

Increasing the Percentage of Students Completing Higher Level Math and Science Courses: Findings from the 2007-08 District Profile of Math and Science Indicators

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Introduction

One of the continuing goals of the Math & Science Collaborative (MSC) is to encourage and support participating districts to increase the number of students successfully completing higher level mathematics and science courses. Taking and passing rigorous math and science courses is predictive of both academic and economic success.

Each year all districts in Southwest Pennsylvania are asked to complete a District Profile that reports the number of graduates successfully completing the math courses: Algebra 1 (Level 1 Math), Geometry (Level 2 Math), Algebra 2 (Level 3 Math), and the science courses: Biology I, Chemistry I, and Physics by the time they have graduated from high school.

Beginning in 2003-04 school year, the Profile expanded to include the math and science courses completed in a given year by all students by graduation. Additional math and science courses were added beyond those courses reported for graduating students¹.

Data from the profile are used in several ways. Each district completing the profile receives a copy of their report where they can review their district results as well as those of the region. Districts typically receive their report each spring with the request for the next year's Profile information. A regional snapshot had previously been provided as part of the *Journal*. Beginning in 2008, the District profile is now published in the *Coordi-Net*.

Districts participating in the MSP Leadership Action Academies use the Profile results along with PSSA, and other data in their data mining sessions, and information on both graduating seniors and course completion in a given year is used for MSP reporting. The regional snapshot provides districts the opportunity to look at their own results and see how they are doing in comparison to the region. Such an investigation may trigger a deeper exploration and discussion of their own district's results. Likewise, for districts not submitting the Profile in 2007-08, there may be a renewed interest in doing so for 2008-09.

Successful Completion of Rigorous Math and Science Courses by Graduating Seniors

Prior to 2003-04, a grade of "C" or higher indicated successful course completion. For 2003-04 and beyond, successful completion was changed to "all passing grades." This definition of successful completion was changed to match national trends in reporting data.

¹ These descriptions were clarified for 2007-08. **Level 1 Math** includes Algebra 1 or its equivalent as recorded on a transcript for college; **Level 2 Math** includes Geometry; Plane or its equivalent as recorded on a transcript for college; **Level 3 Math** includes Algebra 2; or its equivalent as recorded on a transcript for college. **Level 4 Math** includes Algebra 3; or its equivalent as recorded on a transcript for college.; **Level 5 Math** includes Calculus; or its equivalent as recorded on a transcript for college; **AP Calculus (AB)**; **AP Calculus (BC)**; and **AP Statistics**.

Biology - 1st year - Includes Biology I; General Biology; College Preparation; Introductory Biology;

Chemistry - 1st year - Includes Chemistry I; General Chemistry; and Introductory Chemistry; **Physics - 1st year** - Includes Physics I; General; Regents; and Introductory; **Earth Science** - includes Earth Science; Earth-Space Science; Space Science; Aerospace Science; **Integrated Science** - Includes Integrated Science; Unified; Life/Physical Science; Earth/Life/Physical Science; Coordinated Science; **AP/IB Biology** - Includes Advanced Placement and International Baccalaureate exams; AP Chemistry; AP Physics.

07-08 Findings

One hundred and forty-four (144) districts received a request to complete the Profiles, of which 58 districts submitted a Profile. For both math and science, findings are similar for the last three years; however, the emphasis to have all students take level 1 math courses is beginning to show for 2007-08 graduating seniors as can be seen in Figure 1. Additionally, the increase in the lower end of the range that first appeared last year, continued for 2007-08. It appears that more students complete these courses by graduation.

Figure 1 shows the percent and range of all graduating students completing the designated courses based on all reporting districts. Although previous year's results are provided to show trends over time, it is important to remember that while there is a core group of districts completing the Profile every year, districts completing the Profile changed year to year. Additionally, reporting requirements have changed over the years.

