

Promoting Academic Standards?: The Link Between Remedial Education in College and Student Preparation in High School

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This study found that a student's high school preparation was predictive of their need for remedial education in college. Students earning higher grades and taking higher levels of English and math in high school were less likely to need remedial education. Most students completed 12th grade English and Intermediate Algebra in high school. Although completion of higher levels of math in high school reduced remedial placement rates, over half the students successfully completing Intermediate Algebra and Geometry still required remedial math courses or needed to repeat Intermediate Algebra in college. Over a third of the students successfully completing 12th grade English needed remedial English in college; however there were some concerns with the predictive validity of the English assessment.

INTRODUCTION

There is a widespread need for remedial education at colleges and universities across the country. "In 1995, nearly all public two-year institutions and 81 percent of public four-year institutions offered remedial courses" (Kirst, 1998, p. 76). In Georgia, "30 percent of...students who graduated with college preparatory diplomas in 1995 took remedial courses in college" (Sandham, 1998, p. 25). "Only 13 percent of CUNY community college students pass[ed] three basic skills tests measuring 11th grade proficiency" (Sandham, 1998, p. 25). College remediation rates for students were 46 percent in Maryland and 60 percent in Florida (Malooney, 1996).

The California State University System reported that “47 percent of freshmen had to take remedial English, and 54 percent enrolled in remedial math” (Kirst, 1998, p. 76). At some campuses in the system, 80 to 90 percent of the freshmen needed remedial education (Manzo, 1996; Ponessa, 1996; California Community Colleges, 1995). These remediation rates are in a system that is supposed to take the top 30 percent of high school graduating classes in the state.

In 1995, the National Center for Educational Statistics (NCES) found that 29 percent of all freshmen required remedial education at four-year colleges and universities. At community colleges “the figure was 41 percent” (Ignash, 1997, p. 9).

The need for remedial education has captured the attention of legislators who question why they are paying twice for education that students should have learned in high school. Several million dollars are spent annually on remedial education in various states. Estimates for recent years include: California \$10 million, Texas \$155 million, Louisiana \$32 million, New Jersey \$50 million, Oklahoma \$18.7 million, and Georgia \$5 million (Sandham, 1998; Manzo, 1996; Ponessa, 1996; Ignash, 1997). In Massachusetts, Georgia and California, legislation was proposed to make high schools pay for the remedial education of students in college, but the bills did not pass (Sandham, 1998; Ignash, 1997). In Florida, the legislature required college students to pay the full cost of their remedial course work which was “four times greater than the regular tuition rate” (Ignash, 1997, p. 6). The need for remedial education is imposing costs upon students, institutions of higher education, the legislature, and ultimately the tax paying public.

This study examines the connection between remedial education in college and a student’s high school preparation. In the following sections, a literature review on

remedial education and the standards movement is provided, followed by the study methodology and findings. The research study raises concerns that high schools are not giving students the academic preparation they need for college. It also suggests that there is a substantial difference in the rigor of high school math courses compared with the college curriculum.

LITERATURE REVIEW

The “chain of blame” is a metaphor for the discourse taking place in the educational community. It describes how “universities blame the high schools, the high schools blame the middle schools, and the middle schools blame the elementary schools for poor [student] preparation” (Ponessa, 1996, p. 31). Some high school teachers have reported that students entering the school “don’t write with any examples, they write in generalities, they write in first person, they don’t do things they should have learned a long time ago” (Ponessa, 1996, p. 32). In Ohio, a commission studying the preparation of high school students found that “the high school curriculum was not adequate in preparing students for college-level work” (Richey et al., 1997, p. 63). A lack of adequate funding and overcrowding in high school classes were often cited as reasons for poor results (Ignash 1997, p. 5).

Educators express concerns with student failure to take college preparatory courses, grade inflation, and a lack of academic rigor in high school courses. College administrators reported that “there’s been so...much grade inflation, the colleges don’t know what they’ve got until they get it” (Sandham, 1998, p. 25). There were recommendations for “more rigorous work requirements in order to reduce grade

inflation” (Bandy, 1985, p. 88). Educators also advocated “an end to social promotion and an emphasis on intervention” (Feldman, 1997, p. 9).

Many believe that students are not receiving the math preparation in high school that they need for college level work. Educators have stated that two years of math is not enough, and business math or practical math does not give students the math skills they need in college (Manzo, 1996).

College teachers report that students, “have gone through high school math classes without gaining a real understanding of the subject matter. ‘We’ve found that they’ve failed in high school, but somehow there’s a C on their report card’” (Ponessa 1996, p. 31). A study conducted by Lappan and Phillips (1984) found that nearly 70 percent of students enrolled in Intermediate Algebra at the university had taken three to four years of math in high school at the Algebra 1 level and above. Another 42 percent of students in Elementary Algebra had taken two to three years of college preparatory math (Lappan and Phillips, 1984). Many of these remedial students earned C grades in their high school college preparatory courses. The authors found that students needed at least three years of college preparatory math in high school and a B average in the courses to take college level math.

