



K-12 Professional Development

Minority Student Success: The Role of Teachers in Advanced Placement Courses

Nancy W. Burton
Nancy Burgess Whitman
Mario Yepes-Baraya
Frederick Cline
R. Myung-in Kim

Draft Final Report

connect to college success™
www.collegeboard.com

The College Board: Connecting Students to College Success

The College Board is a not-for-profit membership association whose mission is to connect students to college success and opportunity. Founded in 1900, the association is composed of more than 4,700 schools, colleges, universities, and other educational organizations. Each year, the College Board serves over three and a half million students and their parents, 23,000 high schools, and 3,500 colleges through major programs and services in college admissions, guidance, assessment, financial aid, enrollment, and teaching and learning. Among its best-known programs are the SAT®, the PSAT/NMSQT®, and the Advanced Placement Program® (AP®). The College Board is committed to the principles of excellence and equity, and that commitment is embodied in all of its programs, services, activities, and concerns.

Permission to Reprint Statement

The College Board intends this publication for noncommercial use by teachers for course and exam preparation; permission for any other use must be sought from the College Board. Teachers may reproduce this publication, in whole or in part, **in limited print quantities for noncommercial, face-to-face teaching purposes** and distribute up to 50 print copies from a teacher to a class of middle or high school students, with each student receiving no more than one copy.

This permission does not apply to any third-party copyrights contained within this publication.

When educators reproduce this publication for noncommercial, face-to-face teaching purposes, the following source line must be included:

Minority Student Success: The Role of Teachers in Advanced Placement Courses.
Copyright © 2002 by the College Entrance Examination Board. Reprinted with permission.
All rights reserved. www.collegeboard.com. This material may not be mass distributed, electronically or otherwise. This publication and any copies made from it may not be resold.

No party may share this copyrighted material electronically—by fax, Web site, CD-ROM, disk, e-mail, electronic discussion group, or any other electronic means not stated here. In some cases—such as online courses or online workshops—the College Board *may* grant permission for electronic dissemination of its copyrighted materials. All intended uses not defined within ***noncommercial, face-to-face teaching purposes*** (including distribution exceeding 50 copies) must be reviewed and approved; in these cases, a license agreement must be received and signed by the requestor and copyright owners prior to the use of copyrighted material. Depending on the nature of the request, a licensing fee may be applied. Please use the required form accessible online. The form may be found at: www.collegeboard.com/inquiry/cbpermit.html.

Equity Policy Statement

The College Board and the Advanced Placement Program encourage teachers, AP Coordinators, and school administrators to make equitable access a guiding principle for their AP programs. The College Board is committed to the principle that all students deserve an opportunity to participate in rigorous and academically challenging courses and programs. All students who are willing to accept the challenge of a rigorous academic curriculum should be considered for admission to AP courses. The Board encourages the elimination of barriers that restrict access to AP courses for students from ethnic, racial, and socioeconomic groups that have been traditionally underrepresented in the AP Program. Schools should make every effort to ensure that their AP classes reflect the diversity of their student population.

For more information about equity and access in principle and practice, please send an email to apequity@collegeboard.org.

Copyright © 2002 by College Entrance Examination Board. All rights reserved. College Board, AP Central, APCD, Advanced Placement Program, AP, AP Vertical Teams, Pre-AP, SAT, and the acorn logo are registered trademarks of the College Entrance Examination Board. Admitted Class Evaluation Service, CollegeEd, Connect to college success, MyRoad, SAT Professional Development, SAT Readiness Program, and Setting the Cornerstones are trademarks owned by the College Entrance Examination Board. PSAT/NMSQT is a trademark of the College Entrance Examination Board and National Merit Scholarship Corporation. Other products and services may be trademarks of their respective owners. Visit College Board on the Web: www.collegeboard.com.

For further information, visit <http://apcentral.collegeboard.com>.

Minority Student Success
The Role of Teachers in Advanced Placement Courses

Nancy W. Burton
Nancy Burgess Whitman
Mario Yepes-Baraya
Frederick Cline
R. Myung-in Kim

January 2002

Draft final report prepared for the Advanced Placement Research Committee

Many people have helped in the preparation of this Report. Wade Curry, who was the Executive Director of the College Board Advanced Placement Program when this research was funded, provided inspiration, continuing support, a rich understanding of and unparalleled knowledge of Advanced Placement, wise advice, and careful review of plans, questionnaires, analyses, and report drafts. Rick Morgan, who was the statistical coordinator for the Advanced Placement Program during most of this project, provided pithy advice, detailed information, and the data we needed. Paula Herron, a member of the research team, and also a full-time Advanced Placement staff member in the College Board Midwest region, was our closest link with AP teachers and AP students, and kept both the talents and the needs of minority students always clearly before us. Barbara Bruschi, Gwyneth Boodoo, and Dwanli Yan, who were originally part of the research team, struggled through all the difficulties of creating the sample of schools, the data collection instruments, and collecting the questionnaire and roster data from schools and teachers. Finally, we thank Ming-mei Wang for her statistical expertise and her realistic practicality in re-conceptualizing and guiding the analysis of the data we were able to collect.

Abstract

This project described the characteristics and teaching behaviors of those successful teaching AP Calculus AB and English Literature and Composition to underrepresented minority students. Its purpose was to assist educators in improving the participation and performance of underrepresented minority students in AP. Study results showed successful teachers of minority students were good teachers for all groups. They expressed a high opinion of students, both majority and minority, and held them to high standards. They made sure that students understood and could apply the fundamental concepts in the discipline. They also helped students and parents understand and feel comfortable about college.

Key Words

Advanced Placement

Effective teaching

Teaching minority students

African American students

Hispanic students

Academic standards

Minority Student Success: The Role of Teachers in Advanced Placement Courses

Background and Rationale

Advanced Placement is a program with high academic standards that introduces students to a college curriculum and allows them to earn college level credit while still in high school. It improves students' skills for succeeding in college and confidence in their ability to succeed. Such experiences are valuable to any student planning to attend college, but are of even more importance to students without family experience of college attendance, without "a book culture" at home, among peer groups who do not consider education a promising option for the future, or in schools not emphasizing college preparation.

Students in minority groups traditionally underrepresented in college frequently experience one or more of these barriers to college education. Minority students who are not educationally or economically disadvantaged may encounter stereotyped expectations and treatment, which are themselves barriers. Advanced Placement offers the chance for some students to overcome barriers to college education. The chance is not appropriate for all students, since Advanced Placement courses are challenging even for well-prepared students. The chance is also not equally available to all students, since roughly half of all high schools offer no AP courses. This study explored some of the characteristics and practices of AP teachers effective with minority students with the long term goal of opening the AP opportunity to more underrepresented minority students.

Palmaffy (1999) states that "the ultimate measure of teacher quality, of course, is the achievement of their students and the value that a teacher adds," but acknowledges that family and school contexts also influence student learning. The importance of quality teaching is shown by research studies that relate teacher characteristics to measures of student achievement (Greenwald, Hedges, & Laine, 1996; Wenglinsky, 2000). It is also demonstrated in surveys of educators' opinions (Clewell, Anderson, Bruschi, Joy, & Meltzer, 1994.)

What teachers know and can do is important. Haycock (1998), reporting research conducted in several states where data systems have made it possible to tie teachers to student achievement, found that students with the best prepared teachers made the greatest gains in standardized assessments. Wright, Horn, & Sanders (1997) found that teacher test scores are strongly related to improvements in student test scores over the course of a year. Specific kinds of teacher knowledge were found to be important in several studies: Students learn more from teachers with good basic skills test scores (Ferguson, 1991); teachers with high verbal skills (Ballou & Podgursky, 1997; Ehrenberg & Brewer, 1995); and teachers who have a major or minor in the field they teach (Fetler, 1999; Goldhaber & Brewer, 1999; Monk, 1994; Wenglinsky, 2000). Various studies found that students in low-income communities receive less instruction than their middle-class peers and are more likely to be taught by unqualified or under-qualified teachers (National Commission on Teaching and America's Future, 1997; Oakes, 1990; Silver, 1998).

Professional development activities are the principal way of improving existing teachers' subject area and professional knowledge, and recent research has established a connection between teacher professional development and student achievement. Wenglinski (2000), analyzing National Assessment of Educational Progress data for eighth graders in science and mathematics, found that mathematics teachers who had participated in professional development in teaching diverse students and in higher-order thinking skills had substantially higher achieving students. In science, student achievement was positively related to teachers' professional development in laboratory skills and negatively related to teachers' professional development in classroom management.

A few studies highlighted the effects of classroom teaching practices on student achievement. Wenglinsky (2000) showed that eighth-grade mathematics teachers who used hands-on learning and emphasized higher-order thinking skills in instruction had substantially higher-achieving students. The same study showed that a national sample of eighth-grade science students benefited from teachers who use hands-on learning experiences. Confirming these results for math and science, an analysis of the National Educational Longitudinal Study (National Center for Education Statistics, 1996) also found instruction in higher-order thinking important to mathematics achievement but not science achievement. Wenglinsky also showed that

mathematics and science teachers who use tests to assess student progress have more successful students.

Duchsl & Gitomer (1997) recommended a standards-based, rigorous, and well-articulated curriculum, high performance expectations for all students, and teachers proficient in content and in pedagogy to provide a good education for all students. A number of studies (Angelo, 1996; Barnes, 1981; Brophy, 1979; Brophy & Everston, 1976; Education Trust, 1998; Joyce, Showers, & Rolheiser-Bennett, 1987) point to the importance of teaching to high standards as a cornerstone of effective teaching.

Emphasis on higher-order thinking skills is part of the standards movement. Standards in both language arts and mathematics emphasize critical reading and problem solving (National Council of Teachers of English [NCTE] & International Reading Association [IRA], 1996; National Council of Teachers of Mathematics [NCTM], 1989). The NCTE/IRA standards state that “[s]tudents’ critical skills are nurtured in classrooms where questioning, brainstorming, hypothesizing, reflecting, and imaging are encouraged and rewarded” (p. 21). The NCTM standards suggest that rote memorization and practice on lower-level computational skills be replaced with open-ended problems that put emphasis on conceptual understanding through the making and testing of hypotheses and the communication of ideas. Concern about the critical thinking skills of American students has been reflected in a number of commission reports and policy statements (Bennett, 1988; Marzano, Brandt, Hughes, Jones, Presseisen, Rankin, & Sahor, 1988; National Commission on Excellence in Education, 1983; National Governors’ Association, 1986; Reich, 1989). Large-scale studies such as the National Assessment of Educational Progress (NAEP) and the Third International Mathematics and Science Study (TIMSS) document that most American school children can perform tasks that require routine basic skills, but few can perform tasks that require complex higher-order skills (National Assessment of Educational Progress, 1985, 1991, 1996; Silver, 1998). Although the lack of science and mathematics preparation is more evident among American students enrolled in regular courses in these subjects, those students enrolled in honors and Advance Placement mathematics and physical science courses were also found to perform below expectations in TIMSS (Juillerat,

Dubowsky, Ridenour, McIntosh, & Caprio, 1997; National Center for Education Statistics, 1998; Center for Science, Mathematics, and Engineering Education, 1999).

A number of authors advocate specific classroom practices that seem likely to be especially effective with minority students. Darling-Hammond (1998) suggests that teachers need training in inquiry to help them consider multiple perspectives and to use this knowledge to reach all students, particularly those with diverse backgrounds. Teachers need to understand subject matter deeply and flexibly so they can help students build on what they already know (Darling-Hammond, 1998; Haycock, 1998). Teachers need to see the connections across fields and to everyday life in order to relate instruction to students' interests (Darling-Hammond, 1998; Joyce, Showers, & Rolheiser-Bennett, 1987). Raffini (1993) emphasizes finding ways to connect subject matter to students' lives, providing a human touch by including humor, personal experience, and anecdotes, and delivering information with enthusiasm. Gondor (1991) suggests course planning and assessment activities to match the students' learning styles. Several studies (Christie & Sabers, 1989; Signer, 1992) suggest that classroom technology such as computer-assisted testing and instruction can increase students' motivation, self-confidence, and self-discipline, and promote student-student and student-teacher interaction.

McCall (1999) provides an excellent review of research and writings on motivational strategies to use with underachieving students. In defining underachieving students, McCall makes reference to issues confronting many of today's underrepresented minority high school students, including drugs, gangs, crime, teen pregnancy, illiteracy, racial prejudice, poverty, and broken homes. Underachieving students, according to McCall, are generally lacking or concealing motivation to be academically successful. Although underachieving students can be of any race or class, many are from minority groups and/or lower income families. Many also are raised in households in which the parents have not been to college or perhaps not even to high school. Thus, instead of emphasizing the value of education, these parents might encourage their children to get a job and help support the family. To counter this lack of parental involvement in their education, underachieving students frequently need the intervention of a concerned educator to establish academic goals. McCall (1999, p. 422) quotes Jaime Escalante, the famous AP Calculus teacher, to make the point: "Yes, the barriers disadvantaged or minority students

face are substantial, but it is the very possibility of their remaining trapped by them for an entire lifetime which requires that such students be urged to succeed in their academic studies."

A review of successful programs indicates that the general strategies discussed above should be adapted by teachers both to their teaching styles and their students' learning styles. The Jaime Escalante math program for high school Advanced Placement calculus students (Escalante, 1990), for example, emphasized high expectations and hard work, a group spirit, strong parent support, and a very high degree of commitment on the part of the teacher and the students. Escalante also engaged in relentless recruiting to bring minority students (and their parents) into the AP class. The Kay Tolliver mathematics program for junior-high students (Tolliver, 1993) was also centered in a caring teacher who held high expectations. Tolliver blended history, culture, literature, writing, and other subjects with the study of mathematics. Student progress was monitored and communicated constantly, and assessment was performance-based. Like Escalante, Tolliver relied on parental involvement to the extent of developing lessons that require the attendance of the students' families.

Uri Treisman developed a calculus program for first-year calculus students at Berkeley (Treisman, 1992), just the other side of the college transition from Escalante. He found that the common assumptions about minority student academic problems did not hold, at least at Berkeley – African American and Hispanic students did *not* lack motivation, academic preparation, family support, or income. He developed a program based on peer group learning organized around selected problem sets.

