Readiness Of High School Students
For Introductory College Mathematics Courses

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This project examined the readiness of suburban high school students for college level work, and specifically for introductory college courses in mathematics. Nearly all students in grade eleven (juniors) at a suburban high school in the Portland, Oregon area were tested with the ACT Assessment. Students who did not meet college readiness standards in mathematics were identified, and those who were not scheduled to take a math course in their senior year were referred to their counselor for intervention. Thus, students who did not meet college readiness standards in math will have the option to pursue remediation while still in high school, rather than having to pay for non-credit math review courses in college.
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Can college-bound high school students who are not prepared for introductory college courses in mathematics, be identified prior to their senior year so as to allow for remediation while still in high school? This would avoid significant cost to students and colleges, as well as reduce the time spent in earning a college degree. (There is also evidence that students going directly into the workforce need the same level of math skills as those who take beginning college-level math courses (ACT, 2006)).

College readiness is variously defined by different standards. Due to lack of skills and courses, only 32 percent of high school graduates are qualified for college (Greene, 2003). Colleges, by their admission policies, emphasize students’ high school grade point averages (GPA), academic courses, and test scores as predictors of college success (HECB, 2003). Grades alone are of limited value due to the variability of high school curricula and grading standards. Other indicators of college success (defined as college GPA and retention in college) are the ACT English and Math benchmarks for college readiness. In 2004, students who met both benchmarks had college retention rates of 80 percent and first-year GPAs of 2.98. The ACT study showed that “students who met the mathematics benchmark, regardless of whether any other benchmark was met, had higher retention rates than those of all other students”. (ACT, 2005) The Southern Regional Education Board defines standard level (among others) of college
readiness as an ACT composite score of 21, which equals the national mean ACT score (Lord, 2003).

ACT, Inc. has defined college readiness as a 75 percent probability of earning a grade of C or better in a college introductory core academic course (ACT, 2005). For specific subjects, this has been translated to minimum scores on the ACT Assessment, including English (18), Math (22), Reading (21), and Science Reasoning (24). (ACT, 2005). A general minimum college readiness score of 21 can be derived by calculating the average of the sum of the four subject scores, although ACT does not calculate this.

A higher standard of college readiness has been set by some Oregon public colleges and universities. Portland Community College (PCC) (Portland Community College, 2006) and the University of Oregon (UO) (University of Oregon, 2006) use ACT ACT Math scores of at least 25 for placement into college-level and math courses. (The University also offers similar placement for SAT Math scores of 550 or higher). An ACT English score of at least 24 will allow students to enroll in PCC college-level writing. The university requires all students to enroll in an introductory writing course, unless students earn an ACT English score of at least 32, or qualify with the SAT or AP English exams.

In this project, nearly all eleventh-grade students at a suburban high school have completed the ACT Assessment (ACT, 2006), with scores in English, Math, Reading, and Science Reasoning. In this study, it was hypothesized that more than half of the juniors who plan to go to college, but do not meet college readiness standards, did not schedule the mathematics courses needed for remediation while still in high school.
They will be referred to their counselors for intervention prior to their senior year. (The high school requires English in the senior year, but Reading is not offered as a course. No Oregon public colleges use ACT Science scores for general placement purposes). Although it is not within the timeframe of this study, it is anticipated that at least 50 percent of these students will add the indicated course(s) to their schedule; others will have improved sufficiently during the second half of the school year to eliminate the need for remediation. (Recent student learning can be evaluated with a second ACT test, normally taken at the end of the junior year or in the fall of the senior year).

Method

Participants

The secondary data used in this study is based on 360 eleventh grade students, representing over 80 percent of the juniors at one high school. Some special education and some English language learners chose to not take the test. Other students chose to stay home or were not present for the ACT test registration in December.

Measures / Instruments

The ACT Assessment was administered during the school day on a Monday in February of 2006; no classes were held for any students (other students were taking other tests or were not on the school campus). The ACT consists of academic tests in English, Math, Reading, and Science Reasoning, plus an optional essay (required at this site). Also included are questions related to planning for high school and beyond,
which were answered at the time of registration. These questions ask for students’ highest level of education planned after high school, *i.e.*, technical school, two-year college degree, four-year college degree, or graduate degree. All questions asked of students were from the official ACT registration booklet, test booklet, and answer folder.