In New Jersey, 44,453 entering freshmen took the New Jersey College Basic Skills Placement Test in 1986 at all public higher education institutions and eleven private colleges in the state (New Jersey Department of Higher Education, 1987). Only 27 percent demonstrated proficiency in verbal skills, 30 percent were proficient in computation, and 15 percent were proficient in Elementary Algebra. The study examined remedial math placement by level of math completed in high school. Of the “students

who took the typical ‘college prep’ program of Algebra I, II, and Geometry, only 4 percent were proficient in Elementary Algebra” (New Jersey Department of Higher Education, 1987, p. 28). Another 30 percent of students who took Calculus in high school did not demonstrate proficiency in Elementary Algebra.

Other reports indicate a concern with the rigor of high school writing courses. English instructors in the high schools reported that “our basic is kind of like remedial, and our so-called honors is more like a college-prep borderlining on basic” (Ponessa 1996, p. 32). “If we go strictly by the book, half of my honors class would have failed” (Ponessa, 1996, p. 32). Researchers have found that literature and creative writing courses do not prepare students as well for college writing as expository writing courses (Bamberg, 1978, p. 54).

Concerns with the rigor and quality of our educational system have given rise to the standards movement. States are establishing higher standards for high school graduation, increasing admission requirements at senior colleges and universities, structuring open admissions programs, and using testing and evaluation to assess educational outcomes. In South Carolina, a bill is being considered that requires annual testing to assess student progress in relation to state standards. Secondary schools would be classified as A-F schools or labeled “successful, on notice, or challenged” (Sandham, 1998, p. 22). If the bill passes, students may leave challenged schools for those providing a better educational environment. Ohio mandated four years of English and three years of math “one of which should be taken in the senior year” (Bandy, 1985, p. 88).

Other states have been considering the use of differentiated high school diplomas. In New York, there is a Regents Diploma that is separate from the regular high school

diploma. To receive endorsement, students need to pass competency exams (Monk, 1998). In Florida, there were also recommendations to increase standards and create “alternative, differentiated high school diplomas to recognize achievement in college preparation curriculum” using competency tests (Florida State House of Representatives, 1996, p. 39).

As a result of this movement, the testing programs in states have received increased scrutiny. Teachers contend that rapid-paced, multiple choice exams “that are not aligned with high school curricula” are not a good measure of educational outcomes (Kirst, 1998, p. 76). Due to concerns with the validity of testing, some states have overhauled their testing system and included the use of portfolios (Lawton, 1998, p. 18).

Colleges and universities are also assessing their testing programs. At some community colleges, the authors found that their English test did not have a strong correlation with success in English courses (Hughes & Nelson, 1991; Institutional Research, 1997). Other institutions used writing samples as “a second evaluation for borderline students [which] increased reliability without excessively increasing costs and numbers assessed” (Berger, 1997, p. 46). Others argued that if there was a poor correlation between English test scores and subsequent success in college courses, it would be difficult to determine whether standards were compromised in the course, or the test was unreliable (Berger, 1997, p. 38).

Some college governing boards have been reducing the remedial education courses offered by senior institutions and increasing their standards. In Massachusetts, the board mandated that “no more than 10 percent of a freshmen class” can require remedial education at senior institutions (Sandham, 1998, p. 25; Ponessa, 1996, 30). In

California, the state plan called for a 50 percent reduction in remedial education at four year colleges and universities; however, it is was placed on hold because of opposition (Ignash, 1997, p. 6). Oklahoma also increased their college admission requirements and distributed the requirements to all secondary education students (Ignash, 1997).

Colleges and universities are structuring the open admissions process with mandatory testing and placement. They may limit the number of credit hours or other courses that remedial students take at the college. Students testing into remedial reading may not be allowed to take college level courses until remedial course work is completed. Institutions may require the completion of remedial courses during a student's first semester. Academic alert systems are also being implemented. During the first four weeks of the semester or by the midterm, colleges identify students who are having academic difficulty and refer them to academic advising (Fonte, 1997).

Other interventions focus on collaboration between college and high school instructors. For example, the Early English Composition Assessment Program in Ohio, developed a collaborative portfolio program where students complete essays each year in high school. These essays are graded by high school and college English instructors. Feedback is then provided to students and the schools (Richey et al., 1997). In Ohio, the High School Liaison Project was implemented by Clark Technical College and Ohio State University. Efforts were coordinated to develop English and math testing for the local school districts (Bordner, 1986). They also implemented a merit scholarship program, and "2+2 programs linking the last years of high school with the first two years of college" (Bordner, 1986, p. 4). The Department of Education and Department of Higher Education funded the New Jersey Algebra Project. The project "has focused on

teacher retraining and adoption of a new Elementary Algebra curriculum at the seventh, eighth, and ninth grade levels” (New Jersey System of Higher Education, 1987, p. 29). Students who participated in the program showed significant improvement in their test scores.