Most visitors to the program thought that the heart of our project was group learning. They were impressed by the enthusiasm of the students But the real core was the problem sets which drove the group interaction.... [These were] mathematical tasks for the students that not only would help them to crystallize their emerging understanding of the calculus, but that also would show them the beauty of the subject (p. 368).

Trisman wanted to prepare minority students to major in mathematics and enter the future professorate. He found that one common hypothesis for the lack of minority math and science majors (that minority students lack higher-order thinking skills) was not supported. Rather, he believed that the curriculum has become "so compressed, so devoid of life and spirit, that there

was no way to really master the ideas at the level necessary to succeed, let alone become a major” (p. 370). He felt that potential math and science students get buried in a mass of formulas.

A program at the University of Maryland at College Park to encourage women and minority doctoral students in mathematics addressed the psychological barriers to graduate education in math and science (Kellogg, 2001). Brown & Clewell (1998) found that large, impersonal lectures, extremely demanding coursework and labs, and the fear of falling behind were barriers to minority students’ taking mathematics, science, and engineering classes. Both students and professors in the Maryland mathematics department agreed that a major reason for their success was the faculty’s ability to create an atmosphere of acceptance, support and inclusion in an otherwise competitive environment. An important benefit of success was that new minority and women prospects could see a group of peers they would feel comfortable with.

From the broader perspective of the professional development of teachers, Villegas (1992) has proposed five competencies for teachers who want to be effective with diverse students:

- to have an attitude of respect for cultural differences, a belief that all students are capable of learning, and a sense of efficacy
- to be familiar with the cultural resources their students bring to class, and aware of the culture of their own classrooms
- to implement an enriched curriculum for all students
- to build bridges between the content and the process of instruction and the cultural backgrounds of students in their classes
- to be aware of cultural differences when evaluating students

The preceding review of literature was used to identify topics that would be appropriate to a questionnaire study of school demographics and policies, and of teacher characteristics and behaviors. Some of the qualities discussed in the review of literature could not be measured via questionnaire. For example, most of the qualities emphasized by Villegas, above, would require classroom observations, in-depth interviews of teachers, and in-depth interviews of students. Other qualities, such as teachers’ academic major and minor, frequency and content of

professional development experiences, attitudes to students in general and minority students in particular, teaching practices, and AP curriculum emphases could be and were asked about.

Several existing teacher surveys were identified and reviewed for consideration in the development of the school and teacher questionnaires for this study. Instruments included the Pacesetter Mathematics Teacher Questionnaire, published in 1996; NAEP School Questionnaire and Teacher Questionnaire, published in 1996 and 1998; AP School Survey for the Study of Underrepresented Minority-Dominant High Schools with Effective AP Programs, developed in 1993; Schools and Staffing Survey developed for a National Center for Education Statistics, published in 1994; the American Federation of Teachers Teachers' View Survey published in 1997; and the U.S. Department of Education Office of Educational Research and Improvement Fast Response Survey System on Teacher Quality, published in 1999. An additional resource used was the *AP Course Description* books for AP Calculus AB and AP English Literature and Composition.

Design of the Study

Sample

Subject Areas. The Advanced Placement Program reports information about the examinations and the students who take them each year. We reviewed the examinations taken by underrepresented minority students, and discovered that those most frequently taken included AP Calculus AB, AP English Literature and Composition, and (for Hispanic students) AP Spanish Language. Since interpretation of performance on AP Spanish Language would be complicated by the birth language of the student, and since it was not a popular choice of African American students, we decided not to include that examination. The other two examinations included many of the minority students taking any AP examination, and were given in most schools offering AP examinations.

Schools. The Advanced Placement Program keeps information on the number of underrepresented minority students who take each of the AP examinations in each high school giving AP examinations. Approximately 400 schools¹ with the most underrepresented minority

¹ A total of 442 institutions were on the invitation list, but some of these were districts and therefore not eligible to participate.

students taking AP Calculus AB in 1998 were identified and invited to participate in the AP Calculus AB study. The number of AP Calculus AB examinations taken by underrepresented minority students in these high-minority schools ranged from 6 to 80 per school. The same was done for the 400 schools with the most minority students taking AP English Literature and Composition examinations. The number of AP English Literature and Composition examinations taken by underrepresented minority students ranged from 11 to 81 per school. There was some overlap among schools, so a total of 655 different schools were invited to participate either in the AP Calculus AB study, the AP English Literature and Composition study, or both. The data collection packages were sent to schools in March of 1999 and 200 of the invited schools returned school questionnaire data.

Table 1 describes the schools invited and those that participated. First, we will compare the distribution of all schools that give AP examinations to the subset of high minority schools invited to participate in this study. By dividing the percent in column two (“Invited”) by the percent in column one (“All AP Schools”), we can determine what kinds of schools are over- or underrepresented among the high minority AP schools targeted for this study. The results are nearly identical for Calculus and Literature. The second to last column in Table 1 averages the ratios for the two subjects. Categories with a ratio above 1.5 will be considered overrepresented; categories below .5 will be considered underrepresented.

Table 1 about here

Compared to the total population of over 9,000 schools giving AP Calculus AB or AP English Literature and Composition examinations, Table 1 shows that there are fewer high minority AP schools in the Midwestern and New England regions, more high minority AP schools in the Southern, Southwestern, and Western regions, and about average representation in the Middle Atlantic states. The high minority AP schools are three times as likely to be located in large cities (roughly 60 percent of the invited sample as compared to 20 percent of the total population of schools giving AP examinations). Towns and rural areas are underrepresented; medium cities and suburbs are proportionally represented. Among the high minority AP schools, “all other” schools, including non-religious independent schools, non-Catholic religious schools, charter

schools, and home schools, are underrepresented. Public schools and Catholic schools are proportionally represented. Finally, the high minority AP schools, averaging about 350 seniors, are larger than the total population of AP schools (averaging 217 seniors). Thus a typical high minority AP school is a large school in a large city in the South, Southwest, or West.

Next, we compare the *invited* schools to the *participating*² schools, to determine how well the study represents the desired population. For that comparison, the percent participating was divided by the percent invited. Again, results for the two subjects were very close, so the average ratio, given in the last column of the table, will be discussed. The 129 participating AP Calculus AB schools and the 101 participating AP English Literature and Composition schools appear to represent the total invited group well in their regional distribution, type of community, type of school control, and senior class size. There may be slight overrepresentation of schools in the Southwest (ratio = 1.28) and Catholic schools (ratio = 1.36), which is actually an advantage, since both categories have high numbers of Mexican American or Puerto Rican students, the most severely underrepresented minority group in the study. The two categories with low representation in the study – schools in the New England region, and schools that are neither public nor Catholic – are very small categories that can be expected to have very few minority students. In summary, the participating schools are roughly representative of the invited schools in region, location, and type of school. Their representation of other qualities of the invited schools is unknown. Given that fewer than one third of the invited schools participated, one should be cautious in generalizing the results to the original intended population.

Students. The student groups traditionally underrepresented in Advanced Placement classes include African American, American Indian and Alaskan Native, Mexican American, Puerto Rican, and at least some of the students in the “other Hispanic” group. The American Indian and Alaskan Native group, being less than 1 percent of the test-taking population (AP Program, 1998), was too small to include in the study and too unique to combine with other minority groups. We judged that the “other Hispanic” group is also too diverse, culturally, economically,

² Participating schools were defined as those who returned enough data to be analyzed: those with a school questionnaire, a teacher questionnaire, and student test scores and grades.

linguistically, and educationally to produce interpretable results. Finally, the Mexican American and Puerto Rican groups, which were also too small to study by themselves, were combined. They share a common language background, related histories of discrimination in the Anglo society, and a general similarity of distribution of economic advantage/disadvantage, although there are numerous cultural and historical differences. Thus the two target underrepresented minority groups included in the study were African American students and a combined group of Mexican American and Puerto Rican students. In order to be more certain that the teachers identified as successful with the target minority students reliably succeed year after year, we collected data on their AP students in the 1996-97, 1997-98, and 1998-99 school years.

We will refer to these groups as “minority students,” but that classification should be considered to actually include *underrepresented minority groups large enough to study*.

Tables 2 and 3 give numbers and percents of all the students included in this study, and of the subsets of students whose teachers were identified as more and less effective in teaching minority students. Numbers and percents are also given by gender and ethnic group. Percents for males and females are computed for each specific ethnic group. Percents for ethnic groups sum to approximately 100³ in each column. Table 2 documents the sample for AP Calculus AB students, and Table 3 for AP English Literature and Composition students.

Table 2 shows that 18 percent of the AP Calculus AB students included in the study were African American, 9 percent Mexican American/Puerto Rican, 35 percent White, and 38 percent “All Other.”⁴ In contrast, the principals reported that the overall senior classes in participating schools were 35 percent African American, 35 percent Hispanic, 23 percent White, and 7 percent other (see Table 8). Despite the fact that these ethnic/racial definitions are not quite comparable, it is clear that ethnic/racial group is related to AP enrollment. Both African American and Mexican American/Puerto Rican students enroll less than half as much as one would expect if

³ Percents may not sum to 100 because of nonresponse to the gender or ethnic questions.

⁴ The “All Other” category includes Asian American students, Other Hispanic (Cuban, Latino, and South American) students, American Indian students, students who identified themselves as “other,” and those who did not specify their race/ethnicity.

ethnic/racial group were unrelated to AP participation; White students enroll about one and a half times more than would be expected, and Asian American students enroll at an even higher rate.

Table 2 about here

Table 2 also shows the percentage of young women AP Calculus AB students participating in the study by ethnic group and overall. The national AP Program reports slightly fewer young women AP Calculus AB test takers than this study – 47 percent vs. 51 percent. Although the difference of four percentage points is hardly important, the reason for the difference is of interest. It is clearly because of the gender distribution for minority students. 64 percent of African American students, 53 percent of Mexican American/Puerto Rican students, and 50 percent of all other students in this study were young women. Only 45 percent of White students in the study were young women, comparable to 46 percent women among all White AP Calculus AB takers in the national Advanced Placement Program (1998).

The bottom panel of Table 2 divides the total number of students by the total number of teachers to arrive at an average number of students per teacher. This is not the same as class size, since we do not know how many AP classes each teacher takes. Overall, the AP Calculus AB teachers participating in this study had an average 60 AP Calculus AB students over the three years studied (an average of 20 AP students per year).

Table 3 shows the ethnic group and gender of all AP English Literature and Composition students participating in the study, and the students of teachers identified as more and less effective in teaching minority students. Approximately 6,600 students were included in the study: 22 percent were African American, 9 percent were Mexican American/Puerto Rican, 35 percent were White, and 33 percent were classified as “All Other.” This is basically the same distribution as for AP Calculus AB – slightly more African American students and slightly fewer other. As was the case for AP Calculus AB, African American and Mexican American/Puerto Rican students were underrepresented and White and other students were over-represented in AP compared to the overall population of participating schools.

Table 3 about here

The gender representation in this sample is similar to that of the total AP population in the subject. 63 percent of the participants were young women, comparable to the 64 percent reported by the Program for all AP English Literature and Composition examination takers (Advanced Placement Program, 1998). The percentage of young women study participants was somewhat higher for African American students (72 percent). The number of students per teacher was similar in AP English Literature and Composition (Table 3) and in AP Calculus AB (Table 2). Overall, AP English Literature and Composition teachers had an average of 22 Literature students per year over the three years included in the study.

Finally, we can ask how many students have more effective teachers⁵. Table 4 gives a brief summary of the pertinent numbers. It shows that the more effective teachers had many more students than the less effective teachers. Thus the more effective teachers of minority students have a chance to affect more students overall.

Table 4 about here

Are the more effective teachers also more likely to teach students in the target minority groups? This question is not quite so clearly answered. Table 4 shows that in total, the more effective teachers actually had *fewer* target minority students. Even though this finding did not hold up in all categories, overall both African American and Mexican American and Puerto Rican students in this study had less chance of having an AP teacher that was identified as effective in teaching students in their ethnic group than of having a teacher identified as less effective in teaching students in their ethnic group. Because the more effective teachers tended to have larger numbers of students, the target minority students were always a relatively small percentage of the students in their classes. For example, Calculus teachers who were identified as more successful in teaching African American students averaged 20 percent (482/2142) African American students in their AP classes, while the less successful teachers averaged 31 percent (382/1241). In brief, target minority students were somewhat more likely to have a teacher

⁵ The method of selecting more and less successful teachers will be described in detail later in this report.

identified as *less* successful with their group than a teacher identified as more successful. In addition, target minority students were quite likely to be a minority in successful teachers' classes.

Data

School questionnaire. Principals were asked about the general economic and educational background of students and parents in the school, and about school, district, and state policies and practices for AP. These data were collected to identify conditions that might affect the success of minority students but were beyond the AP teacher's control. These might include policies set by the principal or district (about student qualifications for taking AP, for example) that could cause differences in the level of preparation of AP students. Or the state or district or school could have a well-established AP Program with very strong preparation for pre-AP students, again causing differences among schools in the level of preparation of students enrolling in AP. The questionnaires also covered policies and practices for assigning teachers to teach AP classes. See Appendix A for a copy of the school questionnaire.

Teacher's questionnaires. The teacher's questionnaires repeated some of the same questions given on the school questionnaire, to get the teacher's perspective on the school policies and practices for AP and for the general educational and economic background of the students. In addition, questions were asked about the teacher's educational background and professional development, goals for AP, and practices in recruiting for and teaching the AP class. Finally, subject-specific questions about the AP curriculum were asked. The purpose was to identify characteristics and behaviors of teachers that might be related to success in teaching underrepresented minority students. See Appendix A for copies of the teacher questionnaires.

Student data. AP grades were extracted from ETS files. PSAT/NMSQT score files were also matched to AP score files. Because the Advanced Placement Program does not ask students to name their AP teachers, it was necessary to collect class lists from each AP teacher studied. This was also an opportunity to collect some information about students who took the AP class but did not take the AP examination. In order to judge the achievement of students who did not take the AP examination compared to those who did, we asked teachers to supply information for all

AP students about the teacher-assigned class grade and whether or not students enrolled in college (not available for 1999 test takers at the time the data were collected).

