Mathematics Talent Identification and Reclamation in Forsyth County School District

Spring 2009

Introduction

The Future is Here!

Are North Carolina students prepared for the future's high-growth, high-performance jobs? A recent report by the American Diploma Project Network stresses the link between a student's primary education, particularly in high-level math and science courses, and later success in college and the workforce (Achieve, 2008). With this critical need in mind, the Mathematics Talent Identification and Reclamation Report was created as an individual guide to mathematics achievement of students in your district.

This report was prepared using data and expertise from the North Carolina Department of Public Instruction, North Carolina State University, the North Carolina Association of School Administrators, EDSTAR and SAS Institute Inc.* Educators can use this report to understand how they can use existing data to identify and retain the talent in their districts as they wrestle with the challenges of preparing students to be competitive in a global economy. The ultimate goal is to provide as many life choices for students as possible. This report will focus on 8th grade Algebra I as a gateway to life choices.

This report will provide analyses and discussion regarding:

- 8th Grade Algebra I Enrollment in North Carolina
- Achievement: 8th Grade Algebra vs. High School Algebra
- Recommendations for improving Algebra readiness for all students
- Additional data and resources to support college readiness

* SAS provides the EVAAS reporting for North Carolina's districts, schools, students and teachers.

8th Grade Algebra I Enrollment in North Carolina

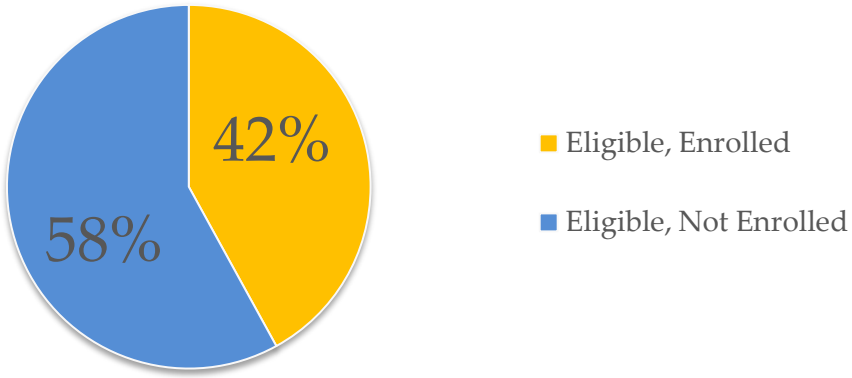
Gateway Course to Realizing Students' Full Potential

Eighth grade Algebra has proven to be a gateway course toward math and science success. EDSTAR and NC DPI examined the course-taking patterns of middle school students who scored Levels III or IV on math EOG and enrolled in eighth grade Algebra as well as those who also scored Levels III or IV on math EOG *but did not enroll in Algebra until the ninth grade*. The results were astounding: among students who scored Level IV on Math EOGs, those who took eighth grade Algebra were *three times* more likely to take chemistry and physics in high school compared with equally scoring students who took ninth grade Algebra. Level III students who took eighth grade Algebra were *55 times* more likely to take chemistry and physics in high school compared with equally scoring students who took ninth grade Algebra. (Data regarding the success of these students in Algebra II and the SAT are included in a later section of this report.)

Who are these students who are given the opportunity to take 8th Grade Algebra? Is your district enrolling all students with a high likelihood of success? ***Statewide, among the 2008-2009 seventh graders who were projected to have at least a 70% probability of proficiency in eighth grade Algebra, less than half actually enrolled in the course (as determined by the presence of an EOC score).***

Figure 1: 2008-2009 NC 8th Grade Algebra Enrollment.

Students are "eligible" for Algebra if their probability of reaching proficiency is 70% or greater.



