th Grade Students

Average Scores on Measures from 2009-10:	Participants	Control
MCA-II GRADE 05 MATH	447.9	447.6
MAP Math Fall RIT	196.7	197.8
MAP Math Winter RIT	202.1	201.9
MAP Math Spring RIT	208.1	209.4
Math Applications Fall	7.6	8.4
Math Applications Winter	10.3	9.8
Math Applications Spring	14.3	14.8
Math Facts Fall	9.9	10.1
Math Facts Winter	15.4	16.0
Math Facts Spring	23.3	24.5

Students were matched on gender and ethnicity as well as performance on math measures. In the control group were 68 females and 63 males. In the participant group were 66 females and 65 males. The districts within SCRED are predominantly white, every effort was made to include students from minority groups and match according to ethnicity. Due to low numbers of students from minorities this was not always possible.

Table 5. Ethnicity of Students

Ethnicity	Control	Participants
White	121	118
Am Indian	4	4
Asian	3	4
Black	2	3
Hispanic	1	2

Participating students were in Math Corps led VMath tutoring sessions for 30 minutes per day. Instruction for students in the control group was left up to the building. Principals and teachers were directed to do whatever instruction they would normally provide to these students. In some cases, control students were provided with other services to improve their performance. Some examples are: Title 1, Targeted Services, or other supplemental instruction. Some information was gathered regarding students who participated in other supplemental instruction. Results for these groups is reported along with students participating in Math Corps and students who only received the general education core mathematics.

Results

The effectiveness of the VMath curriculum was tested by randomly assigning one student from each matched pair to the curriculum. Included in the final results are only 131 pairs, one pair was lost due to spring data not being collected on one student. Each grade takes a different MCA-III test and each grade level has a different growth norm from the MAP test, so results will be presented by grade.

As mentioned earlier, this was the first year for the MCA-III Mathematics test. The state created a test based on more rigorous standards. An indication of the increased rigor is that state-wide the percentage of students passing the MCA-II was 65%. The

percent of students passing the MCA-III dropped to 56% (MDE website, October, 2011). The Minnesota Department of Education is considering the results of the MCA-III Mathematics test as a baseline year.

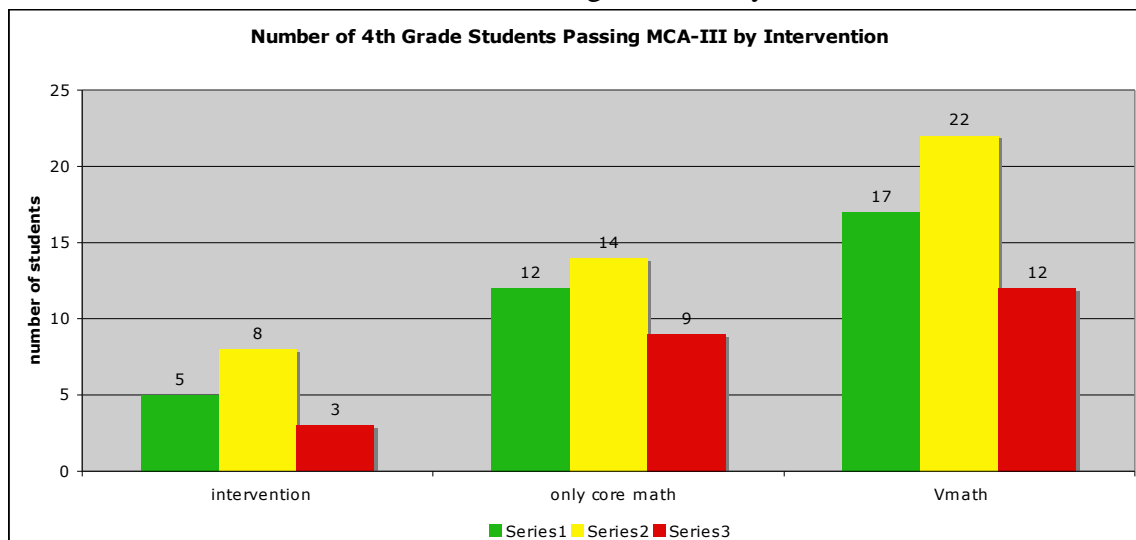
Fourth Grade Results

Results are reported for 102 Fourth grade students. Unusually, the exact same number of students in the control and participating (VMath) groups passed the MCA-III (33%), partially passed (43%), and did not pass (24%). See Table 6 which shows the percent passing and Chart 1 which shows the raw numbers. As can be seen in Chart 1, many more students participated in Math Corps than any other program. For all groups, more students partially passed the MCA-III than passed.