Focus Group Data. A total of 101 AP English Literature and Composition teachers and 129 AP Calculus AB teachers had sufficient data that we could compute their level of success with the target minority students. Because these numbers were somewhat smaller than originally anticipated, there were not enough teachers in any location except New York City to hold conventional focus groups. One focus group of AP English Literature and Composition teachers (N=9) and one group of AP Calculus AB teachers (N=3) were held in Manhattan in February, 2000. A national on-line focus group in a “bulletin board” format was also conducted. Teachers were invited to participate for three days in an e-mail exchange; 6 Calculus teachers and 1 Literature teacher participated. Each day, the facilitator would pose several questions and might pose some follow-up questions. Participants agreed to log on to the bulletin board at least once each day, and to respond to the questions posed by the facilitator and to the answers posted by other participants. They could also go back to other days’ discussions.

The purpose of all the focus groups was to obtain detailed information about recruiting, teaching, and personal interaction techniques that do and do not work with underrepresented minority students, and information about any differences among subgroups of students. The teachers also used the focus groups as a chance to discuss materials, teaching techniques, content, and common issues.

Data Analysis

The research team developed four measures of success for teachers – success in (1) enrolling or (2) teaching African American students, and success in (3) enrolling or (4) teaching Mexican American and Puerto Rican students. These four success measures attempted to take into account existing conditions not under the control of the AP teacher. For the success in enrolling measure, we controlled for the number of seniors attending the high school in the target minority group. For the success in teaching measure, we controlled for the initial PSAT/NMSQT verbal and mathematical reasoning skills of the target minority students. The statistical adjustments made the AP teachers more comparable before we determined their level of success.

Indicators of Success

Enrolling Minority Students

Before one can succeed in teaching minority students, the students must enroll in class. In general, the students who take AP do not represent the national population of minority students in their age group. There are only about one third as many African American and Hispanic students in AP as one would expect based on their frequency in the population ages 15 to 19 (each group is approximately 15 percent of the age cohort but only 5 percent of AP takers). On the other hand, Asian American students are represented at a higher rate in AP than in their age cohort. In AP Calculus AB, for example, Asian Americans are 15 percent of test takers as compared to 4 percent of the age cohort. (Figures for minority representation in AP are found in *Advanced Placement Program, 1998*; figures for the national cohort age 15-19 in *US Census, 2000*).

In the schools sampled for their high numbers of underrepresented minority students taking the AP test in Calculus AB or English Literature and Composition, we were successful in finding schools with a high proportion of African American and Hispanic students: on average, each group represents 35 percent of the student population in participating schools. Even in schools chosen for a high proportion of minority students taking AP, however, the proportion of minority students in AP does not reflect the proportion of minority students in the school. Table 5 shows that roughly 60 percent as many African American students and 30 percent as many Hispanic students participate in AP as one would expect based on their representation in the schools⁶.

Table 5 about here

Minority group teachers are also not in proportion to the student populations at the participating schools. For example, though African American students are 35 percent of the student population, 19 percent of all teachers and 11 percent of all AP teachers in the participating

⁶ The proportion was calculated by comparing the percent target minority in AP classes versus the percent in the total school population. Thus the 60% participation by African American students was computed by dividing the average percent African American students in the two AP subjects being studied [18 (percent in Calculus) + 22

schools are African American. Although our results show higher minority representation, the relative scarcity of minority teachers reflects national trends, which show that 36 percent of the nation's student population but only 13 percent of teachers are minorities (Dozier & Bertotti, 2000).

Not all of these schools and teachers make a special effort to recruit minority students for Advanced Placement. Table 6 shows that about half of the principals report making an effort to let minority students know about AP or to recruit minority students to take AP. Even fewer teachers – about 20 percent of AP Calculus AB teachers and 30 percent of Literature teachers – report making an effort to recruit students in the target minority groups.

Table 6 about here

Minority students who lack a family academic tradition, often in high schools with inadequate counseling, may be very late in discovering their academic talent. The thought of taking an AP course may not even enter their minds. AP teachers appear to be of critical importance in discovering and encouraging academically talented minority students. An earlier study of high minority schools with a high proportion of students earning a 3 or better on the AP examination (Coley and Casserly, 1992), asked students about important educational influences. 70 percent of the students mentioned an elementary school teacher and 75 percent mentioned a middle school or high school teacher. The next highest influences were mentioned by 26 percent or fewer of the students studied.

Because the teacher's influence is so important, the research team originally proposed to make simple minority student *presence* in AP, independent of their *performance* in AP, one of the indicators of teacher success. In the end, the research team decided not to include the results on success in enrolling minority students in this report because the results for those indicators were not interpretable. In addition, other data suggested that success in enrolling minority students did not appear to be a result of teacher behaviors. Focus group results showed that teachers do not

(percent in Literature)/2)] by 35 (the overall percent of African American students in the participating schools); the result (57%) was rounded to the nearest 10%.

consider recruiting to be their job. Questionnaire results agreed that teachers do little recruiting of minority students. Because we were unsuccessful in developing an indicator of success in attracting minority students to Advanced Placement classes, that aspect of the original study design was dropped.

Teaching AP to Minority Students

Probably the most important indicator of success for an AP teacher is the students' achievement in the subject area (Palmaffy, 1999). The Advanced Placement Program is well designed for determining student achievement, since it includes both an assessment professionally designed to assess the specific Advanced Placement curriculum and extensive teacher professional development keyed to the curriculum and the examination. Results of the examination alone are not enough, however, to determine teacher effectiveness. In the first place, not all students take the examination. Nationally, 60 percent of AP students took the examination in 1998 (Advanced Placement Program, 2000). Because less successful AP students are less likely to take the examination, average examination grades for a teacher can be expected to overestimate the whole class's achievement. Moreover, examination policies vary. Some states, districts, and schools pay for all students to take the examination; some base payment on student need; some have a policy that all students must take the examination; some leave the decision (and the payment) to students; others discourage students unlikely to attain a grade of 3 or better from taking the examination; some use examination results to evaluate the AP teacher (Curry, 2000a).

A second major difficulty in using AP examination grades as an indicator of teacher effectiveness is that students come into their AP classes with different levels of prior preparation. In some schools, AP is considered an elite program in which only the finest students participate. In these schools, some students might be able to earn a 3 on the AP examination before taking the class. In other schools, students are encouraged to stretch themselves by taking a college-level course even though they are very unlikely to earn a high enough examination grade to receive college credit. Principals and teachers were asked about policies and practices for the AP course and examination, and PSAT/NMSQT scores were gathered for participating students to use as a control for their general educational background prior to enrolling in AP. The following

sections describe the analysis of AP examination-taking policies and practices and the definition of success in teaching AP to underrepresented minority students.

AP examination policies and practices. The AP examination practices in the sampled schools are described in Table 7. Fewer than one principal in five reports encouraging students to take the AP examination based on their projected grade, and an even smaller proportion of teachers report that policy. Over half of principals and teachers report that all students take the AP examination. Two thirds of the principals report that the school, district, or state pays AP examination fees at least for low income students⁷; one third of principals report that AP examination fees are paid for all students. In addition, two thirds of the participating schools reported applying for and being charged reduced fees by the College Board for their low income students.

A look at the AP goals reported by principals and teachers (Table 7) shows that the least important goal for all groups participating in this study is that students earn a grade of 3 or higher on the AP examination. In contrast, a contemporary study of *new* AP teachers (Burton, Edelstein, Kindig, Bruschi, and Cline, in preparation) found that a passing grade on the AP examination was the highest priority for new AP Biology and U. S. History teachers and the third highest goal for new Calculus AB teachers. Teachers in the present study differed from them in two principal ways – they had a median of four years teaching AP, and they had a high proportion of minority students. For them, scoring well on the AP examination was an important goal, rated about four on a scale from one to five, but other goals were more important. To the more experienced teachers of minority students in the present study, the most important goals were that the students experience college-level work, build their confidence in the subject, and build their confidence of success in college. These goals are also of top importance to their principals. The principals added a fourth goal of equal importance, that of improving the students' chance of admission to college. This one goal was of less importance to teachers. In general, the principals and teachers share high aspirations for their AP classes, and were in agreement about the importance level and the rank order of their goals.

⁷ This finding implies that one third of the principals studied were unaware that under federal grants, *all* states pay the AP examination fees for *all* low-income students.

Table 7 about here

Despite the fact that half of the sampled schools reported that their practice is to have all students take the AP examination, the research team was concerned that minority students might be especially likely not to take the examination. This is because the average minority student is likely to be less wealthy than the average white student, and also to have less academic preparation for AP. For that reason, we collected rosters of all students who took the AP course in 1997, 1998, and 1999 from the AP teachers participating in this study. Table 8 reports the number and percent of students who took the AP examination in Calculus AB and English Literature and Composition. On the average, over 80 percent of all students reported to be enrolled in the participating classes took the AP examination – substantially higher than the 60 percent participation reported by the AP Program overall (Advanced Placement Program, 2000)⁸.

Table 8 about here

There are no patterns of differential ethnic group participation in the AP examination. Because such a high proportion of all students had AP examination grades, the research team decided not to analyze either teacher-assigned class grades or the report of college enrollment as alternate measures of achievement. Teacher grades are difficult to interpret since teachers' grading standards differ, and college enrollment was not a promising variable since virtually all AP students were reported as enrolled in college.

Using the PSAT/NMSQT to predict AP examination grades. Beside the possibility of differential participation in the AP examination, the major interpretive problem in the study was how to take into account differences in the level of prior preparation of students who take the AP course. Though an achievement pretest was not available for the students sampled in the study,

⁸ The research team was surprised that the proportion taking the AP examination was so high. This high rate may have several causes. A high proportion of participating schools do report that all of their students take the AP examination. In the West and in Texas, states help pay AP examination fees. Since many high minority schools are found in these locations, state policies may partly explain the observed exam participation rates. Furthermore, obtaining a high score on the AP examination is a relatively low priority among principals and teachers in these schools, making them more willing to encourage even marginal students to take the exam. However, the high proportion may also be in part due to missing data. That is, schools had to provide all information on students who did not take the examination. It is likely that at least some of the schools failed to provide that information.

it was known that a very large proportion of college-bound students take the Preliminary SAT (the PSAT/NMSQT) in October of their Junior year. The PSAT/NMSQT measures the overall educational background of students – the critical reading and problem-solving skills developed over time both in and out of school. Using PSAT/NMSQT scores to predict AP grades will allow a control on the student’s general educational background to be developed. By basing the prediction on target minority students from the target population of high-minority schools, we can be sure that the background controlled is relevant to the students in this study. Specifically, we analyzed the difference between a student’s AP examination grade as predicted by the PSAT/NMSQT and the actual AP examination grade; this computation essentially subtracts out differences in students’ prior educational backgrounds.

Students who took the AP examination in the spring of their senior year and the PSAT/NMSQT in the fall of their junior year were identified. This is the most common pattern for taking the examinations; this pattern also guaranteed that the PSAT/NMSQT score was earned prior to the AP class. (It is important to control only on the educational background of students before they take the course; one would not want to adjust away gains in reasoning skill obtained from AP instruction.) More than half of the AP test-takers in our sample had taken the PSAT/NMSQT and the AP in the required pattern⁹. Table 8 (above) shows the total sample of students included in the study by subject area and ethnic group, and the number and percent of these students who had the appropriate pattern of AP and PSAT/NMSQT scores. While there are some variations, there is little pattern of difference by subject area or ethnic group.

PSAT/NMSQT verbal and mathematical scores were used to predict AP grades. Separate multiple regression equations were developed for:

- African American students in AP Calculus AB
- Mexican American and Puerto Rican students in AP Calculus AB
- African American students in AP English Literature and Composition
- Mexican American and Puerto Rican students in AP English Literature and Composition

⁹ Camara and Millsap (1998) found PSAT scores for 70% of AP takers in a match of all test-takers (including sophomores, juniors and seniors) from 1993-94 and 1994-95 for both examinations. Approximately 700,000 students had scores on both examinations; this constitutes about 20% of all PSAT takers, but over 70% of all AP takers in the two years (College Board, 2000). Our 54-58% match rate was found for high-minority schools, and only included those students who took the PSAT/NMSQT as juniors and subsequently took AP as seniors.

Equations were computed separately by ethnic group and subject for all students in the invited schools in each of the three years. In addition, comparison equations were computed for all White and Asian American students. All students in the invited schools with the required pattern of PSAT/NMSQT and AP scores were used to compute the multiple regression equations so that the equations would represent the performance of the entire intended population as well as possible; the regression equations based on the total groups were then used to compute predicted AP scores for the participating sample. Table 9 displays numbers and correlations by subject, year, and ethnic group. Correlations with AP grades are given for the PSAT/NMSQT verbal measure alone, the PSAT/NMSQT mathematical measure alone, and for the combination of verbal and math.

Table 9 about here

Both AP subjects show similar patterns of correlations over years and ethnic groups. As would be expected, the verbal test is a better predictor of the AP English Literature and Composition examination grade and the mathematical test is a better predictor of the AP Calculus AB examination grade. In fact, the correlation for the combination of verbal and math is virtually equal to the correlation for the single best predictor. Overall, the AP English Literature and Composition grade is slightly better predicted (with correlations of approximately .7) than the AP Calculus AB grade (correlations between .5 and .6). These are all large correlations, but they fail to explain over half of the variation in AP examination grades. Controlling on PSAT/NMSQT scores will help make the students arriving in each class more comparable, but will leave plenty of room for other effects to be found.

The correlations observed in Table 9 are similar to those found by Camara and Millsap (1998) in their study of 700,000 students who took the PSAT/NMSQT in October 1993 or 1994, and one of 29 AP examinations in May 1994 or 1995. Camara and Millsap looked at other possible predictors of AP grades, including overall high school GPA, course grades in related subjects, and numbers of courses in related subjects. The PSAT/NMSQT score was by far the best predictor of AP grades, with an average correlation of .52 with AP; the next best correlation, for total high school grades, averaged .27 over 25 AP examinations. In multiple regression

equations combining the various predictors, both total grades and relevant course grades made very small (but statistically significant) independent contributions to prediction. The results in Table 10 were reported for our two target examinations.