Because of the need for remedial education at colleges and universities, there has been increased scrutiny of the high school preparation of students. States are attempting to increase their educational standards. Interventions have also been initiated to improve the education of students at the secondary level to reduce remedial placement in college.

METHODOLOGY

The present study was conducted to determine how high school preparation affects remedial placement rates at Utah Valley State College (UVSC). The research is being used as a basis for considering possible interventions to improve the preparation of high school students entering the college. UVSC is an open admission state college that offers a limited number of bachelor degrees. In fall 1998, there were 18,174 students attending the college. Students were an average of 22 years old. About 93 percent were Caucasian, and 46 percent were females. About half of entering freshmen needed remedial education.

This research follows up on a previous study conducted at UVSC on the preparation of students in one school district titled, Level of Math Preparation in High School and Its Impact on Remedial Education at UVSC (Institutional Research, 1998). The academic preparation of students in both English and math from two other school districts was examined in the present study.

The high school transcripts of students from five high schools in the two districts were used in the analysis. There were 2,509 seniors who attended District 1 during academic years 1995 through 1997, and 1,256 seniors who attended District 2 during the 1997 academic year. Transcript data for academic years 1995 and 1996 were not available in electronic format for District 2. Students attending alternative schools in the two districts were not included in the study. The high school transcript data was merged with college transcript data using names and dates of birth.

High school English and math courses were categorized using high school course descriptions and contacting counselors at the high schools. Students received grades for each quarter in the high schools. A student's overall grade point average for each English and math course was calculated by weighting and averaging the grades for each quarter using the credits completed and course grades.

The student's highest level of English and math successfully completed in high school was identified. In general, English and math courses were taught for a full credit over an entire academic year. A course was classified as being successfully completed if the student earned a full credit hour and received an average grade of C- or higher in the course. Students receiving an F or incomplete during any given term did not receive credit, and could not be classified as successfully completing the course. A mark of P or passing grade was considered to be the equivalent of a C. The last time that a student successfully completed the course was used in the analysis because some students repeated courses.

There were a few math courses taught in sections. For example, Geometry and Trigonometry was a common sequence, with a half credit for each. Another sequence

using half credits for each section was College Algebra and Trigonometry. The courses were classified as being successfully completed if the student earned a C- or higher in each section.

The focus of the study was on how well high school courses prepared students for their college course work. Concurrent enrollment courses taught by high school teachers in the high schools were included. However, a few students who took courses on college campuses before graduation were not included in the study. Students receiving transfer credit before taking the college placement tests were also excluded.

A student's placement in English and math at the college was determined by their ACT or COMPASS (Computerized Adaptive Placement Assessment and Support Systems) test scores. Students with low ACT scores, and those who did not have an ACT test score, took the COMPASS test on campus. COMPASS tests were used in the study if they were taken within two months of high school graduation and within two months of attending UVSC. ACT test scores were also used if students took the test during the last two months of their junior year or during their senior year in high school.

Descriptive statistics and logistic regression were used to assess the academic preparation of high school students. Test score averages and remedial placement rates were presented for groups with at least thirty students to avoid exceptional results due to small sample sizes, and to follow guidelines of minimum sample sizes for correlational research (Borg and Gall, 1989).

ACADEMIC PREPARATION OF HIGH SCHOOL STUDENTS

Most high school students from the two districts successfully completed 12th grade English and Intermediate Algebra in high school (Appendix A). About 20 percent or 509 students from District 1, and 30 percent or 378 students from District 2 attended UVSC. The preparation of those attending UVSC ranged from students who failed high school courses or only completed basic English and math to those who completed Advanced Placement English and Calculus. However, a smaller percentage of students who failed courses or only completed basic English and math attended the college.

The academic preparation of students was evaluated in several ways. A student's level of math or English preparation was examined to determine if level of preparation impacted student performance on the ACT test and remedial placement at the college. Logistic regression was used to control for student characteristics when evaluating the effect of academic variables.

High School Preparation and ACT Test Scores

The large majority of students take the ACT test during the last few months of their junior year or during the beginning of their senior year. This often takes place before high school students have completed their last year of math or English. All students in the local school districts are required to take four years of English, so the preparation that students receive prior to the ACT English test is generally 11th grade English. A substantial number of students take mathematics courses during their senior year. For example, about 41 percent of seniors in District 1 and 43 percent of seniors in District 2 enrolled in a math course during their senior year.