Math & Science Collaborative								
Report of District Profile Data, 2000-08								
Data from years 2000-2003 represent graduating seniors who received a "C" or better grade in the courses listed. Due to national trends in reporting data, the Math Science Collaborative changed its format with 2003-04 data to include students receiving a PASSING grade in the courses listed								
Course	2000-01 Total Sample % and Range "C" or better grade Based on 66 districts	2001-02 Total Sample % and Range "C" or better grade Based on 75 districts	2002-03 Total Sample % and Range "C" or better grade Based on 95 districts	2003-04 Total Sample % and Range All passing grades Based on 82 districts	2004-05 Total Sample % and Range All Passing grades Based on 90 districts	2005-06 Total Sample % and Range All Passing grades Based on 76 districts	2006-07 Total Sample % and Range All Passing grades Based on 77 districts	2007-08 Total Sample % and Range All Passing grades Based on 58 districts
Level 1 Math (Algebra 1)	65% (23% to 100%)	74% (47%- 100%)	72% (37% to 100%)	89% (56% to 100%)	91% (14% to 100%)	86% (11% to 100%)	87% (39% to 100%)	91% (33% to 100%)
Level 2 Math (Geometry)	63% (35% to 91%)	62% (31%- 95%)	61% (19% to 95%)	82% (33% to 100%)	83% (38% to 100%)	86% (0% to 100%)	85% (45% to 100%)	85% (32% to 100%)
Level 3 Math (Algebra 2)	58% (27% to 90%)	67% (31%- 97%)	66% (33% to 100%)	75% (33% to 100%)	78% (40% to 100%)	77% (1% to 100%)	77% (36% to 100%)	75% (33% to 100%)
Biology I	77% (20% to 100%)	81% (53%- 100%)	81% (38% to 100%)	92% (61% to 100%)	94% (53% to 100%)	93% (0 to 100%)	88% (24% to 100%)	90% (24% to 100%)
Chemistry I	58% (21% to 98%)	63% (21%- 98%)	63% (31% to 98%)	72% (28% to 100%)	70% (9% to 100%)	76% (24% to 100%)	69% (30% to 100%)	71% (24% to 100%)
Physics	33% (5% to 85%)	35% (4%-86%)	35% (3% to 93%)	40% (4% to 96%)	37% (0% to 98%)	44% (4% to 98%)	41% (4% to 100%)	43% (6% to 94%)

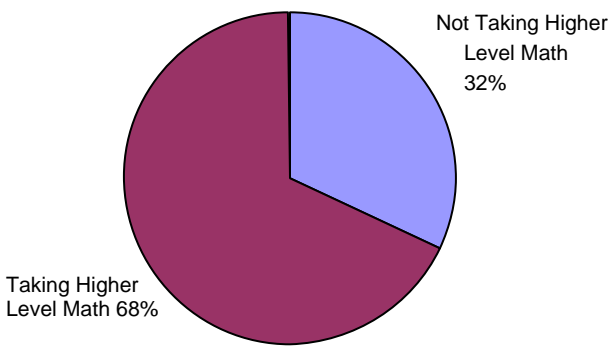
Figure 1

Course Completion in a Given Year

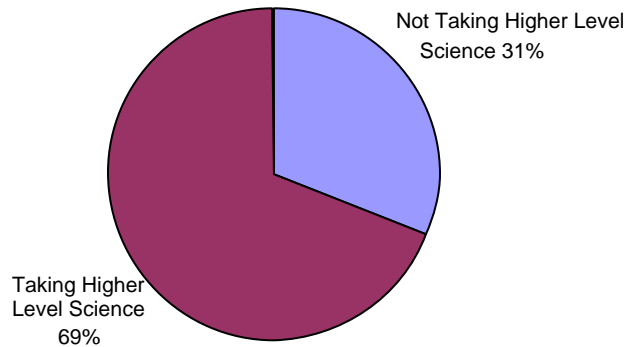
Districts reported on the number of students in Grades 8 through 12 taking the designated math and science courses each year². District enrollment data publically available via Pennsylvania Department of Education’s statistics website (<http://www.pde.state.pa.us/k12statistics>) provided the denominator to calculate the proportion for the various figures in this section of the report.

As can be seen in the pie charts, although approximately 70% of students took the designated math or science courses in 2006-07 and 2007-2008, the actual percentage of students taking these courses is increasing. This is true for both math and science.