Considering the limitation that missing eighth grade Algebra places on students' ultimate math attainment (as measured by SAT in the following section), as a matter of public policy, addressing this inequity could become a strategy for

- increasing graduation rates
- closing the achievement gap
- preparing more students for technical majors after they leave twelfth grade

Identifying Talent Early is Critical

Studies show that students rarely move up after sixth grade placement (O'Connor, Lewis, & Mueller, 2007). When little consideration is given to objective academic criteria to determine sixth grade placement, top-scoring students may be tracked into the standard math that does not lead to eighth grade Algebra. After being placed into the standard track, these students are not prepared for the advanced track regardless of the students' initial math ability, and the gap between these two tracks widens each year. After one year, the difference between the two math tracks is often so significant that, regardless of ability, students in the lower track would be ill-prepared for the higher track. By using SAS EVAAS, LEAs can identify students who are likely to succeed in top math classes and retain this talent.

Furthermore, students who take ninth grade Algebra are far less likely to take the most challenging and rigorous math and science classes in high school compared with equally scoring students who take eighth grade Algebra. This is true even of students who are very successful in ninth grade Algebra. In fact, one North Carolina school district recently reviewed its data and found that although honors math courses are open to students who did not take eighth grade Algebra, very few students who had not done so enrolled in the honors courses, and none of these students took calculus (Haynie, 2009).

Identifying Students' Achievement Levels

The benefits of enrolling in eighth grade Algebra are clear, but how should educators appropriately identify students for the class? Prior achievement data can be a more reliable and less biased predictor of future achievement than many current practices that inadvertently introduce biases into the decision-making process (Finn & Finn, n.d.). Examples of schools or school systems that raised achievement and closed gaps by using objective academic data for course placement are numerous (Education Trust, 2006).

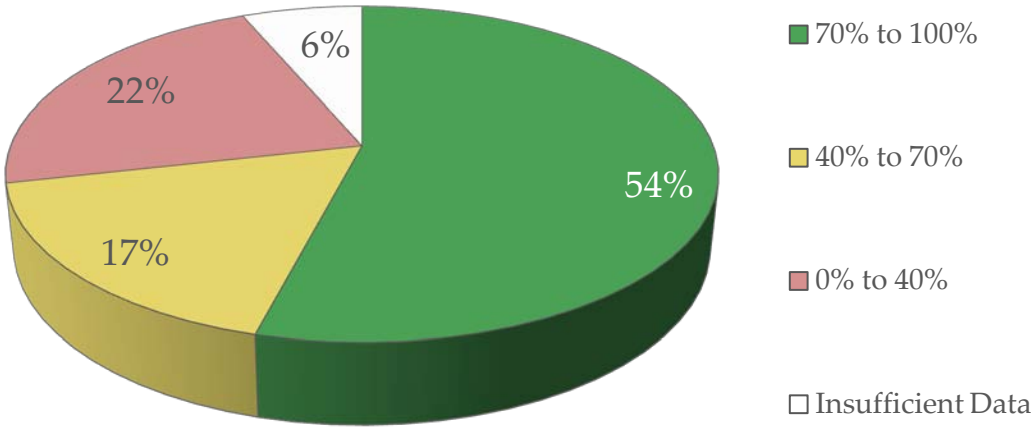
North Carolina educators have access to a resource called EVAAS that uses robust statistical analyses of student achievement data to identify students who are likely to succeed in advanced courses. It also identifies students who are unlikely to succeed without intervention.

A new report released this spring on the EVAAS website, called the Academic Preparedness Report, provides a visual representation of Algebra readiness. Projections to success in Algebra are available for students enrolled in 6th grade and above. At each grade level, educators can see what percentage of students has already succeeded, and for the remaining students, what percentage has a high, moderate, or low likelihood of success. These projections are based on individual student testing histories and assume the student will attend an average school.

The District Academic Preparedness Report for Forsyth County Schools at the 7th grade level is included on the next page.

Figure 2: 7th Grade Algebra Projections for Forsyth County Schools

7th Grade Projected to EOC Algebra I (Level III)		
Probability of Proficiency	**Nr of Students**	**Percentage**
Greater than or equal to 70%	1895	54%
Between 40% and 70%	609	17%
Less than or equal to 40%	775	22%
Students at or above proficiency	0	0%
Students who lack sufficient data	225	6%



These reports are available for other grade levels, beginning in the 6th grade, at the District and School level.