Table 10 about here

These correlational results support the use made of PSAT/NMSQT scores in this study. The Camara & Millsap results show that the prediction of AP grades using the PSAT/NMSQT alone is nearly as good as the prediction including other relevant predictors (the correlation increased by .03 for AP Calculus AB and by .01 for AP English Literature and Composition when total grades and relevant course grades were added to the PSAT/NMSQT in the prediction equation). Therefore, our prediction based PSAT/NMSQT alone will provide nearly all of the adjustment for students' prior educational background possible from data on College Board testing files.

These evaluations encouraged the research team to use the difference between predicted and actual AP examination grades as one indicator of a successful teacher. For each teacher, two measures of success could be computed: their success with African American students and their success with the combined group of Mexican American and Puerto Rican students. We computed the difference between the actual and predicted AP examination grade for each teacher's students in each of the two target minority groups. A predicted AP grade can be interpreted as the average AP grade for all students with a given PSAT/NMSQT score. By our research definition, an effective AP teacher's students learn more than students with the same PSAT/NMSQT scores usually learn. Each success indicator was the average for the teacher's students in one of the two target minority groups. Teachers were ranked according to their average for each target minority group separately. The top one third of teachers were identified as potentially more successful in teaching that minority group; the bottom third were identified as potentially less successful in teaching that minority group.

These measures of success can be interpreted as follows. The top third of teachers had minority students who did better in AP than their PSAT/NMSQT scores predicted, the lower third of teachers had minority students who did worse than their PSAT/NMSQT scores predicted. Because we subtracted the predicted AP grade from the actual AP grade, we essentially

subtracted out the quality of students' academic backgrounds. A successful student could have been a poorly prepared student who got a low AP grade, so long as the AP grade was higher than one would have predicted from the PSAT/NMSQT. Equally, the successful student could have been a well prepared student who did even better on the AP examination. The minority students of teachers identified as possibly successful *did better than expected, regardless of their preparation when they entered the AP class.*

This indicator of success is by no means ideal. The PSAT/NMSQT is a general measure of educational background; academic preparation of specific benefit to the AP class will not be well measured by the PSAT/NMSQT. The students may have useful non-academic traits such as ambition or interest in the subject when they walk into the AP classroom as well. These will also not be well measured by PSAT/NMSQT scores. These pre-existing assets and deficits, because they will not be well reflected in PSAT/NMSQT scores, cannot be controlled and may be incorrectly ascribed to the AP teacher. Furthermore, the PSAT/NMSQT and AP examination grades were not available for all students and the students who did not have scores were probably different from those who did.

However, even though this indicator may not be a highly reliable guide for identifying *individual* teachers who are especially successful and unsuccessful in teaching AP to minority students, we believe that the group of teachers identified as more successful is likely to contain more than its fair share of successful teachers, and the group identified as less successful is likely to contain less than its fair share of successful teachers. Thus our descriptive analyses of these groups will contain useful information on the characteristics and teaching techniques of more successful AP teachers of minority students compared to less successful teachers.

The definition of success used in this study is only one of many possible definitions. For example, Camara and Millsap (1998), in their study of the usefulness of PSAT/NMSQT scores in predicting AP examination grades, created tables showing the proportion of students at various PSAT/NMSQT score levels who scored 3 or more on the AP examination. For the AP English Literature and Composition examination, they found that fewer than one in five AP students with

PSAT/NMSQT verbal scores below 40¹⁰ achieved an AP grade of three or higher. For the AP Calculus AB examination, the success rate was even lower: fewer than one student in ten with PSAT/NMSQT mathematical scores below 40 achieved an AP grade of three or higher.

These results have been interpreted to mean that students with moderate to low PSAT/NMSQT scores are unlikely to succeed in AP. It certainly demonstrates that students with low PSAT/NMSQT scores are unlikely to score high enough to receive college credit for their AP course. Our study defines success in AP somewhat differently than Camara and Millsap: we include students who learn a great deal in the AP course, whether or not they learn enough to earn college credit. Other possible definitions of success, not measured either in this study or in Camara and Millsap, might include improved confidence in their ability to do college-level work, increased likelihood of studying the AP subject in college, or improved college performance in the subject studied in AP. Any of these outcomes might also occur despite low initial PSAT/NMSQT scores.

Independence of Success Indices from the School Context

Before going on to the description of the characteristics and teaching techniques that distinguish successful teachers of minority students, we need to cover one more potential difficulty in interpretation. Ultimately, one would wish to evaluate the effectiveness of AP teachers, controlling for the contextual differences out of their control – supportive school climate or not, informed or distrustful parents, excellent pre-AP preparation or none, etc. We were not able to reach that goal in our study. The measures of success we defined attempt to account for the students' general educational background by controlling on PSAT/NMSQT scores, but the question still remains whether that control was sufficient. It is still possible that success could be related to contextual factors, either in the school or beyond, that the individual teacher could not control or overcome. In this section, we will review school-level information that may affect outcomes. Information about the school population of students and parents, the background and qualifications of its teachers, and its policies and practices, was provided by the school questionnaire designed for this study.

¹⁰ On the 20-80 PSAT/NMSQT scale, not recentered.

Questions from the school questionnaire were correlated with the success indicators¹¹. (See Appendix A for a copy of the school questionnaire.) Correlations between school characteristics and the teacher success indicators would suggest that the teachers alone may not be responsible for student achievement in AP. This, of course, is only common sense. If the school as a whole encourages minority student achievement, one would expect more minority students to take all AP courses. If the school prepares its students well for AP, one would expect better achievement for all students, minority or majority, in AP classes. Because this is an exploratory study, we did not base our analysis on statistical significance tests. Instead, we report on correlations of .2 or above, which may be of practical significance to those selecting or training AP teachers. The tables of results will not present the numerical correlation coefficients themselves, but will use an X to represent a correlation of +.2 or higher and a -X to represent a correlation of -.2 or lower. The purpose is to focus on characteristics that may be worth future investigation rather than exact numerical results.

Table 11 shows the selected school variables that correlated with teacher success indicators. In general, the correlations between school characteristics and success indicators were small (Cohen, 1977). 18 characteristics had correlations +/- .2 or more with the success in teaching indicator in one or more of the four analyses.¹²

Table 11 about here

One school characteristic had notable correlations in three of the four groups. Of data about the student body generally available to principals, the percent of students eligible for free or reduced cost lunch is one of the most effective SES variables. In addition, three other questions were asked about school characteristics related to SES and all three were noted for one or more groups – the percent of seniors who graduate, the percent of graduates who go on to college, and the

¹¹ A total of 41 school variables were defined and correlated with four success indices (success with African American students in AP Calculus AB, success with Mexican American/Puerto Rican students in AP Calculus AB, success with African American students in AP English Literature and Composition, and success with Mexican American/Puerto Rican students in AP English Literature and Composition) for a total of 164 correlations.

¹² Note that for this and all other correlation analyses, the “success in teaching” indicator was (1) the average residual from the prediction for all of the teacher’s African American students with both PSAT and AP scores, and (2) the average residual for all the teacher’s Mexican American and Puerto Rican students with both test scores. The clustering into three success groups was done only for categorical analyses.

percent of seniors who are NOT members of underrepresented minority groups. Another series of school characteristics also correlated with teacher success in one or more groups – these had to do with the principal’s rating of the academic quality of either the student body as a whole, or of underrepresented minority students in the student body. Ten questions asked about the whole student body, and a matching ten questions asked about underrepresented minority students. For these 20 questions, a total of 10 notable correlations were found. The same questions, moreover, were identified as notable for the student body as a whole and for underrepresented minority students: the students’ academic background on arrival in the school; their attitude toward academic achievement; the parents’ level of education; and the parents’ support for AP. A few other miscellaneous school characteristics were noted and are reported in Table 11, but the above were the ones that appeared to have some rationale or consistency.

The SES of the school is the only school characteristic that this study was able to find that may affect success in teaching AP Calculus AB or English Literature and Composition to African American students, once you have taken their PSAT scores into account. More school characteristics were noted as possibly related to success in teaching AP to Mexican American and Puerto Rican students. SES of school is one possible characteristic, and the overall quality of the student body is the other possible characteristic. While the PSAT was meant to control for the general academic background of *AP* students, there may be a general atmosphere of academic quality in the school community as a whole that goes beyond individual students’ accomplishments. In addition, one would not expect that the PSAT/NMSQT score would be effective in controlling for students’ or parents’ *attitudes* – as in the students’ *attitude* toward academics and their parents’ *support* for AP.

We now move on to one of the main purposes of the study: determining student outcomes for teachers identified as more and less successful in teaching minority students. In these analyses, we will need to bear in mind that overall school SES (for students in both target minorities) and the school academic atmosphere (for Mexican American and Puerto Rican students) may be partially responsible for the apparent success of teachers.

Student Academic Performance

The most important measure of teacher success in this study is the AP examination grade, since it represents what the student learned in the course. Table 12 reports average AP examination grades for teachers identified as more and less successful in teaching target minority students. Because we suspect that there were systematic differences in the educational backgrounds of the students entering the AP class, we also give an average *predicted* AP grade based on the students' initial PSAT/NMSQT scores, and the average difference between the actual and predicted AP scores. A positive difference indicates that the students of teachers in that category on average scored higher than predicted; a negative difference indicates that the students of teachers in that category scored lower than predicted.

Note that some of the groups are excluded from Table 12. For the target minority students in the classes of teachers selected as more and less successful for that group, performance is in part an artifact of how successful teachers were identified. Successful teachers were those whose minority students earned AP scores that were on average higher than their PSAT/NMSQT scores would have predicted. Similarly, the target minority students of teachers identified as less successful for that group had lower AP scores than one would expect based on their PSAT/NMSQT scores. So performance of target groups, where contaminated by the selection method, is not reported in the table.

We know that for the target minority groups, the students' relative AP scores will be higher than their relative standing on PSAT/NMSQT for more successful teachers and lower for less successful teachers, since that was how the more and less successful teachers were identified. But what about the scores of students whose performance did not enter into the definition of success? It makes sense that teachers successful with one group of students will also be successful with other groups. So if we find that teachers identified as successful with African American students, for example, also tend to have relatively high AP scores for White and Mexican American and Puerto Rican students, this is another piece of evidence that we have correctly identified more (and less) successful teachers.

Table 12 about here

Overall, Table 12 shows that the mean student AP examination grades for teachers selected as more successful in teaching minority students are strikingly higher than those identified as less successful. This may, however, be due to the initial preparation of their students. The predicted scores for the more successful teachers also tend to be higher than for the less successful teachers. Since the predicted scores were based on PSAT/NMSQT scores, we know that the more successful teachers tended to have students with better academic backgrounds on the average. By subtracting the predicted score, however, we adjust for those differences in previous academic background. By looking at the rows that summarize the differences between actual and predicted AP grades, we can see that the AP teachers selected as successful with one target group were also successful in teaching students in other groups. Similarly, teachers identified as less successful with a target group were also consistently less successful with other groups.

For example, look at the data for the performance of *White* students in the AP Calculus AB classes of teachers identified as more and less successful in teaching African American students (the third grouping of rows in Table 12). The White students of teachers identified as more effective with African American students obtained an average AP grade .25 grade points higher than predicted (3.33 vs. 3.08); the White students of the less effective teachers obtained an average AP grade .45 grade points lower than predicted (2.37 vs. 2.82). The net difference for White students who studied with more and less successful teachers of African American students was .7 AP grade points ($.25 - (-.45) = .7$). For White students of calculus teachers more and less successful with Mexican American and Puerto Rican students, the difference was .47 grade points. These net differences are reported in the column labeled “Difference.”

In this comparison, the AP Calculus AB teachers showed moderate changes in the relative achievement of their non-target students, averaging .7 grade points difference between the more and less successful teachers (about .8 grade points difference between the more and less effective teachers of African American students and about .6 grade points difference between those more and less effective with Mexican American and Puerto Rican students).

The differences in relative achievement for non-target students in AP English Literature and Composition teachers were smaller (averaging about .4 AP grade points between teachers more and less effective with both target minority groups.) These differences can be considered small to moderate in size, ranging between 20% and 80% of a standard deviation of the AP grades. Still, these differences are not artifacts of the definition of success, and provide additional support that teachers identified as more successful for target minority groups are in fact better teachers, and that teachers good with one group of students tend to be good with other groups of students.

The size of the difference between more and less successful teachers for the target groups is also a matter of interest, even though these results are partially an artifact of the method of selecting more and less successful teachers. These results, not reported in Table 12, show that there is a substantial difference between target group performance for the more and less successful teachers. The differences are somewhat larger in AP Calculus AB than in AP English Literature and Composition (see footnote for specifics)¹³.

Another piece of evidence that good teachers for one group are good for another is the number of teachers that were identified as being successful or unsuccessful with both target minority groups. This is not an ideal measure, since there are a number of teachers that did not have students in both target minority groups. The correlation between success in teaching African

¹³ The performance difference for target groups students of more and less successful teachers was more than 1 standard deviation in Calculus (1.14 AP score points (SD=1.08) for African American students and 1.33 AP score points (SD=1.23) for MA/PR students), or about 1.1 SDs for both target groups. The difference between target group performance for more and less successful teachers was just under 1 SD in Literature (.62 AP score points (SD=.91) for African American students and .85 AP score points (SD=.97) for MA/PR students). This translates to .7 SDs for African American students and .9 SDs for Mexican American or Puerto Rican students. According to Cohen (1977), 80 percent of a standard deviation is considered a large difference. Thus the target minority students in both AP Calculus AB and AP English Literature and Composition who had a teacher identified as more effective with their group had a real advantage. As another way of understanding the size of the difference between more and less effective teachers, one can, for example, estimate that 32 percent of the African American students in the more effective teachers' classes would earn a 3 or higher on the AP Calculus AB examination, while 2 percent would earn a 3 or higher in the less effective teachers' classes. This group was chosen as an example because the students started out with equivalent backgrounds as measured by the PSAT/NMSQT – average V = 49 and M = 51 for African American students of both the more and the less effective teachers. In the more effective teachers' classes, the mean and SD of AP grades were, respectively, 2.45, 1.15. In the less effective teachers' classes they were 1.32, 0.64. A score of 3 would be .48 SDs above the mean for the more successful teachers and 2.65 SDs above the mean for less successful teachers. Assuming a normal distribution of AP grades, the probability of a score of 3 or higher would be 0.32 and 0.02, respectively.