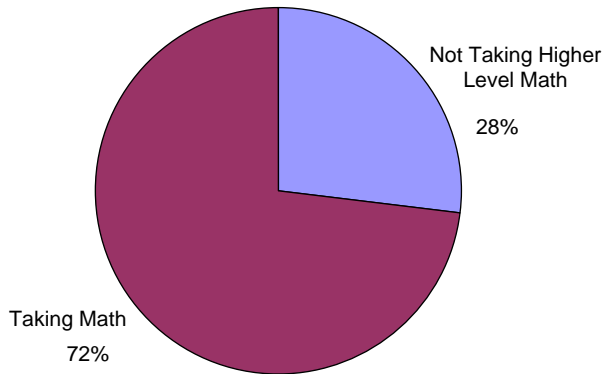
8th-12th Grade Students Taking Higher Level Math in 2006-07



9th-12th Grade Students Taking Higher Level Science in 2006-07



8th-12th Grade Students Taking Math in 2007-08



9th-12th Grade Students Taking Science in 2007-08

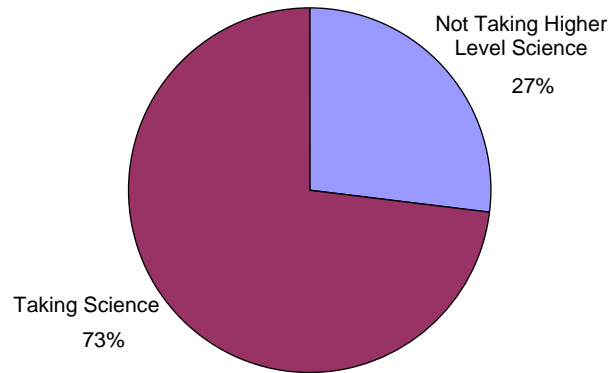


Figure 2

² Grades 8-12 math and science data are necessary for some of the reporting requirements of the MSP. However, for the purposes of this report and to more accurately represent the districts and the data, 8th grade students were removed from science results because in most cases 8th graders do not take the designated science courses and keeping them in the analysis lowered the percentages of students completed the science courses.

The following bar graphs provide additional details for each of the designated math and science courses in 2005-06 through 2007-08.³ The pie chart above shows that 72% of students in Grades 8-12 took the designated math courses in 2007-08. The bar graph below represents the percent of students taking the designated math and science courses. For example, to interpret the bar graph, 18% of all students in Grades 8-12 in 2007-08 completed a Level 1 Math course; 17% completed Level 2, and 14% completed Level 3, etc.