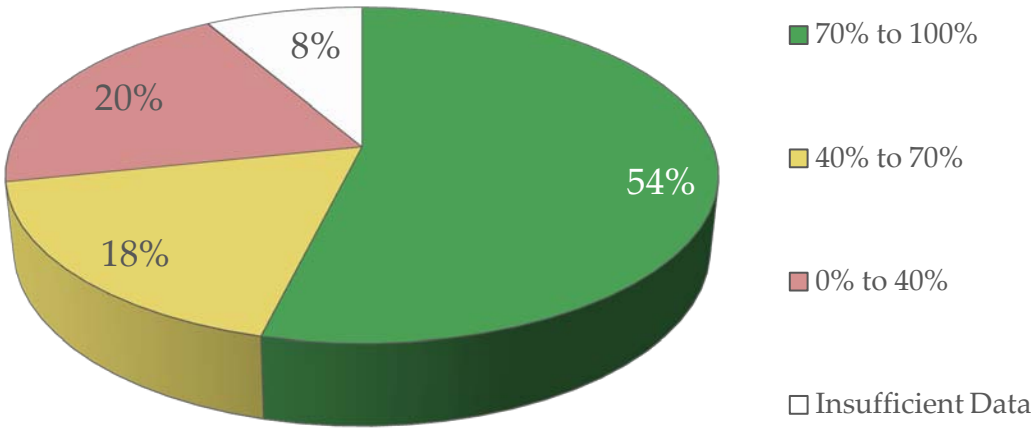
Instructions for accessing the reports are as follows:

- Login to the reporting at ncdpi.sas.com
- Click on the Reports tab and choose District (or School) Academic Preparedness Report
- Click on the Grades tab to choose the grade level you wish to view

When viewing these reports on the website, educators can ***drill down to student names*** by clicking on the underlined number of students in the table above the pie chart. Students in the green slice are those with the highest likelihood of reaching proficiency (70% probability or higher). The authors of this report consider these students to be "eligible" for 8th Grade Algebra. In Forsyth County School District, 54% of 7th graders are eligible for 8th Grade Algebra. As indicated in Figure 3 below, 54% of all 7th graders statewide are eligible for 8th Grade Algebra based on probability of reaching proficiency.

Figure 3: 7th Grade Algebra Projections Statewide

7th Grade Projected to EOC Algebra I (Level III)		
Probability of Proficiency	**Nr of Students**	**Percentage**
Greater than or equal to 70%	54,816	54%
Between 40% and 70%	18,141	18%
Less than or equal to 40%	20,256	20%
Students at or above proficiency	50	0%
Students who lack sufficient data	8,522	8%



Achievement: 8th Grade Algebra vs. High School Algebra

Algebra 2 Achievement

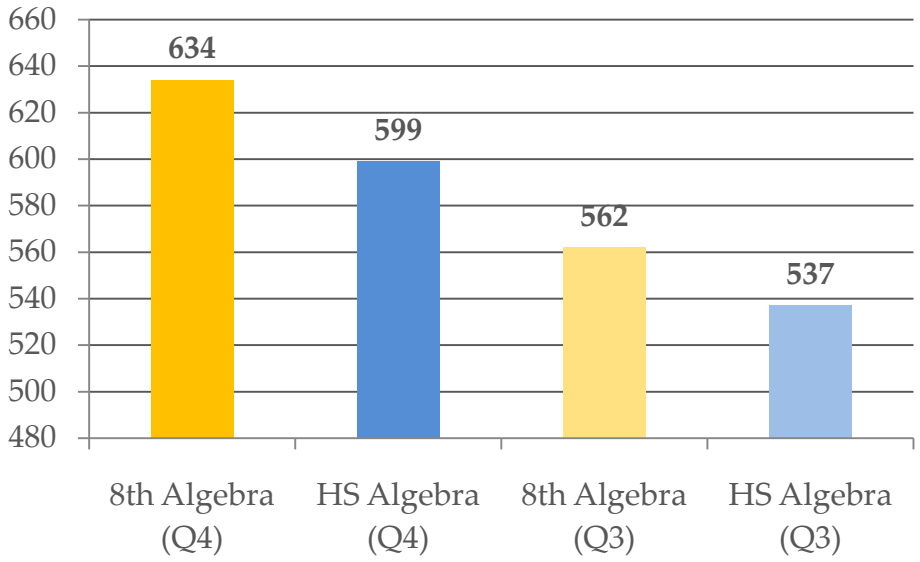
Some districts may be concerned that the recommended 70% cut-off for eligibility is too low. Researchers at SAS EVAAS followed students who met the following criteria: (1) they had 8th grade Algebra I (in the 2006-2007 school year), (2) they entered the course with a 70% or greater probability of success, and (3) they subsequently took Algebra II (as determined by the presence of an EOC score). The results are reassuring: 92% of them scored Level III or Level IV. Disproportionately, those who failed were in classrooms of teachers who profile in the bottom 40% of the state's Algebra II distribution of teaching effectiveness.

