

Data Analysis: Student Transcripts

Because of the change to a semestered block schedule, no student at Suburban High School can complete mathematics courses entailing precisely the same number of hours as offered under the prior scheduling system. The semestered block schedule makes more courses available to each student, with each course lasting fewer hours. Students who allocate the same number of courses to mathematics as they would have done under the prior schedule will actually complete fewer hours of mathematics instruction. Students who enroll in more mathematics courses through semestered block scheduling than they would have under the prior schedule actually do receive more hours of mathematics instruction.

The semestered schedule affords students the opportunity to study more mathematics, if they are motivated to do so. In an extreme case, a student could hypothetically complete eight sequential mathematics courses over her/his high school career. Mathematics teachers believed that having students begin their study of high school mathematics with the IMP curriculum would provide the motivation to study more mathematics. This belief is consistent with research to date. Webb (in press) investigated three schools in California that were the first to offer at least three years of IMP. He found that 64% of students at these schools who started IMP in Grade 9 actually completed at least four years of high school mathematics. In comparison, 38% of students at these schools who started a traditional sequence with Algebra I in Grade 9 actually completed at least four years of high school mathematics. This difference in course taking was significant at the .01 level.

The question remains: Did students really register in additional or more advanced mathematics under the IMP curriculum and semestered block schedule at Suburban High School than under the prior curriculum and schedule? The Secondary Research Questions listed previously break this larger question into the following more detailed questions:

- i. How did students enrolled in a reform-based curriculum and a semestered block schedule differ from students enrolled in a traditional curriculum and traditional schedule in the number of registered mathematics class hours by the end of Grade 12?
- ii. How did students enrolled in a reform-based curriculum and a semestered block schedule differ from students enrolled in a traditional curriculum and traditional schedule in participation in advanced courses, as measured by the number of registered hours in advanced mathematics classes by the end of Grade 12, by the number of students enrolling in Advanced Placement courses, and by scores on Advanced Placement tests?

This aspect of the study is addressed using two sources of data: student transcripts, and annual School Profiles published by Suburban High School.

The transcripts were used to determine course enrollment. For each student each year, the hours registered in mathematics class were computed by multiplying the number of mathematics courses in which the student was enrolled times the number of days per course times the number of hours per course per day

The number of hours registered in advanced mathematics classes was computed the same way, with an advanced class being defined as a class taken after the core

requirements were completed. For the traditional curriculum, advanced classes were defined as those courses taken after successfully completing Algebra 2. For the reform curriculum, advanced classes were those courses taken after successfully completing Integrated Math 4.

Student transcripts were also used to determine the number of students enrolled in Advanced Placement courses each year, by grade level. Students completing Advanced Placement courses had the opportunity to earn college credit in mathematics by taking an Advanced Placement exam administered yearly by the College Board, and many students did so. This study obtained student grades on Advanced Placement exams from annual School Profiles published by Suburban High School.

Groups to be Compared

Students in the Traditional cohort who were tested in the spring of 1997 had used a traditional curriculum and schedule from ninth grade through the time of testing, when they were in eleventh grade. However, when those same students were in twelfth grade during the 1997-98 school year, Suburban High School adopted a pilot block schedule at all grade levels. Since they were *not* enrolled in a traditional schedule in twelfth grade, it would not be appropriate to use these students' transcripts to address research questions iv. and v. Instead, this study used transcript data from the two preceding cohorts at Suburban High School: those students who graduated in the spring of 1996, and those students who graduated in the spring of 1997. Both of these cohorts of students were enrolled in a traditional schedule and curriculum throughout their high school tenure.

Complete transcript data was also available for the First Reform cohort, who graduated in the spring of 2001. As of this writing, students in the Second Reform cohort

have not yet completed high school. Therefore, the transcript analysis in this report compared the registered hours of mathematics studied for students in the First Reform cohort, to the registered hours of mathematics for students in the Traditional cohorts who graduated in the spring of 1996 or the spring of 1997.

As noted previously, student transcripts were also used to identify the number of students enrolled in Advanced Placement mathematics courses each year by grade level and School Profiles were used to obtain student grades on Advanced Placement exams. Data on Advanced Placement enrollment was available each year from 1990-91 through 2000-01 and is reported. Data on Advanced Placement exam scores was available each year from 1994-95 through 2000-01 and is reported.

Statistical Methodology

Formal hypothesis testing could obscure important information about differences in the amount of mathematics that the Reform and Traditional students studied. This is because significance tests ask the question: “Is there a non-chance difference between the groups on some particular population parameter?” The parameter might for example be an adjusted or unadjusted mean value (as reflected in t-tests or linear regression), or a median value (as in “nonparametric” tests like the Mann-Whitney U), or the odds of attaining a certain goal (as in Logistic Regression Analysis). Such population parameters report overall summaries for a set of data. They are likely to obscure possibly interesting patterns of differences between cohorts in detailed course-taking patterns. For example, reporting the mean number of hours enrolled in advanced mathematics courses might miss a pattern in which the bulk of students in a particular cohort enrolled in fewer hours,

while a few students in that same cohort enrolled in substantially more hours. Other summary statistics have similar limitations.

Because of the limitations of traditional hypothesis testing, the analysis of the course registration data will consist of inspection of graphs depicting the registered mathematics hours for each group. In some cases, apparent differences between groups are tested for “statistical significance” to determine if they are likely to have occurred by chance. These post-hoc significance tests, which were conducted after identification of patterns from the graphs, should be viewed as exploratory analyses, not confirmatory hypothesis tests.

After examining differences between the AP exam scores of students who had used the semestered block schedule and the IMP curriculum and the AP exam scores of students in earlier years, a post-hoc Logistic Regression Analysis was done to see if the apparent differences between groups in the Advanced Placement Calculus BC exam could easily be dismissed as being chance variation. Because the statistical analysis of Advanced Placement Calculus BC exam grades was conducted after noticing a pattern in the data, it too must be viewed as an exploratory analysis.