A student’s high school preparation in English and math, prior to taking the ACT test, was used to examine its impact on ACT test performance (Tables 1 and 2). As expected, a student’s preparation in high school mathematics and English courses affected their ACT test scores. As students completed higher levels of English and math in high school, their ACT test scores increased. Most students, who took 11th grade English and took the ACT test, had a score that would permit them to take College Writing (English 1010) at UVSC. The college requires students to have an ACT test score of 19. The median cut score used by colleges and universities nationally is 17 (ACT Research Division, 1998a). Using this cut score, 75 percent of the students nationally were prepared for a standard composition course in college.

TABLE 1. English Preparation and ACT English Test Performance

Course	District 1		District 2	
	Avg English Score	N	Avg English Score	N
English 11	21	267	19	190
English 11 Honors	26	56	24	111

The ACT math cut score required at UVSC for College Algebra (Math 1050/1090) is 24, which is similar to the cut scores used by other colleges and universities in the country. The median cut score for College Algebra used by colleges and universities across the country is 23 (ACT Research Division, 1998a). Using this cut score, ACT found that only 35 percent of the students nationally were prepared for College Algebra.

This study raises questions about the math preparation of students. Students with preparation in Algebra 2, Intermediate Algebra, and Geometry in high school had an

average ACT math score of 20 for District 1 and 19 in District 2. Students with this level of preparation should take College Algebra (Math 1050/1090). However, most of these students did not have scores high enough to take College Algebra on campus, and needed to retake Intermediate Algebra (Math 1010) or a lower level of math while attending UVSC. A substantial number of students successfully completing College Algebra/Trigonometry and Pre Calculus in high school also had cut scores that would not admit them into College Algebra on campus.

TABLE 2. Math Preparation and ACT Math Test Performance

Course	District 1		District 2	
	Avg Math Score	N	Avg Math Score	N
Algebra 1	16	41	--	--
Algebra 2	20	44	17	35
Algebra 2 Geometry	20	72	19	99
Trigonometry	21	41	--	--
College Algebra/Trig	23	32	23	122
Pre Calculus	25	69	--	--

These results are similar to those obtained by the ACT Research Division that are based on self reported information rather than actual high school transcripts. Grades in courses were not considered in the report. The division summarized the results for the high school graduating class of 1998 totaling nearly one million students. The average ACT math score of students completing Algebra 1, Algebra 2, and Geometry was 18, which again would indicate that most of these students would have to repeat Intermediate Algebra in college. The average ACT score of students who completed Trigonometry as their highest math course was 21, again too low for most students to be admitted to College Algebra. Students completing Calculus had an average ACT math score of 25.

The average ACT score of students completing other advanced math (such as Pre Calculus or College Algebra) was 23 (ACT Research Division, 1998b).

These descriptive statistics indicate that as students complete higher levels of English and math in high school, they earn higher scores on ACT tests. However, it raises questions about rigor of high school math courses.

High School Preparation and Remedial Placement

The relationship between high school preparation and placement in remedial education at the college was also assessed. A student's need for remedial education was determined at the college using a student's ACT and COMPASS test scores. Students with ACT scores below 19 were required to take the COMPASS test. The college uses ACT cut scores to place students in College Writing, Intermediate Algebra, and College Algebra. The COMPASS test is used to place students in required English courses and all math courses, including those at the remedial level. The two major remedial courses at the college include Math 0950, Foundations for Algebra, and Math 0990, Introductory Algebra.

ACT has recently developed a concordance table between ACT and COMPASS test scores. Institutions may temporarily use the ACT scores to place students in courses using the score that corresponds to the COMPASS cut scores validated at the institution. This table was not used in the present study because of concerns with the concordance between the COMPASS Pre-Algebra Test and ACT test scores. The ACT concordance scores were unusually high. For example, the concordance table would require students to have an ACT of 20 to take Introductory Algebra on campus. Current policy requires

an ACT score of 19 to take Intermediate Algebra on campus, which is a higher level of math than Introductory Algebra. The cut scores established on campus were less likely to place students in remedial education compared to the ACT concordance table.

If students successfully completed a math or English course during their senior year and did not have a COMPASS test score, they were not categorized in the remedial education group. These students were excluded from the charts. The student's highest placement based on either ACT or COMPASS test scores was used in the analysis. Using this method, the remedial placement rates of students were calculated based on their highest level of math or English successfully completed in high school. Success was defined as both a C- and B- in the course.

Over half the students who only completed 11th grade English as their highest level of English in high school, required remedial education while they attended UVSC (Table 3). These students did not successfully complete 12th grade English. About 35 percent of students earning a C- or higher in 12th grade English in District 1 still required remedial English in college. Another 36 percent of students earning a C- or higher in 12th grade English in District 2 required remedial education in English. Very few students who completed advanced placement English needed remedial education. Remedial placement rates were lower when using a B- as the criteria for success, particularly for District 2 (Table 4).