American students and Mexican American and Puerto Rican students was .4 in AP Calculus AB, but only about .1 in AP English Literature and Composition (see Table 13).

Table 13 about here

Having reviewed the student outcomes for more and less successful teachers, we can now move to a second main purpose of the research. That is to determine whether individual teachers' background, education, or teaching practices can be shown to have a relationship with effectiveness in teaching minority students. In the next section, we will discuss the correlations between success in teaching the two target minority groups and the teacher's questionnaire description of participating AP teachers.

Teaching Minority Students

Characteristics of AP Teachers Successful with Minority Students

To determine whether teaching practices or teacher characteristics are related to success in teaching minority students, questions on the teacher questionnaires (see Appendix A) were correlated with success indicators. For example, question A1, gender, was coded 1=male and 2=female. A positive correlation between gender and one of the success indicators would indicate that women teachers were more successful than men. Some of the questions had to be specially coded. For example, the question asking about the teacher's race or ethnic group (A2) was broken into several variables. Question A2 option c ("Black/African American, non-Hispanic") was coded 1=yes, 0=no. A positive correlation for this question would indicate that African American teachers were more successful than non-African American teachers.

196 teacher variables were defined from the AP Calculus AB teacher questionnaire and 175 from the AP English Literature and Composition questionnaire¹⁴. Each of these variables was correlated with the measure of success in teaching African American students and the measure of

¹⁴ There were fewer curriculum questions on the AP English Literature and Composition questionnaire. See Appendix A.

success in teaching Mexican American and Puerto Rican students¹⁵. As in the earlier analysis of correlations between school characteristics and policies and teacher success, we did not base our analysis on statistical significance tests, and we do not present the numerical correlation coefficients, but will use an X to represent a correlation of +.2 or higher and a -X to represent a correlation of -.2 or lower. The purpose is to focus on characteristics that may be worth future investigation rather than exact numerical results.

Overview. There were few items on the teacher questionnaires that correlated with our measures of success in teaching minority students. They clustered in two areas: emphasis on some of the topics and skills in the AP curriculum was the first area; the teacher's evaluation of the academic quality of students who attend the high school, both the total student body and minority students in particular, was the second area. Many of the variables suggested in the literature review were not found to be related to success in teaching AP to minority students. Overall, the teacher's experience in teaching, academic degrees and certification, attendance at AP workshops and Summer Institutes, or general sources of support at school did not appear to be related to success in teaching minority students. The teacher's specific academic preparation in the subject and professional development in the subject and in teaching techniques were also generally not found to be related to success. Finally, the school's and the teacher's policies and practices in selecting AP teachers, in informing and selecting AP students (including special efforts for minority students), and in encouraging students to take the AP examination were not found to be related to success in teaching minority students. There were sporadic correlations in some of these areas, but the only concentrations of correlations were in curriculum and student body quality.

Quality of student body. A series of questions that seemed particularly related to success for minority students involved the teacher's rating of the overall academic quality of the student body in general, and of the overall academic quality of the minority students attending the school (Teacher Questionnaire questions D3 and D4). This was true both for AP Calculus AB and for AP English Literature and Composition teachers. Most of these questions had to do with what

¹⁵ Note that for this and all other correlation analyses, the "success in teaching" indicator was (1) the average residual from the prediction for all of the teacher's African American students with both PSAT and AP scores, and (2) the average residual for all the teacher's Mexican American and Puerto Rican students with both test scores. The clustering into three success groups was done only for categorical analyses.

students brought to the school, including the students' academic background on arrival, their aspirations, their parents' level of education and support of education. These questions could be interpreted straightforwardly as measures of the background of AP students outside of the teachers' control. However, they might also be seen as reflecting the teacher's subjective perception of his or her students, which could also affect the teacher's success. The answers that school principals gave to these same questions (summarized in Table 11) have quite a different relationship to the success measures than the teachers' ratings¹⁶. This suggests that the teachers' responses may capture more than the students' objective backgrounds.

Table 14 presents the results of the teachers' ratings of the student body. All 10 of the questions asked about student body quality are presented, and all correlations of +/- .2 or more extreme are noted. The first two rating questions – the students' academic background on arrival in high school, and their attitude toward academic achievement in general – were notably related to teacher success in most groups. The sum of ratings over the entire set of questions (“sum of above quality ratings”) was the next most frequently noted variable. Several questions were related to success in teaching AP Calculus AB but not English Literature and Composition – the students' regard for school property, their aspirations to attend college, and the preliminary courses offered by the school (or school system) to prepare students for AP. The Literature teachers' ratings were not as frequently correlated with success (especially success in teaching Mexican American and Puerto Rican students) as were the Calculus teachers' ratings.

Table 14 about here

Curriculum in AP Calculus AB. Table 15 reports correlations between AP Calculus AB curriculum topics on functions, derivatives, and integrals and the measures of success in teaching minority students. The correlations (all positive) show which topics were emphasized more by successful teachers and less by unsuccessful teachers. Topics that were not correlated tended to be emphasized equally by all teachers. All 17 content topics are reported, although only the section on integrals shows a consistent pattern of association with success in teaching minority

¹⁶ For example, three of the ratings that correlated positively for principals correlated negatively for teachers. Only one of the 8 positive correlations of principals' ratings was also noted as a positive correlation for teachers.

students. The table illustrates the kind of sporadic pattern of correlations observed for most of the questionnaire in the questions about functions and derivatives. In these two sections, the only topics correlated with success in teaching minority students are those requiring the students to use and apply the concepts they are learning. Many of the topics in integrals are related to success. These are among the core concepts of calculus. In summary, teachers who emphasize integrals and some topics that require application of calculus concepts are more successful in teaching African American, Mexican American, and Puerto Rican AP students.

Table 15 about here

Curriculum in AP English Literature and Composition. Table 16 reports correlations between AP English Literature and Composition curriculum topics and the measures of success in teaching minority students. This set of questions gives more hints about successfully teaching Mexican American and Puerto Rican students than African American students. The only curriculum topics that are related positively to the success measures for African American students involve critical reading: close reading for multiple meanings, and observing textual detail and establishing connections. The only other large correlation for African American students is the *negative* correlation with emphasizing a wide range of vocabulary in writing. Teachers successful with Mexican American and Puerto Rican students emphasize the specifics of literary analysis – structure, style, and themes; figurative language; textual detail and connections. They also emphasize the specifics of writing: using a wide range of vocabulary, a variety of sentence structures, and effectively using rhetoric. Finally, they emphasize the overall goal of developing and organizing ideas in clear, coherent, persuasive language.

Table 16 about here

Other teacher characteristics and practices correlated with success in teaching minority students. Table 17 summarizes other teacher qualities correlated with success in teaching. All of these questions were asked of all teachers regardless of the subject taught, so the results for Calculus and Literature are presented together. Only those characteristics that were correlated with success in more than one subject or more than one target minority group are noted, since the

pattern of correlation offers some additional evidence that the correlations are not merely due to chance fluctuations.

Table 17 about here

The most noted characteristic is the teachers' own rating of their knowledge of the AP program and examination, and of the subject area. Amount of recent professional development in the subject area is also noted. Two demographic teacher characteristics are related to success: being a woman (both subjects and both target minority groups), and being White (both target groups in Literature). There were two questions noted (for Calculus teachers only) related to rising trends in the number of students, and the number of minority students, dropping AP. Finally, for Calculus only, teachers who place a high value on students earning a 3 or better on the AP examination are more likely to succeed with minority students.

Focus Group Results: Useful Practices for Teaching Minority Students

The study

In February, 2000, a sample of nine AP Calculus AB and 9 AP English Literature and Composition teachers who had provided data for the minority success study were invited to participate in one of three focus groups. Teachers identified as above average in their success either in teaching or enrolling underrepresented minority students were invited to participate.¹⁷ Two focus groups were held in Manhattan, one for AP English Literature and Composition teachers and one for AP Calculus AB teachers; the third was a national three-day on-line interaction in a bulletin board format that included teachers in both subject areas. The purpose of the focus groups was to gather information on

- teaching strategies that are successful (or unsuccessful) with minority AP students
- characteristics of teachers successful with minority AP students
- factors that influence the success of AP programs with minority students
- support that AP teachers of minority students would find most helpful

¹⁷ The “success in enrolling” variable was dropped from the study later.

The information was meant to provide specific illustrations for the final report of this project that would be useful for AP teachers or for those responsible for recruiting, training, and retaining AP teachers

The participants included teachers between the ages of 28 and 55, ten women and seven men, three African American and fourteen White. All teachers had at least four years' experience teaching AP; three had more than ten years' experience. Although not all teachers were asked about the percentage of their students who were minority, virtually all mentioned that more than half of their AP students belonged to minority groups; several taught only minority students.

In both the live focus groups and the on-line bulletin board, teachers were asked about:

- how they prepare to teach AP classes
- specific methods they use when teaching minority students
- teacher attributes needed to teach minority students
- professional development experiences
- “wish list” of resources to enhance their teaching
- recommendations to improve AP programs and to recruit quality AP teachers

The focus groups took two hours each; the bulletin board lasted for three days. All were held in February, 2000, hosted by Harris Interactive.

Results

Good teachers of minority students are good teachers. The teachers did not want to generalize about minority students. They consistently maintained that effective teaching for minority students is no different from effective teaching for any student.

- “The personal attributes needed to be a teacher of minorities would be the same attributes needed just to be a teacher: Knowledge and love of your subject, organization skills, patience, perseverance, the ability to see your students as individual people with their own needs and personalities.”

- “A teacher must know the subject he/she is teaching, love people and students in particular, believe in the abilities of all motivated students to master the material, possess a genuine desire to motivate those who are not as aggressive as the others, be able to make the material he/she is teaching fun and be able to make the students laugh about something between problems.”

Partly, the teachers were unwilling to commit the common error of assuming all minority students are academically backward and poor. Another important factor is their commitment to teaching their subject to demanding academic standards. They wanted to make clear that they would not change their standards for minority students. A third important factor is the teachers’ belief that to teach students well, one must demand excellent performance and believe that the students are capable of excellent performance. They did not feel they would be doing minority students any favor by changing their standards.

Teachers should apply high standards fairly to all students. The teachers said in a number of different ways that the most important attribute of a teacher of minority students is fairness. Equally important is that the students know the teacher is fair. What is meant by fairness?

Teachers

- apply rules firmly and consistently, not making excuses for students’ minority status
- maintain high expectations of themselves and of their students and communicate those expectations clearly

Fair treatment gives students the chance to achieve excellence. In addition, students become aware of low expectations. Some students conclude that the teachers are right and learn to expect less from themselves. Even students who maintain a belief in their own competence may still feel the pressure of those stereotypes (Steele & Aronson, 1995)

- “Counselors often use [students’] background to plead for an erosion of standards. Personally, I find this to be an immoral thing to do to a student.”
- “When the chips are down, [people] can get accusatory, blaming the kids’ home lives, different educational values, and failed upbringing for everything that cannot be achieved in classes. Of course these things are never said directly to kids, but they get the message.”

Some students have attended schools with small budgets, poorly-trained teachers, inadequate counseling, and many discipline problems; have experienced spotty instruction; will be the first in their family to go to college, have low incomes, or have grown up in a non-English speaking family. Minority students are more likely than White students to face one or more of these problems. Teachers need to have a solid belief in minority students' ability to do excellent work. However, they also need to attend to whatever problems individual students actually have. The participating teachers had several suggestions about how teachers can best help students overcome any problems they may have. See the following paragraphs for these suggestions.

Teachers need strong content knowledge and teaching skills. A myth has grown up about AP students: That they are so well prepared and so motivated that they can practically teach themselves. Such students would be likely to be relatively invulnerable to teacher deficiencies. This myth was probably never true – most AP students have always been ordinary college-prep high school students – but it is certainly not true in many places today. Legislatures are supporting AP courses in every school; school districts are mandating AP as a way of improving the standards for the entire high school curriculum; schools, including many minority-dominant schools, are using AP classes to encourage students to consider college and to help them prepare for college. These students are definitely not invulnerable.

Teachers need to make sure that the most fundamental content and skills in the AP curriculum are well covered. One literature teacher spoke of the primary need to teach students to read *actively* and *critically*, skills that they had not necessarily learned in earlier classes. One calculus teacher requires students to give their answers aloud in standard English. This rule was designed to help students present themselves in academically acceptable ways. Another calculus teacher has students deliver equations verbally, encouraging them to understand the concepts and operations, not just repeating a shorthand expression like “ dv/dt .” Both of these teachers were accomplishing both ends: Helping students learn standard academic English, and helping students understand the concepts and operations behind the formulas. Many of the teachers discussed how to make sure that the fundamentals are covered.

Calculus teachers:

- teach slowly and thoroughly, with lots of examples (also important in Literature)

- give frequent quizzes
- send students to the chalkboard often
- relate mathematical abstractions to real situations of interest to the students
- encourage students to use their graphing calculators to understand problems
- encourage students to use AP CDs so they can repeat mathematical concepts as often as they need to
- make sure that students learn the writing skills they need to communicate their ideas (also important in Literature)

Literature teachers:

- teach slowly and thoroughly, with lots of examples (also important in Calculus)
- focus students on a single paragraph to help them understand the writer's tone and use of rhetoric
- encourage students to use sticky notes so they can annotate books they're not allowed to write in
- relate literary characters and situations to students' experiences
- make sure that students become familiar with the classics of literature
- make sure that students learn the writing skills they need to communicate their ideas (also important in Calculus)

Having students work together in small groups is a method for improving academic skills mentioned by many teachers.

Teachers can and do use a wide variety of teaching techniques. Although having students work in small groups was frequently mentioned, a number of different approaches were used.

- "I have my kids sit in pairs or threes and discuss the problems, because there's no point in a kid sitting there staring at a problem, [not knowing] what to do. It helps for them to talk with each other about a problem, because somebody may have an idea and that gets it started." Calculus teacher.

This teacher is simply interested in what works to get problems solved. Another is interested in what helps motivate students.

- “Sometimes students who are unmotivated to succeed on an individual assignment will be willing to try to help someone else get a good grade. They don’t want to let the other person down.” Calculus teacher.

Still another thinks about group dynamics.