Table 6. Percentage of Fourth Grade Students Passing the MCA-III

Grade 4	Control	Participants
Passing	33% (17)	33% (17)
Partial Passing	43% (22)	43% (22)
Does Not Pass	24% (12)	24% (12)

Chart 1. Number of 4th Grade Students Passing MCA-III by Intervention



Although the passing rate was the same for the control and participating students, the VMATH students grew more. On average the control group grew 11 RIT points on the MAP. The VMATH group grew nearly 15 RIT points on average. These growth numbers can be compared to the “typical” growth rate based on a national sample reported by NWEA of 8 RIT points growth from Fall to Spring (Table 7). In addition to national growth norms, the percent of expected growth shows how much more a student grew compared to their individual growth goal. Students who exactly meet their growth goal have a percent of expected growth score of 100%. The VMATH students exceeded their

individual growth goals on average by 160%. The control group exceeded their growth goal, on average, by 120% (Table 7).

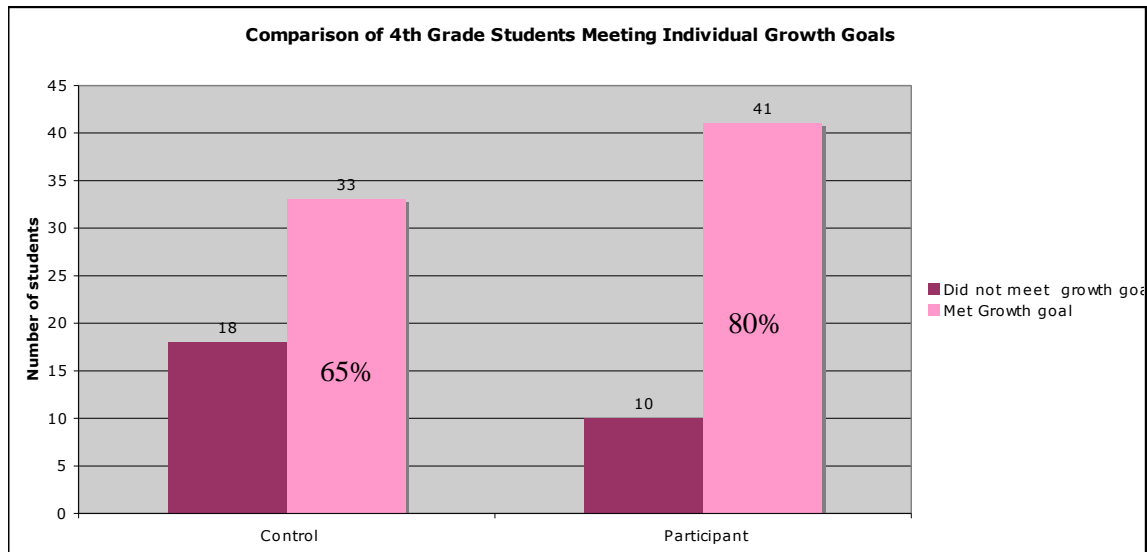
Table 7. Average Growth of Groups on the Measures of Academic Progress (MAP)

Grade 4	Control	Participants	Typical*
Average of Actual MAP MATH Fall-Spring Growth	11.2	14.7	8
Average of MAP MATH Fall-Spring Percent of Expected Growth	120%	160%	

*Typical National Median Growth (NWEA, 2008)

Chart 2 shows that more VMath students met their individual growth goal than control students. Eighty percent of VMath students met their individual growth goal. The national average is that 50% of students would meet their individual growth goal.

Chart 2. Comparison of 4th Grade Students Meeting Individual Growth Goals



General outcome measures or Curriculum-based measurement are also used to measure growth. The VMath students also showed more growth on Math Applications and Math Facts than the control group (Table 8).