**Results**

Of the 360 juniors of this high school who completed the ACT Assessment in February of 2006, 19 percent (*n* = 68) meet the ACT college readiness standards in all four areas: English, Math, Reading, and Science. When the higher standards used by Portland Community College and the University of Oregon are considered for this group of 68 college-ready juniors, 76 percent (*n* = 52) of them meet or exceed the college readiness scores in both English and Math, allowing placement into introductory college-level courses in both areas.

Although the school mean Math score of 20.9 is just above the national average (20.7), seventy-five percent (*n* = 271) of all tested juniors at the school studied failed to meet the local (PCC-UO) definition of college readiness in math (See Figure 1.). The mean subject scores of juniors at the school exceed the ACT college readiness standards in all areas except Science Reasoning. The school mean ACT Composite score of 20.9 is just below the derived composite score (21) for general college readiness. The percentages of students meeting the ACT college readiness standards
in English, reading, and science were not calculated for this study, as these are not relevant to interventions for adjusting senior year courses, as explained above.

Discussion

The goal of this project was to learn about the academic college readiness of students at the high school studied, and specifically the mathematics preparation for college of students at the high school. The focus was on areas of academic readiness that could be identified with the ACT Assessment, since that instrument was administered to all juniors at the school on a single day, and it has both academic tests and self-report data on high school achievement and college planning. Although the ACT standards of college readiness exist for English, Math, Reading, and Science Reasoning, for reasons listed above, only the readiness of students for college-level math courses was chosen for study and intervention at the school. Further, the higher standards of readiness used by the local community college and the University of Oregon were judged to be more realistic for students, rather than the abstract standards of ACT.

The primary result of this project is that 271 junior-level students have been identified as lacking the math skills usually required for introductory college-level mathematics courses and for work training programs. (Juniors at the school have been informed of these standards for English and mathematics). An anticipated result is that at least 50 percent of these students will change their senior year schedules by adding
a course in math. If a low percentage of students add a math course in response to their below-standard ACT Math scores, it may be attributed to fear of math, procrastination, or belief that they will improve in the last part of their junior year and thus later attain a math score that qualifies for college-level introductory mathematics courses. Whatever the reason for failing to take another math course in high school, the probability of taking a non-credit refresher math course in college could be reduced by requiring another year of mathematics for all seniors who failed to meet the standard. (Three credits of mathematics are required by the school district for a diploma). Similar requirements could also be made for students who do not meet the standards in Reading and Science Reasoning, although standards in these areas are not used by local colleges and these courses do not presently exist at the high school.

Increasing math requirements for high school students may have unintended consequences, however. Tony Wagner, co-director of the Change Leadership Group at Harvard University’s Graduate School of Education has raised a troubling issue:

We know that advanced math requirements are one of the most significant contributors to increasing numbers of high school students’ dropping out; why, then should all students have to take these courses for admission to a four-year college, instead of classes that teach more widely used math skills like statistics and probability? (Wagner, 2006)

Further research could explore the predictive value of the ACT college readiness standards at Oregon colleges, by examining retention, first year GPA, and graduation rates. This could then be compared with the predictive value of the Oregon Certificate of Initial Mastery (CIM) and Certificate of Advanced Mastery (CAM) programs, which are
being phased out in the next few years. Perhaps the ACT Assessment, although relatively expensive at about $40 per test, could be a more useful measure of high school achievement and readiness for college and workforce training for all students. Finally, future research could determine the (PCC-UO) readiness levels of students who (1) plan to attain a two- or four-year college degree, and (2) plan to directly enter the workforce. This could focus intervention and relevant remediation levels on students in both groups who fail to meet readiness standards.
College Math Readiness of High School Juniors

![Bar Chart]

**Figure 1.** College Readiness: a comparison of students meeting vs. not meeting benchmarks for college introductory math courses, and enrollment in senior year math. 
*Note:* Data on graph is hypothetical, pending release of more specific data from school district assessment office.
References

ACT, Inc., (October, 2004). Ready for College and Ready for Work: Same or Different?


ACT, Inc. (May, 2006). High School Graduates Need Similar Math, Reading Skills