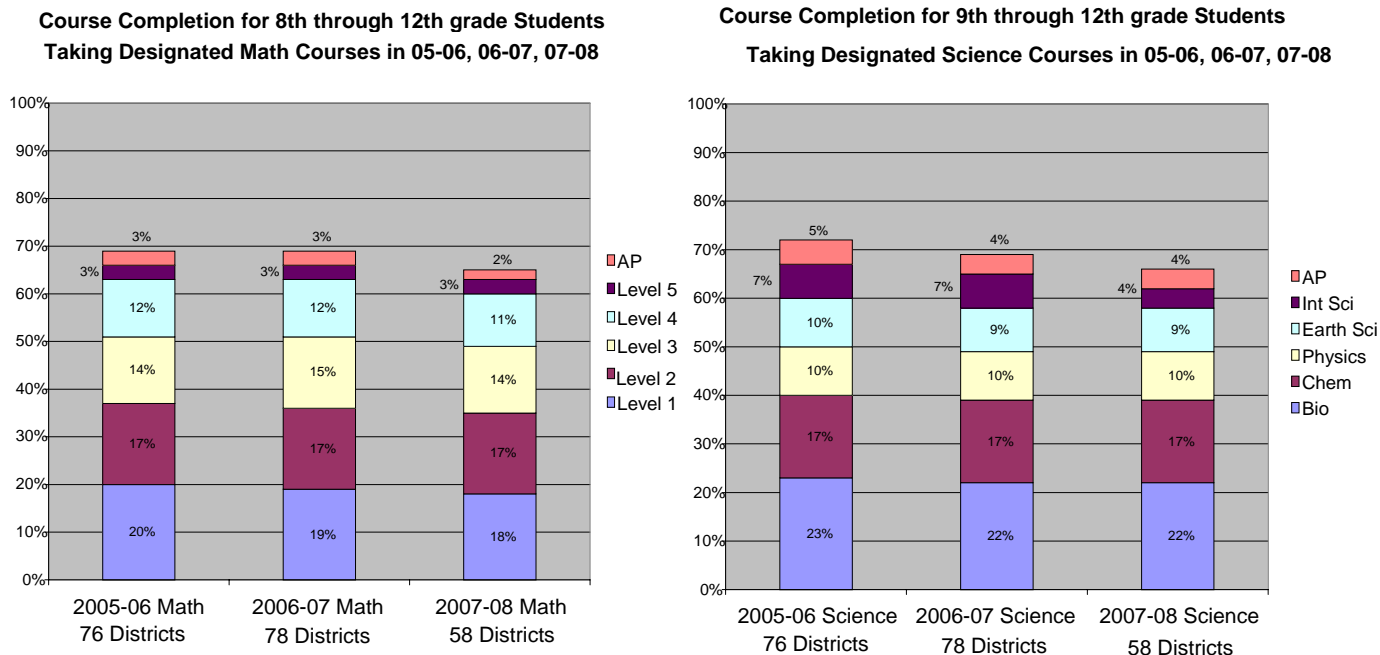


Figure 3

Course completion data were further disaggregated to look at gender and grade differences. In terms of gender, males and females were similar in the courses they completed. However, in 2007-08 both more males and females took science courses than in previous years. This may be indicative of the PSSA now assessing science. In 2007-08 67% males and 71% females completed the designated math courses and 64% males and 66% females completed the designated science courses. In 2006-07, 64% males and 70% females completed the designated math courses and 57% males and 60% females completed the designated science courses. In 2005-06, 65% males and 71% females completed the designated math courses and 58% males and 63% females completed the designated science courses.

Data were not disaggregated by ethnicity because ethnicity enrollment data were not made available this year on the PDE website as in previous years. Further inquiry confirmed that these data would not be available. Consequently, no denominator was available to do the calculations.

Grade

For the purposes of this report, analysts examined certain courses by grade level to answer the following questions: “In what grades are students taking Level 1 Math courses?” and “In what grades are students taking Physics 1?”

As can be seen in the bar graphs below, the majority of students are taking Level 1 Math courses in Grades 8 and 9 and the majority of students taking Physics 1 are in Grades 11 and 12. This appears to be consistent for all three academic years.

³ 2003-04 and 2004-05 data are not included as they were the first years these data were collected. Due to the newness of the task, confidence in accuracy of reporting results was a concern.