Table 8. Comparison of Growth in Math Applications and Math Facts

Grade 4	Control	Participants
Average of Growth in Math Applications	4.9	5.5
Average of Growth in Math Facts	14.7	16.3

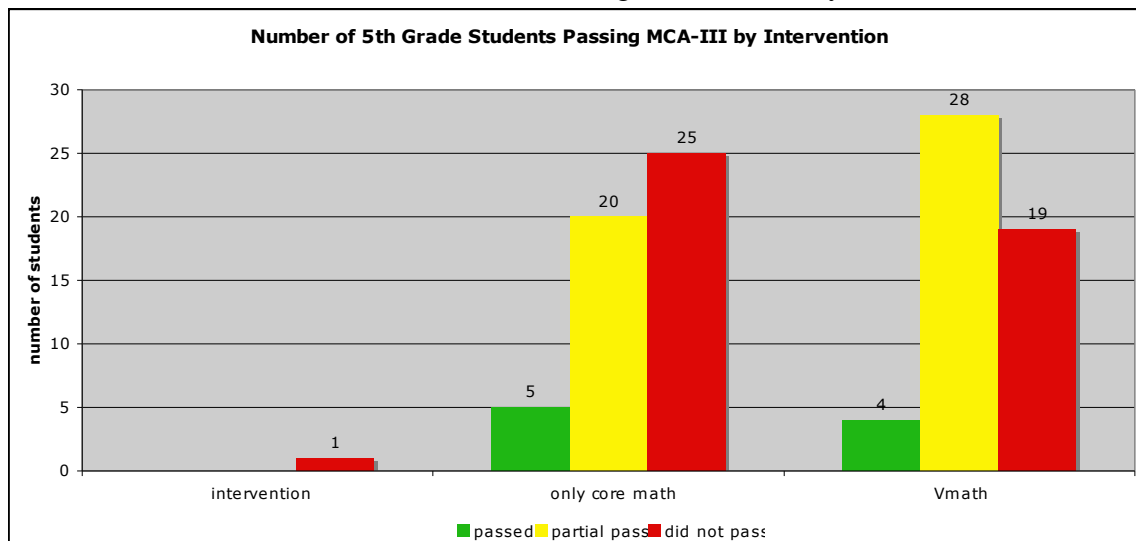
Fifth Grade Results

Results are reported for 102 Fifth grade students. A small percentage of students in both control and participant groups passed the MCA-III (Table 9). The difference between the groups was 1 student. More students partially passed the test from the VMath group than from the control group that only received core math instruction (Chart 3). Fewer students from the VMath group were in the “did not pass” category.

Table 9. Percentage of Fifth Grade Students Passing the MCA-III

Grade 5	Control	Participants
Passing	10% (5)	8% (4)
Partial Passing	39% (20)	55% (28)
Does Not Pass	51% (26)	37% (19)

Chart 3. Number of Fifth Grade Students Passing the MCA-III by Intervention



Despite the poor performance on the MCA-III, students grew, on average, 180% of their individual growth goal on the MAP (Table 10). However, the VMath and control groups showed a similar high growth rate.

Table 10. Average Growth of Groups on MAP

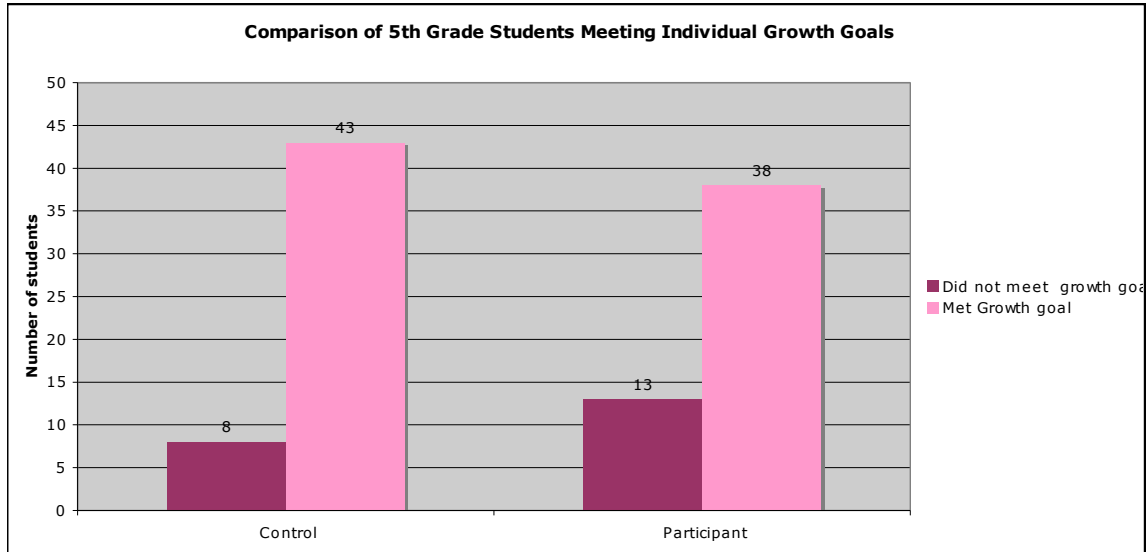
Grade 5	Control	Participants	Typical*
Average of Actual MAP MATH			
Fall-Spring Growth	14.3	14.1	8
Average of MAP MATH			
Fall-Spring Percent of Expected Growth	180%	180%	