TABLE 3. Highest English Completed (C-) And Remedial Placement

Course	District 1 Remedial	N	District 2 Remedial	N
English 11	59.18%	49	52.27%	44
English 12	34.78%	230	35.90%	234
English 12 AP	1.18%	85	6.67%	45

TABLE 4. Highest English Completed (B-) And Remedial Placement

Course	District 1 Remedial	N	District 2 Remedial	N
English 11	49.06%	53	40.48%	42
English 12	29.71%	175	11.84%	152
English 12 AP	1.21%	83	4.76%	42

These findings raise some concern with the English preparation of high school students. However, a prior study of the COMPASS English test at the college found a weak correlation between test scores and subsequent success in College Writing, so interpretation of this finding must be made with caution (Institutional Research, 1997).

Concern with the math preparation of high school students was much greater. The present study confirmed findings from previous research on one local school district showing that students often needed to repeat in college the same level of math they took in high school or a lower level of math. For example, about 90 percent of students who earned a C- or higher in Algebra 2, Intermediate Algebra, and Geometry in both districts needed to repeat Intermediate Algebra (Math 1010) or take a remedial math course at the college (Table 5). These results were the same as those found in the prior study (also 90 percent).

A similar result is obtained when using a B- as the criteria for successful completion (Table 6). When using a B-, remedial placement rates declined; but, the results still showed that most students had to repeat math courses or take a lower level of math than they took in high school. Students had to take Calculus in high school to substantially reduce their remedial placement rate in college.

TABLE 5. Highest Math Completed (C-) And Remedial Placement

Course	District 1			District 2		
	Remedial	Math 1010	N	Remedial	Math 1010	N
Algebra 1	83.17%	5.94%	101	--	--	--
Algebra 2	64.00%	26.00%	50	86.67%	6.67%	30
Algebra 2 Geometry	56.72%	32.84%	67	75.36%	11.59%	69
College Algebra	--	--	--	48.48%	33.33%	33
Trigonometry	42.86%	35.71%	56	--	--	--
College Algebra/Trig	24.32%	43.24%	37	30.58%	42.15%	12
Pre Calculus	18.61%	30.23%	43	--	--	--
Calculus	1.66%	25.00%	60	9.38%	18.75%	64

TABLE 6. Highest Math Completed (B-) And Remedial Placement

Course	District 1			District 2		
	Remedial	Math 1010	N	Remedial	Math 1010	N
Algebra 1	77.97%	20.34%	59	--	--	--
Algebra 2	42.86%	29.55%	42	--	--	--
Algebra 2 Geometry	40.91%	36.36%	44	56.52%	26.09%	46
Trigonometry	40.43%	31.92%	47	--	--	--
College Algebra/Trig	--	--	--	25.96%	45.19%	104
Pre Calculus	18.42%	34.21%	38	--	--	--
Calculus	1.70%	23.73%	59	8.93%	14.29%	56

A prior study at UVSC confirmed that the math test was a good predictor of student performance in college math courses (Institutional Research, 1997). Students

took the test to help academic advisors assist them in determining which math course to enroll in on campus. The large majority of students followed the recommendations. Students who failed to follow the placement recommendations and bypassed two levels of math on average earned a C- in the course and frequently failed. Those who bypassed one level of math on average earned a C+ in the course, which did not adequately prepare them for more advanced math courses. In contrast, students following the recommendations on average earned B grades in math courses. The college has now made the math placement recommendations mandatory.

Students may need to repeat math courses taken in high school later in college for several possible reasons. There may be a problem with grade inflation in the high schools, or teachers may fail to cover the requisite math concepts. Students may not retain the material when taking the college assessment. Many students may need repeated exposure to difficult math concepts to learn the material. In other words, repetition may be a normal aspect of learning required to master the material.

Other practices observed in the high schools may contribute to high remediation rates in college. In the prior study, transcript data showed that students were given the option to complete modules at learning centers so that they could get the credit needed for graduation. Students sometimes successfully completed up to two years of math during their senior year using the modules, which was often basic or vocational math. These students frequently earned failing grades in math during prior years.

Educators also informed one of the researchers that parents called in and successfully obtained grade changes. Parents complained to school officials when their children received low grades in courses. In one district, a teacher reported that he could

not fail students in his class because of school practices. He had students who would attend his class and fail to complete assignments, yet he still passed them.

Student motivation on the assessment could be one explanation for the results. Some students may not give the exams their best effort. However, this would not be the norm at UVSC because most students who did not follow the placement recommendations experienced academic difficulty in college math courses. Students also had an interest in knowing what math course they should take on campus. They received credit for college math courses when their scores were high enough on the exams. In addition, evaluation of the ACT test scores confirmed the same findings. Students generally would be motivated to perform on the ACT test because it is used for college admission.