- “My students work in pairs initially to build a sense of community and security. I usually begin to wean them in November, and by December they are working alone. After this they come together twice again: Once for a research project (a team effort), and again for an oral presentation. Once they are individuated, the competition gets fierce.” Literature teacher.

But not all AP teachers endorse group work because it can take longer, get loud, encourage talking about other matters, result in “group answers,” or allow some students to coast.

- “I am not as skilled at making sure group work is effective, partially because I know how group work tends to go. ... One or two students do everything because they are bright or because they are determined to get a good grade for the group, and three or four other students do very little and learn next to nothing.” Literature teacher.
- “If [group work is] not carefully planned, it doesn’t work.” Literature teacher.
- “My primary mode of teaching is lecture-style – simply to make sure all material is covered, even beyond the AP Calculus AB exam. I would never finish this material in a group format.” Calculus teacher.

However, we will let the last word on using groups in AP go to the following careful planner.

- “I randomly choose the groups so everyone in these racially mixed classes gets a chance to work with most everyone else in a class. I think they are more willing to open up in a group, and discussions tend to be less dominated by the more aggressive personalities in the class.” Literature teacher.

Teachers need to supply both information and a level of comfort about college work and college itself. Perhaps the teachers’ most important advice was to gain parents’ understanding and cooperation. The family’s tacit assumption that a child will or will not attend college is crucial to their understanding and support of the AP program.

- “It is almost impossible for a teacher to undo 17 years of low expectations [about going to college] unless the student has a reason to outdo her/his parents.”

Both parents and students need to learn about college, and need to become comfortable with the idea of the student going away from the family to attend college. They need to picture what college is like and picture the student in college. They need to understand the AP course in that context and support the demands that AP will make.

- “More and more families have been introduced to AP exams and earning college credit and the idea of [their children] going away from the family for college.”
- “[Our counselors] have evening information sessions and workshops for [students and their families]. They also help the students and parents with financial aid forms and with college applications. This has really helped improve the participation of minority students.”
- “I spend a fair amount of time explaining [to parents] the amount of work that students have to do ... the kind of work that will be done and how the students will be graded.”

Another important ally is former AP students.

- “It is always a blessing to hear from former students and share their progress with your current students. ... Sometimes they visit our high school while on break and tell us how things are going. This is a big plus!”

Finally, a number of teachers spoke of the students’ interest in the teacher’s own college experiences and feelings about them. The teachers used a variety of methods to respond to this interest, perhaps telling stories in class about their college experience, or appealing to students’ competitive interest in being the smartest students in school, or simply responding to students’ questions about what it was like for them.

Have a good AP program.

- “The best way to build the numbers in any particular AP course is to make that course successful – that is, raise the pass rate on the exam. Each year after the first, my scores went up as my class size went up. ... I also think that adding other AP courses such as

statistics or even non-math programs can help to build a climate where AP is a positive, results-oriented experience.”

What these AP teachers were like. Qualitative research is not particularly good at describing what everyone is like, but it does give one insights into the people who participated. So we will talk briefly about what this particular group of AP teachers was like. These teachers were identified as ones who were likely to be successful in teaching or enrolling minority students. Moreover, they were enthusiastic enough about AP to take the trouble to attend a focus group in Manhattan after school in February, or to log onto a bulletin board for three days running. What else do we know about them?

- They are crazy about their subject area, are strong advocates of the AP program, and respect, admire, and like their AP students.
- They have many different approaches to teaching and very different styles of personal interaction with students.
- A significant number of the participants mentioned feeling alone, unappreciated, not well supported, in a major competition for their own time and the time of AP students, and surprisingly modest about their own competence.
- Not all of the teachers had participated in AP professional development opportunities. Some who had not expressed unwillingness to take the time and frustration at the lack of support from their schools. Those who had, however, were most enthusiastic. As one reviewer of the transcripts put it, “they cherished even the rudimentary workshops provided and wanted far more.”
- Although they may or may not express enthusiasm for professional development, the participating teachers appeared to be genuinely excited by the opportunity provided by the focus groups to talk to other AP teachers, share problems, and get new ideas for teaching strategies or resources.

Help teachers need. This research showed that teachers are interested in strengthening AP programs, and many have achieved a great deal on their own. However, teachers report that they need external support too. They lack the time, funding, and political clout to make some of the changes needed.

Summary and Discussion

The purpose of this study was to explore methods of identifying Advanced Placement teachers who are successful in enrolling and teaching students from minority groups now underrepresented in higher education, and identifying the background, training, and teaching practices used by such successful teachers. It was a practical study aimed at those most concerned with Advanced Placement – districts, schools, and teachers, and also those who train new teachers and provide professional development to practicing teachers. Its goal was to suggest how to identify teachers likely to be effective with minority students, and to describe the methods used by teachers effective with minority students. The results of this exploratory study are suggestive but do not constitute proof either that the teachers selected are successful at teaching underrepresented minority students, or, even if they are successful, that the practices described are the ones making them effective. This study should be considered a necessary first step. More definitive studies cannot be done unless potentially successful teachers and potentially successful practices can be fairly simply identified for further study.

Two AP subject areas – Calculus AB and English Literature and Composition – were chosen for study. These are two of the most popular examinations for minority students; cover science and humanities majors; are taken by both young men and young women; and are offered in most schools that offer any AP courses. Schools with the largest numbers of underrepresented minority students who took AP examinations in these two subjects were invited to participate – even so, invitations went to schools with as few as six minority examination takers in 1998. Two underrepresented minority groups were defined for analysis: African American students and a combined group of Mexican American and Puerto Rican students. Each teacher was evaluated separately on success with African American students specifically, and with Mexican American or Puerto Rican students specifically. This was a good decision, since the results indicate that the conditions of success may differ for these two target minority groups.

Two different measures of potential success were developed. The first was designed to measure success in enrolling underrepresented minority students; the second was designed to measure success in teaching them. While student achievement is a familiar measure of teacher success,

we added student enrollment as a secondary measure of success simply because minority students cannot be successfully taught if they are not in class. Both measures were defined *relative* to the teacher's environment. For the success in enrolling measure, the proportion of target minority students in the teacher's class was compared to the proportion of that minority in the high school. For the success in teaching measure, the target minority performance on the AP examination was compared to their AP performance as predicted by the PSAT/NMSQT. We attempted to evaluate how well each teacher did *given* how many students were available and how well those students were prepared (at least in a general sense) to take AP. Otherwise teachers in schools with the most underrepresented minority students would necessarily appear to be the best recruiters, and the teachers in the schools with the best prepared minority students would necessarily appear to be the best teachers.

The measure of success in teaching was satisfactory. Previous studies indicate that PSAT/NMSQT scores are good predictors of AP examination grades; that school grades, even grades in closely related courses, add only slightly to the prediction of AP grades. Our own analysis suggested that many variables outside the teacher's control, such as quality of Pre-AP courses or school policy, may not relate to success once the students' overall academic backgrounds (as measured by the PSAT/NMSQT) are taken into account. While this study was not powerful enough to determine the more subtle correlates of success in teaching minority students, the factors that were identified seem to be supported by multiple lines of evidence and to have common sense support as well. They are worth pursuing in future research and program development. The measure of success in enrolling was less satisfactory, and was eventually dropped from the analysis. Focus group and teacher questionnaire results indicate that AP teachers generally do not consider recruitment to be part of their role. They depend on their colleagues teaching preliminary honors courses in the subject area and school counselors to identify and encourage potential AP students.

The quantitative information available from existing records and from the questionnaires designed specifically for this study was supplemented with qualitative information from focus groups. A group of participating teachers who appeared to be relatively more successful in enrolling and teaching underrepresented minority students were identified and a sample were

invited to discuss their teaching experiences with minority students. These discussions gave the research team a vivid understanding of how AP teachers feel about their students, their minority students, and about AP.

What we Learned from the Review of Literature

While the entire literature on effective teaching applies to minority students as well as majority students, there were a number of themes that seemed particularly applicable to minority students. These emphasized the following teacher behaviors in addition to a strong academic background and continuing high-quality professional development:

- high performance expectations for all students
- deep understanding of the characteristics of all students, including underachieving students, minority students, and disadvantaged students
- deep understanding of the cultural resources students bring to class, and awareness of the prevailing culture in school and the classroom
- a broad repertoire of effective teaching strategies and tools, including proficiency with learning technologies and familiarity with community resources
- ability to engage all students in meaningful learning tasks
- ability to personalize instruction and adapt it to the needs and learning styles of the students

In addition, a demanding program like AP needs *cooperation* and *communication*

- hard work and a high level of commitment from the teacher, students, and parents
- clear communication of expectations and progress between the teacher, students, and parents

What we Learned from Successful Teachers: Focus Group Results.

These themes from the literature also appeared in the focus group discussions for this study.

There were, in addition, some themes that applied specifically to Advanced Placement.

- Good teachers of minority students are good teachers.
- Good teachers can and do use a wide variety of teaching methods.
- The way to encourage minority student participation in AP is to have a good AP program.
- Teachers should apply high standards fairly to all students.

- Teachers need to make sure that the most fundamental content and skills in the AP curriculum are well covered.
- Teachers need to teach about college. Students and parents both need to know about college and feel comfortable about it.
- Teachers lack the time, funding, and political clout to make some of the changes needed to improve the teaching of minority students. They need external support.

Perhaps the most strongly felt theme in all of these discussions was that a good teacher of minority students is no more and no less than a good teacher. A good AP program is a good way to attract minority students (and parents) to AP. The theme of high standards for all students appears, but is modified to specify that the high standards must be *fairly* applied. Very often in the discussion, it was clear that fairness was seen as making no excuses for minority students. Making no excuses for minority students did not, however, mean denying whatever lacks exist in a specific student's preparation. These teachers wanted to make sure that their minority students left the AP class with all the fundamental understandings and skills that perhaps can be assumed in more privileged students. Interestingly, the Calculus teachers especially mentioned the need to improve minority students' oral and written communication skills. Another theme unique to AP was the importance of teaching about college. Particularly for students with no family experience of college, the AP teachers interviewed felt the need to provide information and a level of comfort about college, both for the students and their parents. This teaching was necessary in a number of ways. Students and parents both need to understand why a very demanding and severely graded course is worthwhile. In addition, being in AP raised all sorts of other questions about college – what will it be like? How will I fit in?

Finally, the teachers spoke of their need for external support. Many of the issues of minority students are outside their control or outside their personal definition of their role. Wade Curry (2000b), former Executive Director of the AP Program, had the following comments after reviewing the report of the focus groups.

“With a tiny staff, the College Board cannot intervene directly with 16,000 school districts and 100,000 AP teachers. However, I imagine that the computer companies faced the same problem in relating directly, not to 16,000 organizations, but to millions

of users with complex technical problems. The College Board needs to find ways to establish effective leadership and influence.

1. The first step should be determining what causes strong AP programs.
2. College Board needs to find ways to communicate that information broadly, and use their small staff to the best effect.
3. There are a number of key audiences, including
 - parents
 - school administrators
 - state education departments
 - legislators
 - businesses

For each audience, College Board needs to consider what is possible in communications as well as what would be desirable – better publications, better policies, effective alliances, communication through organizations, speaking at the right places.

4. There is also a need to advocate directly with these key audiences. While the College Board staff cannot do the work, they need to consider how to encourage others to help and to provide the information needed to support effective advocates.
5. This is the most important issue facing the AP Program.”

What we Learned from the Questionnaires

The teachers who were identified as successful in teaching target minority students tended to come from schools with fewer free or reduced lunch students (that is, higher SES schools). Target minority students tended to be a lower proportion of the successful teacher’s AP class compared to the less successful teachers. The more successful teachers rated themselves as knowledgeable about the AP Program and their AP subject. They rated the student body in general, and the minority students in particular, highly. The principals of successful teachers also tended to rate the academic preparation of the student body, both majority and minority, highly. They rated themselves as knowledgeable about the AP Program and their AP subject.

Successful teachers were chosen because their target minority students did better than their PSAT/NMSQT scores would have predicted. These teachers' students who were NOT in the target minority also did better than their relative standing on the PSAT/NMSQT would suggest. Since the success measure was based only on the performance of target minority students, the performance of the other groups could have turned out better, worse, or the same. The fact that the non-target students' performance mirrored target students' provides additional support to the identification of teachers as more or less successful. This is support for the interpretation that the teachers identified as more successful are genuinely better teachers, and that good teaching is effective with all students. It supports the focus groups' conviction that good teachers of minority students are simply good teachers.

Turning to the teachers' academic backgrounds, teaching methods, and curricular emphases, the principal finding of this study is that many of the "best teaching" findings were not confirmed in this study. The variables that were *not* systematically related to success in teaching minority students included:

- Years of teaching overall or years of teaching AP
- Academic degrees or certification, including a major in the discipline
- Professional development, including attendance at AP Summer Institutes or Workshops
- The school's and the teacher's policies in selecting AP teachers, in recruiting and selecting AP students (including special efforts for minority students), or in encouraging students to take the AP examination

However, relationships were discovered between success and the content and skills emphasized in the AP curriculum. In AP Calculus AB, the series of topics on Integrals were most strongly related to success. A few topics that required *applications* of the curriculum content were also related to minority students' success.

In AP Literature and Composition, the results were clearer for the combined Mexican American and Puerto Rican group than for African American students, and were also clearer for the writing part of the curriculum than for the literature portion. For African American students, the emphases that were associated with success had to do with developing critical reading skills. This is consistent with the comments of one of the focus group members who stated that the

fundamental skill for her students was active, critical reading. For Mexican American and Puerto Rican students, the important curricular emphases appeared to be the specifics of literary analysis and also the specifics of writing as well as the overall goal of “developing and organizing ideas in clear, coherent, persuasive language.” Like the results for Calculus, in Literature the emphasis that had the closest relation to success was the *application* of what was learned, in this case, in the process of writing.

An Issue: Measuring Effectiveness in Enrolling Minority Students

This study failed to locate a group of teachers who are actively involved in recruiting and encouraging minority students. While the AP teachers studied showed every sign of being enthusiastic and dedicated AP teachers, they appeared to have focused their energy almost exclusively on teaching. Based both on focus group comments and questionnaire results, it is clear that few teachers engage in the vigorous recruiting efforts that (for example) Jaime Escalante did.

However, the focus groups also made it clear that the teacher is more important for minority students than for others. Because more minority students lack a good academic background, it is important that they have good AP teachers.