* Typical National Median Growth (NWEA, 2008)

In a comparison of the number of students who met their growth goals, more students in the control group met their growth goals than VMath students. Synthesizing

the data from Table 10 and Chart 4, we see that fewer students met their growth goals but those who did meet their goal grew well beyond it. Those students who benefited from instruction benefited greatly. On general outcomes measures, VMath students had slightly higher scores than the control group on average.

Chart 4. Comparison of 5th Grade Students Meeting Individual Growth Goals



Comparing VMath students with control students on general outcome measures, the VMath group, on average, performed slightly higher.

Table 11. Comparison of Growth in Math Applications and Math Facts

Grade 5	Control	Participants
Average of Growth in Math Applications	4.6	5.5
Average of Growth in Math Facts	15.1	16.1

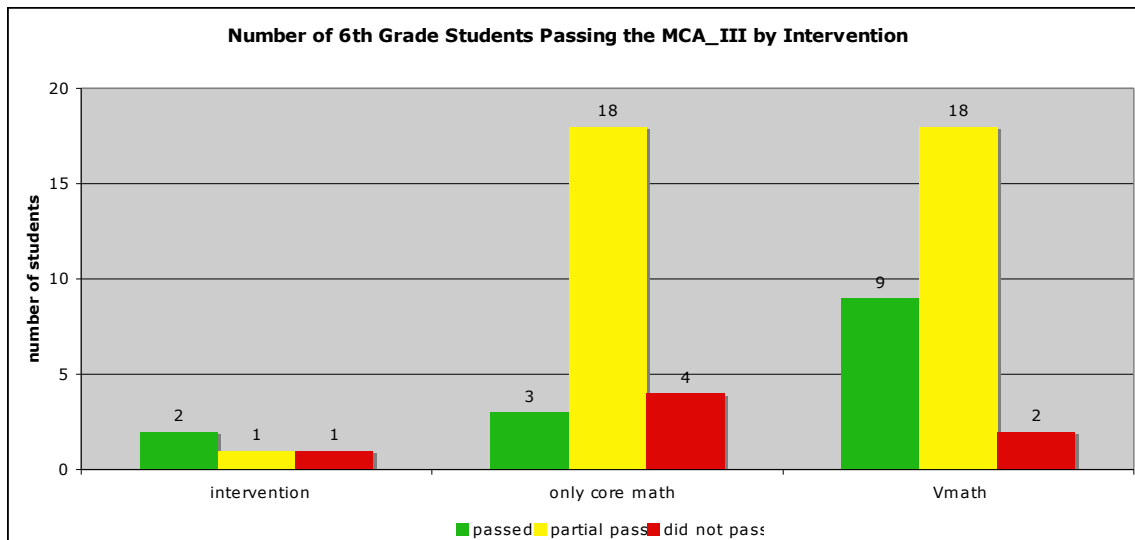
Sixth Grade Results

Results are reported for 58 Sixth grade students. There are fewer sixth grade students because 2 of the elementaries are K-5 buildings and the Middle Schools did not participate. At the sixth grade level we see a larger proportion of students passing the MCA-III, nearly double as the control group (Table 12). Only 2 students in the VMath group did not at least partially pass the test. Chart 5 shows how the VMath curriculum resulted in better performance than the general education math curriculum alone or the supplemental interventions that were provided for only 4 students.

Table 12. Percentage of 6th Grade Students Passing the MCA-III

Grade 6	Control	Participants
Passing	17% (5)	31% (9)
Partial Passing	66% (19)	62% (18)
Did Not Pass	17% (5)	7% (2)

Chart 5. Number of 6th Grade Students Passing the MCA-III by Intervention



Students in the control and VMath groups showed a similar growth pattern on the MAP test. Both groups nearly doubled the “typical” national growth rate of 6 RIT points. Both groups grew well beyond their individual growth rate, on average, growing 170% of that goal (Table 13).