Predicting Remedial Placement

There are several factors other than the level of math or English taken in high school that may impact remedial placement in college. The relationship between level of preparation in high school, grades in math and English courses, gender, ethnicity, delayed entry into college, attendance at different high schools, and remedial placement were examined using logistic regression (Tables 7 and 8). Logistic regression was used because the dependent variable was an indicator variable (1= remedial, 0=non-remedial). Students of color were coded with an indicator variable (1=minority, 0=Caucasian). Females were also coded with a “1”, and males were coded as “0”. Students who took the COMPASS test a year or longer after their high school graduation date were also categorized using indicator variables and identified as delaying their entry to college.

The student's grade point average in the course (1.7 or higher) was also included in the regression analysis.

Several indicator variables were used to identify various levels of English and math preparation. The remedial placement rates of students who completed less than 12th grade English in high school, and those completing 12th grade Advanced Placement English were compared with students who completed regular 12th grade English in high school. The remedial placement rates of students who completed less than Algebra 2 in high school, and those completing College Algebra/Trigonometry, Pre Calculus, and Calculus were compared with students completing Algebra 2 in high school.

Regression analysis was used for each school district with similar results. The model chi-square tests indicated that the coefficients of all the terms included in the models were not zero. The logistic regression models for math fit the data better than the models did for English. For District 1, 79 percent of the students who did not need remedial math were correctly classified, and 83 percent of the students who needed remedial math were correctly classified. Another 87 percent of students who did not need remedial English were correctly classified, but only 47 percent of the students needing remedial English were correctly classified.

For District 2, 84 percent of the students who did not need remedial math were correctly classified, and 77 percent of the students who needed remedial math were correctly classified. Another 95 percent of students who did not need remedial English were correctly classified, but only 30 percent of the students needing remedial English were correctly classified. In other words, the models predicted placement in remedial math well, but there was difficulty in predicting students who needed remedial English.

This may in part reflect the more subjective nature of grading for English courses and possibly the difficulty in designing standardized tests that measure writing ability.

The regression coefficients (B) and partial correlations (R) are presented in the tables. The Wald statistic is used to test whether the coefficients were significantly different from zero. The partial correlation gives an indication of the strength of relationship between each independent variable and remedial placement.

The analysis confirmed that the level of high school preparation and grades were significantly related to placement in remedial education. Students who completed less than 12th grade English were more likely to be placed in remedial English, and those completing advanced placement English were less likely to need remedial English. Taking advanced placement English was not statistically significant for District 2; however, a larger sample may have resulted in a significant finding. Students earning higher grades were more likely to be prepared for college level English. Grades and level of English taken had the largest partial correlations, indicating that these factors had a stronger relationship or greater effect on remedial placement, as expected.

Delayed entry to college was not significant. The students included in the study graduated or attended high school in the last three years, and most attended the next fall or spring after graduation. If more students who had delayed their education over longer periods of time were included in the study, delayed entry to college might be significant.

There were no differences among the high schools in English remedial placement rates. Sex and ethnicity were not significant.

TABLE 7. Factors Predicting English Remedial Placement

Variables	District 1 N=402		District 2 N=277	
	B	R	B	R
Students of Color	.8410	.0490	-1.2515	.0000
Female	.0050	.0000	.0994	.0000
Delayed Entry	.3238	.0000	-5.1221	.0000
High School B	.0268	.0000	.0547	.0000
High School C	--	--	.5660	.0000
English GPA in Highest Course	-.7619**	-.1587	-.7638*	-.1269
Less Than 12 th Grade English	.6907*	.0883	1.8046**	.2861
Advanced Placement English	-3.3907**	-.1337	-1.1725	-.0268
Constant	1.6815**	--	1.6080	

* $p < .05$ ** $p < .01$

The level of math preparation and grades were also significant predictors of placement in remedial math. The variables with the largest partial correlations were grades and level of math taken. Students who did not complete Intermediate Algebra were almost always placed in remedial math in college. Students completing College Algebra/Trigonometry, Pre Calculus, and Calculus were less likely to be placed in remedial education.

Although taking higher levels of math reduced remedial math placement rates, over half the students taking Algebra 2, Intermediate Algebra, in high school were placed into remedial math at the college. Students had to take Calculus in high school to substantially reduce their remedial math placement rate. However, 25 percent of Calculus students from District 1, and 19 percent of Calculus students from District 2 still tested into Intermediate Algebra (Math 1010) at UVSC. This course is considered remedial at other institutions.

Students earning better grades in their highest math course were less likely to be placed into remedial math classes. Delayed entry, and ethnicity were not significant. Females were more likely to test into remedial math in District 1, but not in District 2.