“...while I agree that it is essential for all teachers to be excellent for all students, some students suffer less as a result of exposure to poor teaching. To clarify, students in some communities can be exposed to a deadbeat teacher, spotty instruction or even long term absence from school and still come out fine. The home support may be exposure to a father who just happens to be a professor at Columbia, an at-home library that is a trove, or a social and cultural frame of reference that fills in all of the gaps. Too, there is going to be a school board in place that soon gets rid of the shabby teacher. My kids have no such framework, and so I guess I am saying that it is essential that their teachers’ credentials be impeccable. Too, not only do minority kids have to buy into the education itself, but very often, because of various pathologies, they also have to be inculcated into the value and values of education. This requires that they see their teacher as having integrity, and I think we demonstrate this by being models for them. The Caucasian

students I have taught have not been in need of this role-model factor in this way. In this one area they are more independent.” AP English Literature and Composition teacher.

Because more minority students would be the first in their family to go to college, they may need the mentoring and the information from teachers that their parents cannot supply.

“The only group of parents who could use help are those who are from families with no tradition of going to college and little expectation of such for their children – whether they are minority or not. There are plenty of minority parents here who do an excellent job of developing a desire to learn and do well in their children, but there are others who have told me flat out, ‘There is no tradition of attending college in our family – could you encourage my son/daughter?’” AP Calculus AB teacher.

This AP Calculus AB teacher goes on to say that “[p]arents’ expectations are CRUCIAL. And it is almost impossible for a teacher to undo 17 years of low expectations...” Nevertheless, if minority students are to break their family’s non-academic tradition, it is difficult to see where they will get the information and encouragement to take AP if not from their schools.

Recommendations for Future Research

This study explored a large number of variables that might be related to success in teaching AP courses to underrepresented minority students. It appeared to be successful in identifying *teaching* success, although we suspect that the characteristics of successful teachers could have been more crisply described if appropriate statistical controls for such variables as socioeconomic status and the overall academic climate of the high school could have been added. The study was much less successful in identifying success in *enrolling* minority students, perhaps because it was looking in the wrong place. We were not able to find a group of teachers who were enthusiastic recruiters of minority students. Perhaps success in enrolling minority students is a collaboration of school district policy, principal, and counselor efforts as well as parent and community support. Finding out how to bring minority students into the AP classroom is a crucial issue that needs to be understood.

It was somewhat surprising that so few of the characteristics and behaviors that have been found in the effective teaching literature were found to be important in this study. It must be noted that a number of the effective teaching studies have had much larger samples than this study, comprising all schools in a state or even large national or international sample surveys. It is almost certainly true that teacher effects are difficult to pull out of the complex reality of the educational enterprise and that a powerful study is needed to detect them. However, it is also possible that the AP class, with highly motivated students and enthusiastic teachers, is a different environment with different rules. The two areas most strongly associated with success in teaching minority students in this study were the teacher's rating of the academic quality of the students in his or her school, and the teacher's emphasis on understanding and applying the fundamental concepts of the discipline. These suggest that the key to teaching AP to underrepresented minority students is *academic*. Recalling Treisman's comments about teaching calculus to minority students at Berkeley, the common concerns about poor preparation, poor motivation, and poor "thinking skills" may not apply as well to minority students in AP classes.

Curry's comment (2000b) that the first step is to determine what makes strong AP programs is clearly supported by this study.

We would suggest that further questionnaire studies of effective teaching in AP, similar to this one but with large enough samples to allow statistical controls, and large enough samples to test the hypotheses generated in this study are worth doing. In the end, however, identifying successful teaching practices in AP will require studies that actually measure outcomes for all students in the AP class, not only their growth in knowledge of the discipline, but also changes in their attitudes toward higher education, the AP subject area, and their own academic competence. Furthermore, studies that observe teacher's interactions with students in the AP classroom will also be necessary to describe successful AP teaching adequately. Probably a different study, casting a broader net to include the school system and the community context, is required to find out successful ways of enrolling minority students in AP.

References

- Advanced Placement Program (1998). *1998 Advanced Placement Program national summary report*. New York and Princeton: College Board and Educational Testing Service.
- Advanced Placement Program (January, 2000). *1999-2000 Participation Survey*. Princeton, NJ: Educational Testing Service.
- Angelo, T. A. (1996). Relating exemplary teaching to student learning. *New Directions for Teaching & Learning* 65, 57-64.
- Ballou, D., & Podgursky, M. (1997). *Teacher pay and teacher quality*. W. E. Upjohn Institute for Employment Research.
- Barnes, S. (1981). *Synthesis of selected research on teacher findings*. Austin, TX: Research and Development Center for Teacher Education.
- Bennett, W. (1988). *American education: Making it work*. Washington, DC: Government Printing Office.
- Brophy, J. (1979). Teacher behavior and its effects. *Journal of Teacher Education*, 71, 733-750.
- Brophy, J. and Everston, C. (1976). *Learning from teaching: A developmental perspective*. Boston: Allyn and Bacon.
- Brown, S. V., & Clewell, B. C. (1998). *Project Talent Flow: The Non-SEM Field Choices of Black and Latino Undergraduates with the Aptitude for Science, Engineering and Mathematics Careers* (Final report to the Alfred P. Sloan Foundation). Baltimore MD: University of Maryland, Baltimore County (UMBC).
- Burton, N. W., Edelstein, K., Kindig, L., Bruschi, B., & Cline, F. (In preparation). *Evaluation of Advanced Placement Summer Institutes*. Princeton NJ: Educational Testing Service.
- Camara, W. J. & Millsap, R. (1998). *Using the PSAT/NMSQT and course grades in predicting success in the Advanced Placement Program* (College Board Report No. 98-4). New York: College Board.
- Carnevale, A. P., & Rose, S. J. (in preparation). *Socioeconomic status and access to selective colleges* (Prepared for the Century Foundation for their Task Force on Higher Education). Washington DC: Educational Testing Service.
- Center for Science, Mathematics, and Engineering Education (1999). *Transforming undergraduate education in science, mathematics, engineering, and technology*. Washington, DC: National Academy Press.

- Christie, N. & Sabers, D.L. (1989). *Using microcomputers to implement mastery learning with high-risk and minority adolescents* (ERIC Document Reproduction Service No. ED 326178).
- Clewell, B. C., Anderson, B., Bruschi, B., Joy, M. & Meltzer, M. (1994). *Conditions conducive to success in minority-dominant schools with strong Advanced Placement Programs* (unpublished final report submitted to Advanced Placement Program). Princeton, NJ: Educational Testing Service.
- Cohen, J. (1977). *Statistical power analyses for the behavioral sciences*. Hillsdale NJ: Lawrence Erlbaum Associates.
- Coley, R. J. & Casserly, P. L. (1992). *A study of AP students in high school with large minority populations* (Advanced Placement Program Report). Princeton: Educational Testing Service.
- College Board (2000). Annual AP Program participation table. New York: College Board. [WWW.Collegeboard.org/ap.]
- Curry, W. (2000a). Personal communication.
- Curry, W. (2000b). Unpublished memorandum.
- Darling-Hammond, L. (1998). Teacher learning that supports students learning. *Educational Leadership*, 55 (5), 6-11.
- Dossey, J., Jones, C., Klag, P., Kennedy, D., Kilpatrick, J., Lappan, G., Silver, E., & Smith, M. (In press). *Quantitative literacy and the middle school curriculum*. New York: College Board.
- Dozier, T., & Bertotti, C. (2000). *Eliminating barriers to improving teaching*. Washington DC: Teacher Quality Initiative, US Department of Education. [www.ed.gov/teacherquality].
- Duschl, R.A. & Gitomer, D.H. (1997). Strategies and challenges to changing the focus of assessment and instruction in science classrooms. *Educational Assessment*, 4, 37-73.
- Education Trust (1998). *Good teaching matters: How well-qualified teachers can close the gap*. National Commission Report on Teaching 1996, Vol. 3, Issue 2.
- Ehrenberg, R. G., & Brewer, D. J. (1995). Did teachers' verbal ability and race matter in the 1960s? Coleman revisited. *Economics of Education Review*, 14 (1), 1-21.
- Escalante, J. (1990). The Jaime Escalante math program. *The Journal of Negro Education*, 59(3), 407-423.

- Ferguson, R. (1991). Paying for public education: New evidence on how and why money matters. *Harvard Journal of Legislation*, 28, 465-491.
- Fetler, M. (1999). High school staff characteristics and mathematics test results. *Education Policy Analysis Archives*, 7 (9).
- Goldhaber, D. D., & Brewer, D. J. (1999). Teacher licensing and student achievement. In M. Kanstoroom & C. E. Finn, Jr. (Eds.), *Better teachers, better schools*, pp. 215-238. Washington DC: The Thomas B. Fordham Foundation.
- Gonder, P. O. (1991). *Caught in the middle: How to unleash the potential of average students*. Arlington, VA.: American Association of School Administrators.
- Greenwald, R., Hedges, L. V., & Laine, R. D. (1996). The effects of school resources on student achievement. *Review of Educational Research*, 57, 415-435.
- Haycock, K. (1998). Good teaching matters. *Thinking K-16*, 3 (2). Washington, DC: Education Trust.
- Joyce, B. R., & Showers, B. (1988). *Student achievement through staff development*. New York: Longman.
- Joyce, B. R., Showers, B., and Rolheiser-Bennett, N. (1987). Staff development and student learning: A synthesis of research on models of teaching. *Educational Leadership*, 45(2), 11-23.
- Juillerat, E., Dubowsky, N., Ridenour, N.V., McIntosh, W.J., and Caprio, M.W. (1997). Advanced placement science courses: high school–college articulation issues. *Journal of College Science Teaching* 27, 48-52.
- Kellogg, A. P. (February 16, 2001). A university beats the odds to produce black Ph.D.'s in math. *The Chronicle of Higher Education* [<http://chronicle.com/free/v47/i23a01401.htm>].
- McCall, A. (1999). *Motivational strategies for underachieving math students*. [<http://mstemac4.ed.uiuc.edu/mccall/summary.html>].
- Marzano, R. J., Brandt, R. S., Hughes, C. S., Jones, B. F., Presseisen, B. Z., Rankin, S. C., & Suhor, C. (1988). *Dimensions of thinking: A framework for curriculum and instruction*. Alexandria, VA: ASCD.
- Monk, D. H. (1994). Subject area preparation of secondary mathematics and science teachers and student achievement. *Economics of Education Review*, 13 (2), 125-145.
- National Assessment of Educational Progress (1985). *The reading report card: Progress toward excellence in our schools*. Princeton, NJ: Educational Testing Service.

- National Assessment of Educational Progress (1991). *Trends in academic Progress*. Princeton, NJ: Educational Testing Service.
- National Assessment of Educational Progress (1996). *NAEP 1994 trends in academic progress*. Princeton, NJ: Educational Testing Service.
- National Center for Education Statistics (1996). *High school seniors' instructional experiences in science and mathematics*. Washington DC: Government Printing Office.
- National Center for Education Statistics (1998). *Third International Mathematics and Science Study*. Washington, DC: U.S. Department of Education.
- National Commission on Excellence in Education (1983). *A nation at risk*. Washington, DC: Government Printing Office.
- National Commission on Teaching and America's Future. (1997). *Doing what matters most: Investing in quality teaching*. New York: NCTAF.
- National Council of Teachers of English, & International Reading Association (1996). *Standards for the English Language Arts*. Urbana IL: NCTE.
- National Council of Teachers of Mathematics. (1989). *Curriculum and evaluation standards for school mathematics*. Reston VA: NCTM.
- National Governors' Association (1986). *Time for results: The governors' 1991 report on education*. Washington DC: Center for Policy Research and Analysis.
- Oakes, J. (1990). *Multiplying inequalities: The effects of race, social class, and tracking on opportunities to learn mathematics and science*. Santa Monica, CA: The Rand Corporation.
- Palmaffy, T. (1999). Measuring the teacher quality problem. In M. Kanstoroom & C. E. Finn, Jr. (Eds.), *Better teachers, better schools*. New York: The Thomas B. Fordham Foundation.
- Raffini, J. P. (1993). *Winners without losers: Structures and strategies for increasing student motivation to learn*. Needham Heights, MA: Allyn and Bacon.
- Reich, R. R. (1989). Must economic vigor mean making do with less? *NEA Today*, 7, 13-19.
- Signer, B. R. (1992). *A study of black at-risk urban youth using computer-assisted testing*. (ERIC Document Reproduction Service No. ED 348024).

- Silver, E.A. (1998). *Improving Mathematics in Middle School: Lessons from TIMSS and Related Research*. Pittsburgh: School of Education and LRDC, University of Pittsburgh. [<http://www.ed.gov/inits/Math/silr-cov.html>].
- Steele, C. M., & Aronson, J. (1995). Stereotype threat and the intellectual test performance of African Americans. *Journal of Personality and Social Psychology*, 69 (5), 797-811.
- Toliver, K. (1993). The Kay Toliver mathematics program. *The Journal of Negro Education*, 62(1), 35-46.
- Treisman, U. (1992). Studying students studying calculus: A look at the lives of minority mathematics students in college. *The College Mathematics Journal*, 23 (5), 362-372.
- US Census Bureau (2000). *Projections of the total resident population by 5-year age groups, race, and Hispanic origin with special age categories: Middle series, 1999-2000* (NP-T4-A). Washington DC: Population Projections Program. [POP@CENSUS.GOV.]
- Villegas, A. (1992). *The competence needed by beginning teachers in a multicultural society*. Paper presented at the annual meeting of the American Association of Colleges of Teacher Education, San Antonio, TX.
- Wenglinsky, H. *How teaching matters: Bringing the classroom back into discussions of teacher quality*. Princeton, NJ: Educational Testing Service Policy Information Center.
- Wright, S. P., Horn, S. P., & Sanders, W. L. (1997). Teacher and classroom context effects on student achievement: Implications for teacher evaluation. *Journal of Personnel Evaluation in Education*, 11, 57-67.