Table 13. Average Growth on MAP

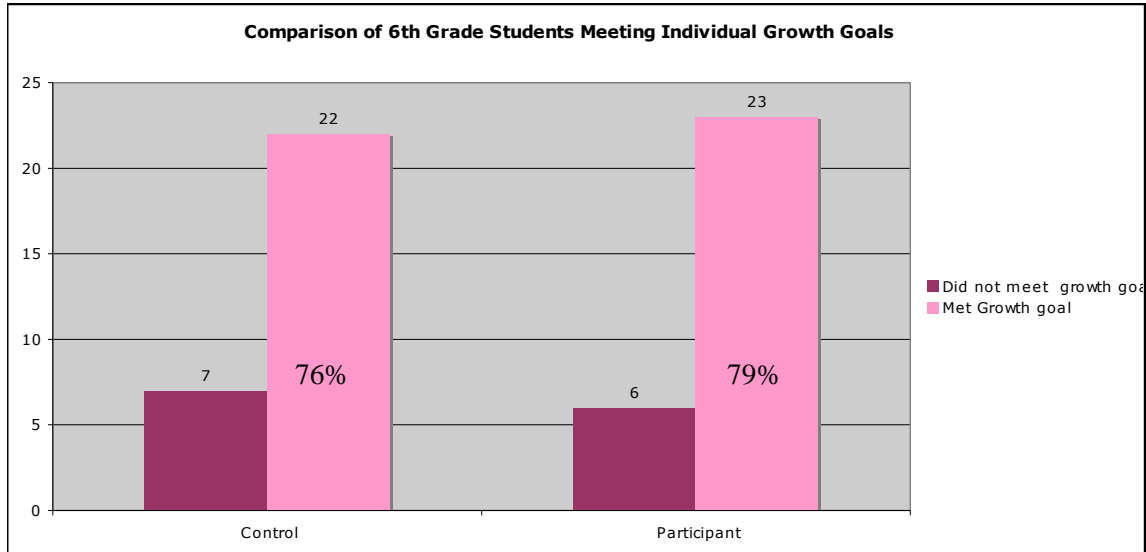
Grade 6	Control	Participants	Typical*
Average of Actual MAP MATH Fall-Spring Growth	11.3	11.8	6
Average of MAP MATH Fall-Spring Percent of Expected	170%	170%	

Growth

* Typical National Median Growth (NWEA, 2008)

Seventy-nine percent of VMath students met their individual growth goal. The difference between the control group and VMath group was only one student.

Chart 6. Comparison of 6th Grade Students Meeting Individual Growth Goals



VMath students on average grew more than the control group on the general outcome measures of Math Applications and Math Facts.

Table 14. Comparison of Growth on Math Applications and Math Facts

Grade 6	Control	Participants
Average of Growth in Math Applications	6.1	7.9
Average of Growth in Math Facts	11.8	13.5

Tutoring Time

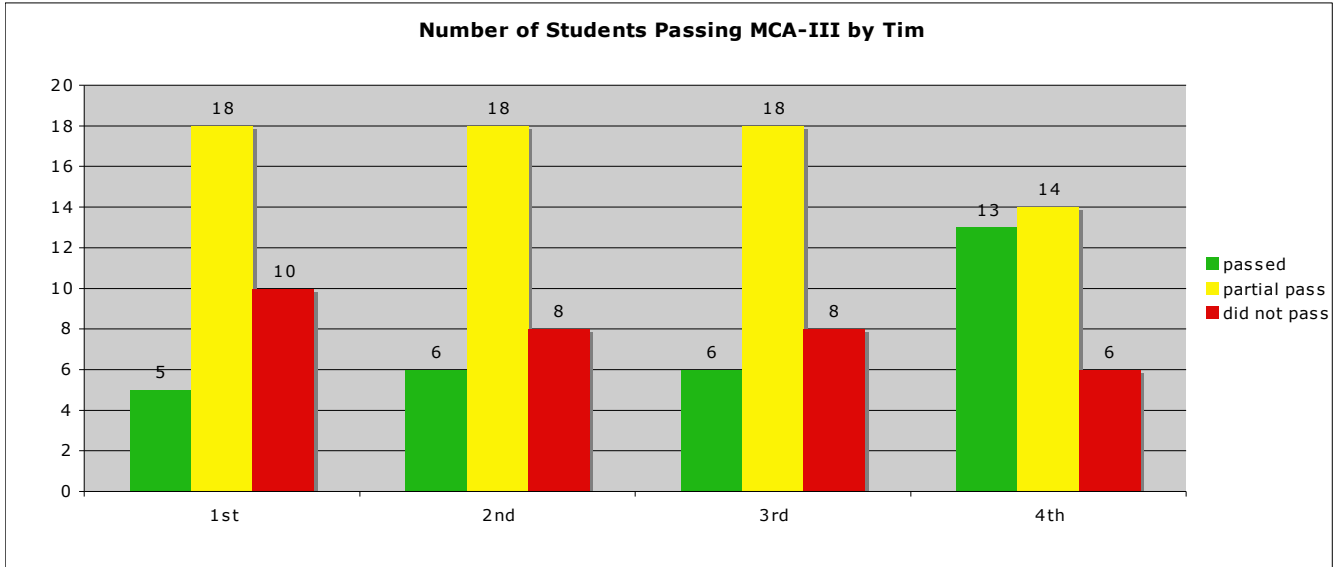
In addition to performance of grade level tests and growth, we wanted to see if a certain number of minutes of tutoring were necessary to achieve successful results. The VMath tutoring sessions were designed to happen daily for 30 minutes. In 180 days that equals 5400 minutes across the school year, counting on the unlikely event of no absences, field trips, and programs.