Table 8. Factors Predicting Math Remedial Placement

Variable	District 1 N=478		District 2 N=361	
	B	R	B	R
Students of Color	.0595	.0000	2.4074	.0523
Female	.7725**	.0999	.3637	.0000
Delayed Entry	.7548	.0000	6.4036	.0000
High School B	-.5390	-.0449	1.8051**	.1898
High School C	--	--	2.1291**	.2142
Math GPA in Highest Course	-.5194**	-.0963	-1.3006**	-.2303
Less Than Algebra 2	2.1685**	.2166	.9123	.0251
College Algebra/Trig	-.9758**	-.1131	-2.1446**	-.2405
Pre Calculus	-1.7625**	-.1399	--	--
Calculus	-4.3380**	-.1546	-3.5495**	-.2720
Constant	1.6300**	--	1.5367	

* $p < .05$ ** $p < .01$

The high school that students attended in District 1 did not make a significant difference in remedial math placement, but there was a significant difference in remedial placement rates among the high schools in District 2. One of the high schools in District 2 had substantially lower remedial placement rates for students taking College Algebra/Trigonometry (14 percent) compared with the other two schools (40 and 36 percent). The math department chair at the high school said that they maintained high expectations for their students. The liaison at the Center for High School Studies at UVSC also believed that the instructors at the high school were more demanding of students than other teachers in the district.

The results partially confirmed findings in a previous study on a third district that found substantial differences in remedial placement rates among high schools (Institutional Research, 1998). However, in the prior study 8th grade math test scores were available which provided additional information. The prior study showed that students in a specific high school were entering Algebra 2 better prepared than students in the same courses at other high schools. Students with higher 8th grade test scores were less likely to subsequently need remedial education. In other words, the differences in the remedial placement rates among the high schools was explained by a student's math preparation in junior high school. This could not be assessed in the present study because the districts did not have 8th grade testing data available for the cohorts.

High schools in the local districts varied in the pre-requisites required for entry into math courses. For example a C, B-, B, B+, or A grades were required for entry into the same courses across schools. A few schools did not specify grades needed in prior courses. In some schools, counselor approval, teacher recommendations, or approval from the department head were specified as prerequisites. There may also be differences between high schools in the extent to which pre-requisites are followed. If students are better prepared when entering the courses, they will be able to learn the material better than less prepared students.

IMPLICATIONS FOR PRACTICE

The increasing need for remedial education by students at colleges and universities has created a heightened national concern with the preparation of high school students. The present study also raises questions about the preparation of students, particularly in mathematics.

However, simply increasing graduation standards and establishing a testing program may not be sufficient to resolve the remedial education dilemma. The study provides evidence that there may be a fundamental problem with the current educational environment in our secondary schools. There appears to be a lack of individual accountability for learning in some cases, and such a heightened concern to help every student succeed that the integrity of the system may be compromised.

Students may realize that teachers are unlikely to give them a failing grade because of various pressures. The school may send messages to teachers telling them that they should not fail students. Parents also exert pressures on teachers to increase grades when students are given low marks. Legislators may threaten funding for students who receive failing grades. In extreme situations, students may fail to complete their assignments, perform poorly on tests, merely show up to class, and still receive passing grades.

Students may complete two years worth of math modules in their senior year in an effort to give them a diploma. These are often basic math courses. Since this policy choice has been accepted by the educational system, the integrity of the system may be safeguarded by awarding differentiated high school diplomas--giving some students credit for demonstrating competence in college preparatory courses.

Simply establishing a set number of years for English and math will not necessarily reduce the need for remedial education. Many students will take several years of courses that do not give them the requisite preparation. Setting a certain level of preparation is also difficult, when the curriculum and grades in college preparatory

courses have been compromised so that successful completion of the course does not demonstrate competency in the subject.

What needs more attention is the standards that teachers incorporate into their classrooms. Lax standards may create student attitudes, behaviors, and expectations for performance that lead to failure in the college environment. There is a need to review pre-requisites that schools use to admit students into English and math courses. Students who are underprepared for courses should be re-directed into courses appropriate to their skill level. Teachers need administrative support when they give low grades to students who do not demonstrate an understanding of the subject matter. Schools should not be penalized through state funding mechanisms for giving students failing grades.

Test scores should be used with discretion. Simple comparisons across districts, without regard to the preparation that led to the particular score may give schools a false sense of accomplishment, especially if the curriculum in general is not adequately preparing students across the nation. A school may look like it is doing a good job relative to other schools when the large majority of schools need improvement.

These issues underscore the importance of validating placement tests and cut scores used by educational institutions. This is even more problematic for tests that assess writing skills because of the difficulty in accurately measuring writing ability. Using standards based on invalid test instruments raises cynicism and further weakens the ability of educators to maintain educational standards.