Course Completion for Level 1 Math by Grade for 2005-06, 2006-07, 2007-08

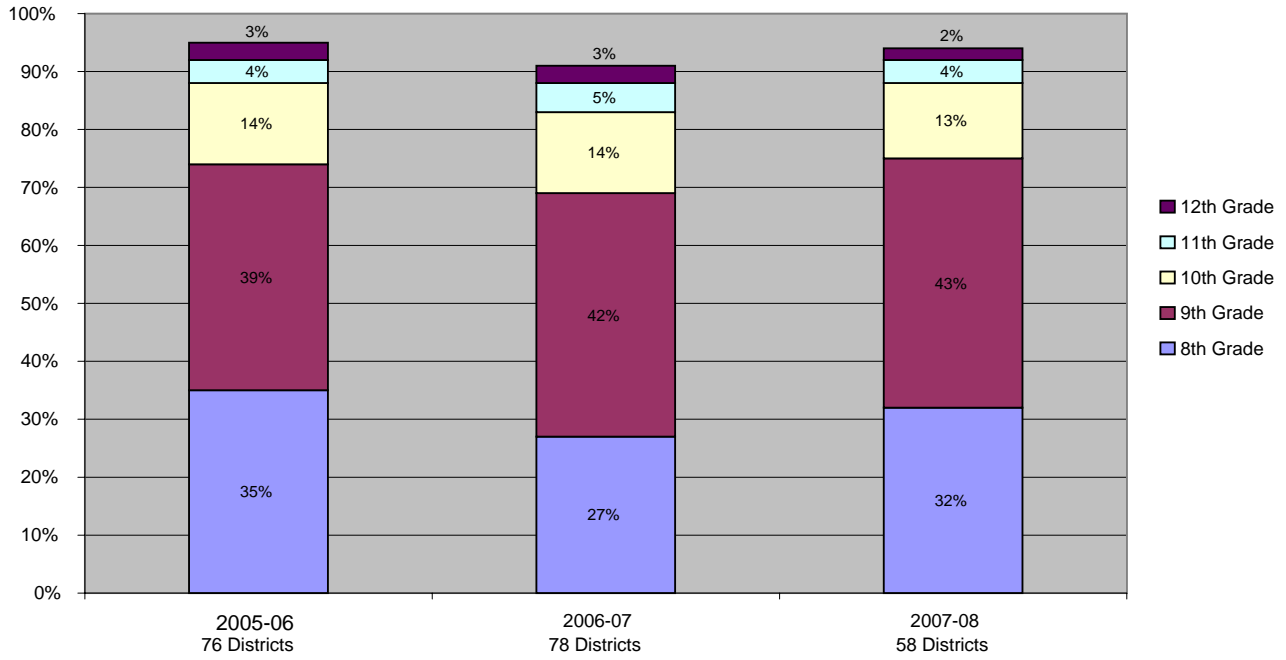


Figure 4

Course Completion for Physics 1 by Grade for 2005-06, 2006-07, 2007-08

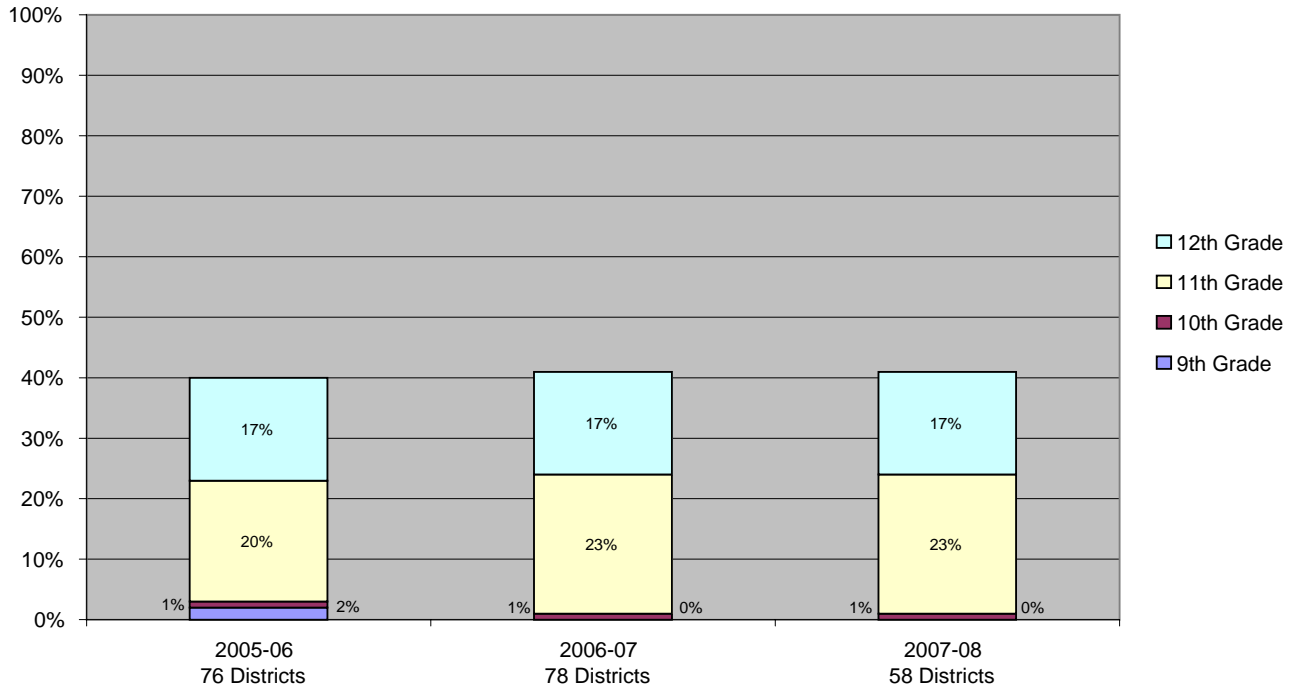


Figure 5

Next Steps

Profile results will continue to serve as the primary source of information to determine the percent of graduates completing designated math and science courses and the proportion of students taking and completing the designated math and science courses each year. Additionally, increasing the overall proportion of students taking the designated courses, and examining the patterns of when math and science courses are taken will be the continued focus of future reports. Ways to ease the data collection burden are also being explored.

For more information about the MSC or this report, please contact Dr. Nancy Bunt at the Math & Science Collaborative (412) 394-4600.