SAT Achievement

Students who take the most rigorous and challenging math and science classes in high school are likely to score higher on the math portion of the SAT. These results have consequences when it comes to 21st century preparedness.

The following figure compares the mean math SAT scores of students who took eighth grade Algebra to those who did not take it, for the top two quartiles of students. In the top quartile (Q4), 86% of students took 8th grade Algebra. In the next quartile (Q3), 60% of students took 8th grade Algebra. The vertical axis indicates the average SAT Math score for each group of students. We see that in both quartiles, the students who took 8th Grade Algebra did better on their SAT math than those who waited until high school.

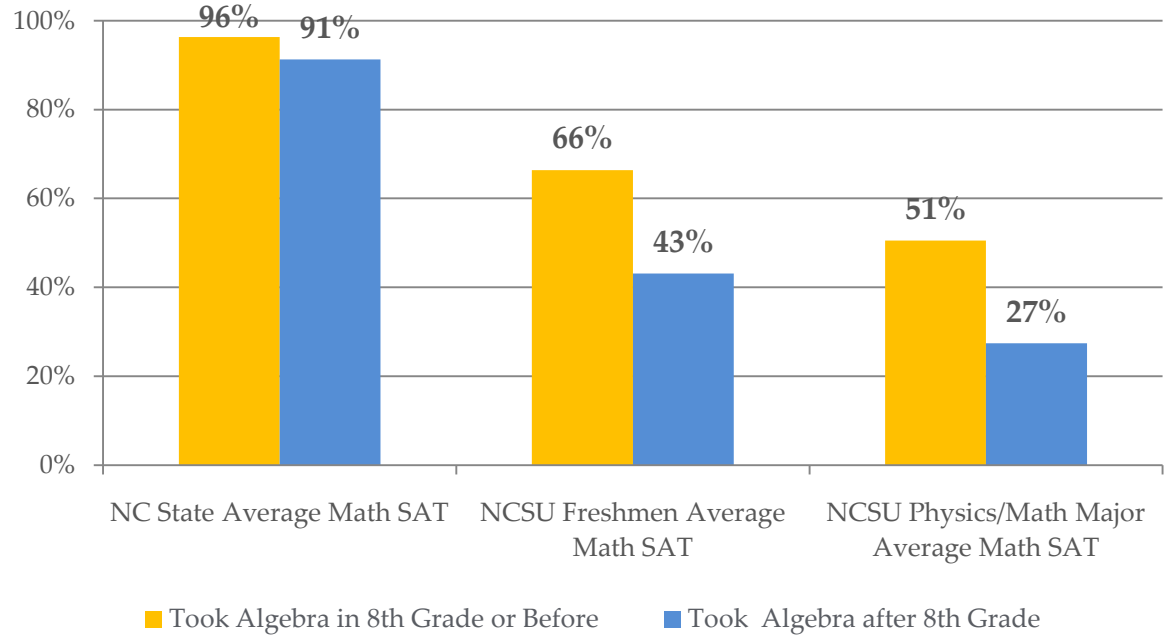
Figure 4: Mean SAT Math Scores for Top 2 Quartiles of 8th Graders



College Opportunities

Data from the seventh grade top-quartile students who later took the SAT showed that those who took eighth grade Algebra were much more likely to have SAT scores high enough to be competitive as physics or math/science majors at NCSU. The following figure compares SATs of top seventh graders who took eighth grade Algebra to those who did not take it.