Colleges and universities have a responsibility to maintain appropriate admission standards. The admissions process at open institutions, that give underprepared students a second chance at a college education, should be structured to ensure that students are

prepared for college level course work. Early completion of remedial course work should be obligatory. Requiring students, who could have completed preparatory courses in high school, to pay the full cost of their remedial education should be considered.

Perhaps the study findings reflect a normal pattern of student learning. In high school, students may gain an initial exposure to math concepts. To fully master and retain the math skills, most students may need repetition again at the college level. Most students may not be cognitively ready to learn difficult college level math concepts in high school. High schools students may need four years of math with a lot of repetition, in addition to four years of English. However, the concern lies in giving underprepared students credit or certification that they are ready for college level work.

A greater focus on the process of teaching and learning in the classroom needs to take place. There must be an understanding among schools at all educational levels of what constitutes competence. This includes communication between faculty at the college level and teachers in the secondary schools.

The present study supports the need for collaborative efforts between institutions of higher education and secondary education to improve the preparation of students. Faculty at colleges and universities may be able to assist instructors in the process of improving the English and math curriculum in the local schools. A focus on expository writing, and college preparatory math is needed. Intervention may be more effective in the middle schools before students enter high school. However, the effectiveness of these efforts will have less of an impact if educational standards in the classroom are not maintained.

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Appendix A: Tables

TABLE 9. Highest English Course Successfully Completed In High School
(All High School Students)

Course	District 1		District 2	
	Percent	N	Percent	N
Incomplete	6.97%	175	4.22%	53
Basic English	3.79%	95	4.06%	51
English 9	3.03%	76	4.94%	62
English 9 Honors	.16%	4	.32%	4
English 10	5.26%	132	6.93%	87
English 10 Honors	.16%	4	.48%	6
English 10-12	.20%	5	--	--
English 11	10.04%	252	17.91%	225
English 11 Honors	1.91%	48	3.98%	50
English 11-12	4.03%	101	.72%	9
English 11-12 Honors	.88%	22	--	--
English 12	41.33%	1,037	44.59%	560
English 12 Honors	1.71%	43	--	--
English 12 AP	16.54%	415	10.03%	126
College Writing	2.43%	61	--	--
English (Unknown)	1.55%	39	1.83%	23
Total	100.0%	2,509	100%	1,256

TABLE 10. Highest Math Course Successfully Completed In High School
(All High School Students)

Course	District 1		District 2	
	Percent	N	Percent	N
Incomplete	12.00%	301	8.84%	111
Basic Math	8.89%	223	6.85%	86
Applied Math	.28%	7	1.35%	17
Geometry	1.99%	50	2.79%	35
Algebra 1	16.62%	417	12.82%	161
Algebra 1 Geometry	3.95%	99	8.28%	104
Algebra 2	11.24%	282	7.40%	93
Algebra 2 Geometry	9.33%	234	13.85%	174
College Algebra	.12%	3	6.85%	86
Trigonometry	7.05%	177	1.91%	24
College Algebra/Trig	8.29%	208	19.35%	243
Pre Calculus	5.58%	140	--	--
Calculus	14.67%	368	9.71%	122
Total	100%	2,509	100%	1,256

TABLE 11. Highest English Course Successfully Completed
(UVSC Students)

Course	District 1		District 2	
	Percent	N	Percent	N
Incomplete	1.64%	8	.54%	2
Basic English	1.43%	7	--	--
English 9	1.43%	7	1.34%	5
English 9 Honors	.20%	1	.27%	1
English 10	4.50%	22	2.69%	10
English 10 Honors	.20%	1	.81%	3
English 11	10.02%	49	11.83%	44
English 11 Honors	1.43%	7	6.45%	24
English 11-12	3.07%	15	.81%	3
English 11-12 Honors	.61%	3	--	--
English 12	54.60%	267	62.90%	234
English 12 Honors	.41%	2	--	--
English 12 AP	17.59%	86	12.10%	45
English (Unknown)	.82%	4	.27%	1
College Writing	2.04%	10	--	--
Total	100%	489	100%	372

TABLE 12. Highest Math Course Successfully Completed
(UVSC Students)

Course	District 1		District 2	
	Percent	N	Percent	N
Incomplete	3.93%	20	2.91%	11
Basic Math	4.91%	25	.79%	3
Applied Math	--	--	.26%	1
Geometry	3.73%	19	1.06%	4
Algebra 1	18.07%	92	4.23%	16
Algebra 1 Geometry	5.70%	29	5.03%	19
Algebra 2	10.22%	52	7.94%	30
Algebra 2 Geometry	13.75%	70	18.25%	69
College Algebra	.20%	1	8.73%	33
Trigonometry	11.20%	57	1.85%	7
College Algebra/Trig	7.47%	38	32.01%	121
Pre Calculus	8.84%	45	--	--
Calculus	11.99%	61	16.93%	64
Total	100%	509	100%	378