The minimum number of minutes of a VMath participant was 1775 minutes. The maximum number of minutes was 7920. The average amount of time was 4466 minutes. The average, 4466 minutes was approximately 1000 minutes less than the 5400 optimistic rate of everyday having a session. These 1000 minutes equal 33 days of instruction at 30 minutes a day. A substantial amount of instructional time was lost.

To determine how much time is necessary, the range of time was broken into quartiles. Chart 7 shows the number of students in each time quartile and the results of their MCA-III. The best results occurred when students had 5802 to 7920 minutes across

the school year. Tutoring sessions that were longer than 30 minutes and occurred on a daily basis resulted in better performance on outcomes.

Chart 7. Number of Students Passing MCA-II by Time Quartiles



In examining how total time for tutoring differed across grade levels, 4th grade was fairly evenly distributed, 5th grade had the fewest students in the highest number of tutoring minutes, and 6th grade had few students in the lowest ranges of minutes with the most students receiving the highest number of minutes. An interesting comparison can be made with the number of students at each grade level in the 4th quartile for time and the number of students passing the MCA-III. Fourth grade had 14 students in the 4th quartile of time and 17 students passing. Fifth grade had 6 students in the highest quartile for time and had 4 passing. Sixth grade had 13 students in the highest quartile and had 9 passing.

Table 15. Number of Students in Time Quartiles by Grade

Grade 4	Grade 4	Grade 5	Grade 6
1st Quartile	15	13	5
2nd Quartile	13	18	1
3rd Quartile	9	13	10
4th Quartile	14	6	13

Summary

Our results show that fourth grade students in the VMath curriculum showed higher growth rates on the MAP test compared to control students. However, this increase in growth did not translate into higher rates of students passing the MCA-III. In fifth grade, the VMath students performed similarly to the control students in passing the

MCA-III and growth rates on the MAP. More VMath students partially passed than control students.

The bright spot is at 6th grade where more students passed the MCA-II that were in the VMath group than in the control group. The amount of time for tutoring seems to matter, fifth grade had few students get the higher amounts of time and had few students pass. Sixth grade had a higher portion of students getting larger amounts of tutoring and had the best passing rate of all the grades.

The unknown difficulty level of the MCA-III test clearly affected the results. Based on our MCA-II predictors we thought students were at slight risk, the truth is that they were at greater risk for not passing than we realized. If we had accurate predictors for the MCA-III we probably would have chosen different students, students who were closer to passing and therefore the large amounts of growth that we generally saw would have been enough to raise them to a passing level.

Another factor that may have resulted in lower passing rates than hoped for was that the general outcome data was not responded to as normally would have been done. Since this was a study of the VMath curriculum, we stayed true to the curriculum and implemented it as intended. Normally in our interventions with students, we use general outcome data to let us know if students are growing and if we do not see enough growth we make a change to the instruction. As we saw in the tables for general outcome data, growth was very small. Had we felt that we could alter how we were implementing the VMath curriculum we may have seen greater growth.

Some recommendations for the future of SCRED Math Corps are to use selection criteria based on the MCA-III, ensure that minimal number of tutoring sessions are lost, and modify the VMath instruction based on progress monitoring with general outcome measures.