Figure 5: Percentage of Top-Quartile 7th Graders Who Met NCSU SAT Averages in 2008



For math, these average scores are as follows:

Math Score	Explanation
511	Average SAT Math score for all North Carolina students.
607	Average SAT Math score for all freshmen enrolled at North Carolina State University.
640	Average SAT Math score for students majoring in physics and math sciences at North Carolina State University.

SAT information specific to Forsyth County School District is included in a later section of this report.

Recommendations for Improving Algebra Readiness for All Students

Equitable Opportunity

All students deserve an equitable opportunity to make progress. Appropriate academic progress each year for students at ***all achievement levels*** is a worthy goal for districts that wish to increase their students' college opportunities. Armed with the knowledge of the benefits of 8th Grade Algebra I, educators are in a position to adjust policy practices that will increase their students' college readiness and career opportunities.

Resource Allocation

The EVAAS website provides valuable diagnostic information for this purpose. Student projections for Algebra I achievement are available in the Academic Preparedness Reports for students in 6th grade and beyond. Projections to math EOGs are available for 4th through 8th grades.

Are your lowest-achieving students (identified by the red slice in the Academic Preparedness Report) receiving intervention services? Intervention should begin in the early grades, should be measurable, and should be sustained. Have you already identified strategies and resources that accelerate the progress of more students toward proficiency without suppressing the growth of early high-achieving students?

Do your highest-achieving students (identified by the blue and green slices) have access to rigorous and challenging coursework? Schools may need to adjust staffing and scheduling to allow for extra sections of Algebra I if more students are projected to be proficient in 8th grade.

Effective Teaching & Instructional Practices

Is instruction for all students active, deep, and engaging? Is instruction focused on mathematical reasoning or on mathematical rules? Does your district assign teachers to students based on their effectiveness with students at certain achievement levels? While all students should have access to effective teaching, it is especially critical for the lowest achieving students. These students need to make exceptional progress to catch them up to their peers.

Cultivating High Expectations

Does your staff acknowledge and celebrate the strengths all students bring to the classroom? Correctly identifying students' strengths and purposefully supporting students to achieve their highest is best obtained by a staff that *believes* in its students and all that they can accomplish.

"Developing a greater awareness and understanding of the students we teach is an important step in helping students obtain a high-quality mathematics education… An important first step for mathematics teachers is to reflect on what we believe about our students and on what we are prepared to do to make student successes real. Remember, we set higher standards not only for our students but also for ourselves." (Stiff, 2002)

Additional Data & Resources to Support College Readiness

In this section of the Mathematics Talent Identification and Reclamation Report, discussion broadens from Algebra readiness to college readiness.

SAT Projections

Future SAT projections for Forsyth County School District are given below. These projections were calculated for students who were tenth graders in the 2007 – 2008 school year.[1] Using all their longitudinal end-of-grade and end-of-course test data and assuming that each student will have a state average schooling experience in the future, all North Carolina students received an individual projection for their eleventh or twelfth grade SAT scores. From these EVAAS projections, it is possible to determine an estimate of how many students from your district have at least a 50% chance to reach various levels of SAT achievement at the end of their high school experience.

Please note that the College Board averages only include data from those students who actually tested whereas the SAS EVAAS projections to SAT include all students with sufficient data.

Projected College Readiness on a National Scale

SAT COMPOSITE 1021

Projections	N	%
Statewide	**22,824**	**26%**
Forsyth County	**778**	**26%**

The average SAT composite score in the United States for high school graduates was 1021 in 2006.[2] Based on EVAAS projections, 26% of last year's tenth graders in Forsyth County (representing 778 students) have at least a 50% chance to reach the national average. This is compared to the statewide projection of 26% of last year's tenth grade students (representing 22,824 students).

Projected College Readiness on a State Scale

The average SAT Math score in North Carolina for high school graduates was 513 in 2006. Based on EVAAS projections, 26% percent of last year's tenth graders in Forsyth County (representing 791 students) have at least a 50% chance of reaching the state average on Math. This is compared to the statewide projection of 28% of last year's tenth grade students (representing 24,237 students).

SAT MATH 513

Projections	N	%
Statewide	**24,237**	**28%**
Forsyth County	**791**	**26%**

[1] More information on projection methodology can be found in "Measurement of Academic Growth of Individual Students toward Variable and Meaningful Academic Standards," which is available at www.sas.com/govedu/edu/wrightsandersrivers.pdf.

[2] National and state averages provided by the College Board for the year 2006 and are available at www.collegeboard.com. NCSU averages provided by NCSU's Office of Admissions.

Improving College Readiness

Some strategies have already been mentioned as ways to improve Algebra Readiness. The list below provides a guide for districts wishing to improve overall effectiveness.

1. Improving college readiness of students based on students' projected achievement levels to various college benchmarks to assess the necessary growth for preparedness.

2. Leveraging highly effective teaching, such as assigning students to teachers who have demonstrated teaching effectiveness for their previous achievement level.

3. Empowering highly effective teaching, such as pairing first-time teachers with a mentoring teacher who has demonstrated teaching effectiveness.

4. Anticipating staffing needs based on students' projected achievement levels, such as hiring additional Algebra I teachers for middle schools if more students are projected to be proficient in eighth grade.

5. Identifying district strengths and opportunities for improvement, such as identifying what accelerates the progress of more students towards proficiency without suppressing the growth of early high-achieving students.

6. Improving educational opportunities for all students by ensuring students at varying levels of previous achievement are making appropriate academic growth each year.

7. Identifying greatest areas of need for resource allocation, such as identifying and formulating academic plans for students projected to be at-risk for graduation.

Formulating and implementing these strategies could be enhanced by the following reports available through the EVAAS website:

Strategy	Potential Support for Strategy
1, 2, 4, 7	EVAAS custom student reports of individual student projections
3, 4, 5	EVAAS feeder pattern reports
1, 2, 4, 6, 7	EVAAS individual student projections
2, 3, 6	EVAAS school diagnostic report
5, 7	EVAAS school performance diagnostic report
2, 3, 7	EVAAS school value-added summary
5, 6, 7	EVAAS district diagnostic report and summary report
5, 7	EVAAS district performance diagnostic report and summary report
5, 6, 7	EVAAS district progress reports
2, 3, 5, 7	EVAAS district value-added summary

Some North Carolina administrators using NC Wise have another information resource available to them. Although not discussed in this summary, EVAAS teacher reporting provides additional insight into educational effectiveness. Appropriate use of teacher results could leverage teaching effectiveness for more students.

The challenge that policy makers face is twofold:

- Ensuring a more equitable distribution of North Carolina's teaching talent[3]
- Improving the preparation of beginning teachers

This challenge, and the others cited in this summary, can be addressed through the resources described in this section. These resources, available at the district, school, teacher and student level, can aid educators with the preparation of their students for college and beyond.

[3] See for example:
Carter, Pamala J. "Defining teacher quality: An examination of the relationship between measures of teachers' instructional behaviors and measures of their students' academic progress." Ph.D. dissertation, University of North Carolina at Chapel Hill, 2008.

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Sanders, William L. "Comparisons among Various Educational Assessment Value-Added Models," presented at The Power of Two—National Value-Added Conference, Columbus, Ohio, October 2006.

Sanders, William L. and June C. Rivers. "Cumulative and Residual Effects of Teachers on Future Student Academic Achievement," Research Progress Report by the University of Tennessee Value-Added Research and Assessment Center, November 1996.

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