Table 1. Comparing Schools Invited to Participate and Schools Participating in this Study to all AP Schools in two Subjects

	AP Calculus AB				AP English Language and Literature				Average		
	All AP Schools	Invited	Comparison (I/A)	Participated	Comparison (P/I)	All AP Schools	Invited	Comparison (I/A)	Participated	Comparison (P/I)	Comparison (P/D)
Number	9139	442	-	129	-	9603	400	-	101	-	27%
CB Region											
Middle States	20%	23%	1.15	20%	0.87	20%	18%	0.90	23%	1.27	1.07
Midwest	24%	8%	0.33	8%	1.00	21%	8%	0.38	8%	1.00	1.00
New England	8%	1%	0.12	1%	1.00	8%	1%	0.12	-	-	0.50
South	21%	30%	1.43	37%	1.23	22%	33%	1.50	31%	0.94	1.08
Southwest	9%	11%	1.22	16%	1.45	11%	20%	1.82	22%	1.10	1.28
West	18%	27%	1.50	19%	0.70	18%	18%	1.00	17%	1.00	0.85
Location											
Large City	19%	58%	3.05	58%	1.00	19%	53%	2.79	59%	1.11	1.06
Medium City	14%	12%	0.86	11%	0.92	13%	14%	1.07	12%	0.86	0.89
Town	24%	9%	0.38	14%	1.55	25%	11%	0.44	4%	0.36	0.96
Suburb	27%	16%	0.59	15%	0.94	26%	16%	0.62	16%	1.00	0.97
Rural	16%	3%	0.19	2%	0.67	17%	6%	0.35	9%	1.50	1.08
Type of School											
Public	79%	87%	1.10	87%	1.00	79%	87%	1.10	85%	0.98	0.99
Catholic	8%	9%	1.12	11%	1.22	9%	8%	0.89	12%	1.50	1.36
All other	13%	4%	0.31	2%	0.50	12%	5%	0.42	3%	0.60	0.55
Senior Class Size Mean (SD)	217 (154)	361 (195)	-	366 (192)	-	213 (153)	328 (195)	-	342 (209)	-	-

NOTE: I/A=the ratio of Invited schools to All schools; P/I=the ratio of Participating schools to Invited schools.

**Table 2. AP Calculus AB Students Participating in the Study:
Numbers and Percents* by Ethnic Group** and Gender**

Ethnic Group	Gender	All Participants		Students of More and Less Effective Teachers							
				Numbers				Percents			
				More Effective		Less Effective		More Effective		Less Effective	
AA	M&P	AA	M&P	AA	M&P	AA	M&P				
African American	Female	877	63.7%	297	76	216	103	68.8%	65.5%	56.5%	62.4%
	Male	496	36.0%	135	40	165	62	31.3%	34.5%	43.2%	37.6%
	Total	1376	17.8%	432	116	382	165	20.2%	7.1%	30.8%	13.9%
Mexican American & Puerto Rican	Overall										
	Female	380	53.1%	23	79	55	155	54.8%	45.4%	49.1%	57.4%
	Male	336	46.9%	19	95	57	115	45.2%	54.6%	50.9%	42.6%
	Total	716	9.3%	42	174	112	270	2.0%	10.7%	9.0%	22.7%
	Best Language: English										
	Female	170	51.7%	13	45	31	66	50.0%	46.4%	46.3%	59.5%
	Male	159	48.3%	13	52	36	45	50.0%	53.6%	53.7%	40.5%
	Total	329	4.3%	26	97	67	111	1.2%	6.0%	5.4%	9.4%
	Best Language: Bilingual										
	Female	134	53.0%	5	23	17	61	50.0%	47.9%	58.6%	52.1%
Male	119	47.0%	5	25	12	56	50.0%	52.1%	41.4%	47.9%	
Total	253	3.3%	10	48	29	117	0.5%	3.0%	2.3%	9.9%	
White	Female	1206	44.5%	455	244	186	192	46.8%	42.1%	43.3%	44.8%
	Male	1491	55.0%	516	335	244	237	53.1%	57.8%	56.7%	55.2%
	Total	2710	35.1%	972	580	430	429	45.4%	35.7%	34.6%	36.1%
All Other	Female	1470	50.5%	363	380	151	174	52.2%	50.3%	47.6%	53.9%
	Male	1375	47.2%	297	345	166	147	42.7%	45.7%	52.4%	45.5%
	Total	2912	37.7%	696	755	317	323	32.5%	46.5%	25.5%	27.2%
Total	Female	3933	51.0%	1138	779	608	624	53.1%	47.9%	49.0%	52.6%
	Male	3698	47.9%	967	815	632	561	45.1%	50.2%	50.9%	47.3%
	Total	7714	100.0%	2142	1625	1241	1187	27.8%	21.1%	16.1%	15.4%
Number of Teachers		129		35	25	34	25				
Average Number of Students per Teacher	Female	30.5		32.5	31.2	17.9	25.0				
	Male	28.7		27.6	32.6	18.6	22.4				
	Total	59.8		61.2	65.0	36.5	47.5				

*Percents may not add to 100 because of non-response to ethnic or gender questions.

**AA=African American; M&P=Mexican American and Puerto Rican.

**Table 3. AP English Literature & Composition Students Participating in the Study:
Numbers and Percents* by Ethnic Group** and Gender**

Ethnic Group	Gender	All Participants		Students of More and Less Effective Teachers							
				Numbers				Percents			
				More Effective		Less Effective		More Effective		Less Effective	
				AA	M&P	AA	M&P	AA	M&P	AA	M&P
African American	Female	1041	72.4%	148	87	385	177	71.8%	72.5%	70.6%	63.9%
	Male	380	26.4%	43	32	160	99	20.9%	26.7%	29.4%	35.7%
	Total	1438	21.8%	206	120	545	277	12.6%	8.8%	49.9%	30.7%
Mexican American & Puerto Rican	Overall										
	Female	380	60.9%	78	74	58	62	54.2%	55.6%	58.0%	47.0%
	Male	243	38.9%	65	59	42	70	45.1%	44.4%	42.0%	53.0%
	Total	624	9.4%	144	133	100	132	8.8%	9.8%	9.1%	14.6%
	Best Language: English										
	Female	172	56.0%	35	44	30	30	45.5%	50.6%	55.6%	42.3%
	Male	135	44.0%	42	43	24	41	54.5%	49.4%	44.4%	57.7%
	Total	307	4.6%	77	87	54	71	4.7%	6.4%	4.9%	7.9%
	Best Language: Bilingual										
	Female	137	65.6%	31	16	23	31	73.8%	69.6%	65.7%	56.4%
Male	72	34.4%	11	7	12	24	26.2%	30.4%	34.3%	43.6%	
Total	209	3.2%	42	23	35	55	2.6%	1.7%	3.2%	6.1%	
White	Female	1453	62.1%	350	274	141	161	61.0%	59.8%	62.1%	47.1%
	Male	775	33.1%	206	160	86	181	35.9%	34.9%	37.9%	52.9%
	Total	2339	35.4%	574	458	227	342	35.2%	33.8%	20.8%	37.9%
All Other	Female	1303	59.1%	383	357	128	69	54.3%	55.3%	57.9%	45.7%
	Male	845	38.3%	285	243	93	82	40.4%	37.6%	42.1%	54.3%
	Total	2204	33.4%	705	646	221	151	43.3%	47.6%	20.2%	16.7%
Total	Female	4177	63.2%	959	792	712	469	58.9%	58.4%	65.1%	52.0%
	Male	2243	34.0%	599	494	381	432	36.8%	36.4%	34.9%	47.9%
	Total	6605	100.0%	1629	1357	1093	902	24.7%	20.5%	16.5%	13.7%
Number of Teachers		101		34	22	33	21				
Average Number of Students per Teacher	Female	41.4		28.2	36.0	21.6	22.3				
	Male	22.2		17.6	22.5	11.5	20.6				
	Total	65.4		47.9	61.7	33.1	43.0				

*Percents may not add to 100 because of missing data

**AA=African American; M&P=Mexican American and Puerto Rican.

Table 4. Summary of AP Program Size for More and Less Effective Teachers

	More Effective		Less Effective	
	AA	M&P	AA	M&P
<i>All Students</i>				
Calculus	2,142	1,625	1,241	1,187
Literature	1,629	1,357	1,093	902
<i>Total for All Students</i>	3,771	2,982	2,334	2,089
<i>Target Minority Students</i>				
Calculus	432	174	382	270
Literature	206	133	545	132
<i>Total for Target Minority Students</i>	638	307	927	402

Table 5. Ethnic/Racial Breakdown of Students and Teachers

Ethnic Group	National Comparisons			Students in Study			Teachers in Study	
	Census Age 15-19*	National AP Pop.**		All Seniors in School	AP Takers****		All teachers in school***	AP teachers ***
		Calc AB	Eng Lit		Calc AB	Eng Lit		
African American	15%	4%	5%	35%	18%	22%	19%	11%
Hispanic	14%	5%	6%	35%	9%	10%	15%	12%
White	66%	67%	70%	23%	35%	35%	60%	70%
All other	5%	24%	19%	7%	38%	33%	6%	7%

*US Census Bureau (2000). ** AP Program (1998) ***Based on school questionnaire responses by 200 principals. ****Based on sample of students in study. See Table 3 for Ns.

Table 6. Special Efforts for Minority Students

	Principal	Calculus Teacher	Literature Teacher
N	200	129	101
Make students aware of AP	44%	21%	30%
Make parents aware of AP	34%	-	-
Attract students to AP	46%	20%	28%
Use special methods to select for AP	-	6%	8%

**Table 7. Practices and Goals Related to the AP Examination
As Reported by Principals, Calculus Teachers, and Literature Teachers**

Question	Principal	Calculus Teacher	Literature Teacher
N	200	129	101
<i>Practices regarding students taking the AP examination</i>			
Encourage students likely to get a 3 or higher	17%	14%	9%
Leave decision to the student	23%	23%	29%
All students take the exam	52%	57%	55%
Other	8%	6%	7%
<i>Goals for AP students (average rating: 1=low; 5=high)</i>			
Earn a grade of 3 or higher	3.8	3.9	3.7
Experience college-level work	4.4	4.5	4.8
Build confidence in subject	4.4	4.5	4.7
Build interest in subject	4.2	4.2	4.4
Improve chances of college admission	4.4	3.9	4.0
Gain confidence in college success	4.4	4.4	4.6
<i>School, district, or state pays AP examination fees</i>			
No	25%	-	-
All fees paid	37%	-	-
Fees paid for low income students	29%	-	-
Other	9%	-	-

Table 8. Students who Took AP and PSAT/NMSQT Examinations

Ethnic Group	Total Sample	N with AP Scores	% with AP Scores	N with AP and PSAT	% with AP and PSAT
<i>AP Calculus AB Students</i>					
African American	1376	1121	81%	811	59%
Mexican American and Puerto Rican	716	646	90%	388	54%
White	2710	2339	86%	1521	56%
All Other	2912	2372	81%	1476	51%
Total	7714	6478	84%	4196	54%
<i>AP English Literature and Composition Students</i>					
African American	1438	1189	83%	751	52%
Mexican American and Puerto Rican	624	548	88%	336	54%
White	2339	1850	79%	1443	62%
All Other	2204	1868	85%	1331	60%
Total	6605	5455	83%	3861	58%

**Table 9. Predicting AP Grades from PSAT/NMSQT Scores
in Schools Giving the Most AP examinations to Underrepresented Minority Students***

Ethnic Group	1997				1998				1999			
	N	V	M	V+M	N	V	M	V+M	N	V	M	V+M
<i>AP Calculus AB Students</i>												
African American	794	.37	.51	.52	1120	.40	.53	.54	1147	.42	.57	.58
Mexican American and Puerto Rican	565	.34	.47	.48	807	.40	.50	.51	952	.39	.49	.50
Asian American	1085	.31	.57	.57	1177	.44	.58	.58	1528	.39	.56	.57
White	1936	.37	.48	.49	2004	.39	.54	.56	2635	.34	.49	.49
<i>AP English Literature and Composition Students</i>												
African American	1354	.69	.53	.70	1724	.70	.52	.70	2096	.65	.50	.66
Mexican American and Puerto Rican	1017	.69	.52	.70	1390	.69	.52	.69	1808	.70	.51	.70
Asian American	1020	.74	.51	.75	1120	.69	.49	.69	1440	.70	.53	.71
White	2915	.68	.46	.69	3218	.67	.46	.67	4043	.65	.42	.66

* This table is based on all test-takers in the schools invited to participate, not just on participating schools. In other words, these correlations represent the entire population of interest for this study.

**Table 10. Predicting AP Grades with PSAT Scores, GPA, and Relevant Course Grades
All AP Test takers with PSAT/NMSQT Scores**

AP examination	All Predictors	PSAT + GPA + Relevant Grades	PSAT Alone
English Lit & Comp	-	.63	.62
Calculus AB	.52	.52	.49

*Data taken from Camara and Millsap (1998), p. 15.

Table 11. Relationship of School Characteristics to Success in Teaching Minority Students

Question Number		Calculus		Literature	
		AA	M&P	AA	M&P
A4	Percent of students NOT eligible for free or reduced-cost lunch	X	X		X
A5	Percent of seniors who graduate				X
A6	Percent of graduates who go on to college				X
A7	Percent of students NOT underrepresented minority			X	X
A8	School has special entrance requirements				X
A12a	Rating of students' academic background on arrival				X
A12b	Rating of students' attitude to academic achievement				X
A12c	Rating of students' regard for school property	-X			
A12f	Rating of parents' level of education				X
A12h	Rating of parents' support for AP		X		
A13a	Rating of minority students' academic background on arrival				X
A13b	Rating of minority students' attitude to academic achievement				X
A13f	Rating of minority parents' level of education			-X	X
A13h	Rating of minority parents' support for AP		X		
B3	Percent of AP students NOT eligible for free or reduced-cost lunch	X			
B5	Average number of years teaching experience, AP teachers	-X			
B10a-e	School supports attendance at AP Workshops		X		
B27	Grade of 3+ on AP exam an important goal				X

Correlations between +0.2 and -0.2 are not noted

**Table 12. Average AP Grades for More and Less Successful AP Teachers:
Their Success with Non-target Groups**

		Teachers Successful with African American Students			Teachers Successful with Mexican American and Puerto Rican Students		
		More	Less	Difference	More	Less	Difference
AP Grades for AP Calculus AB							
African American Students	Actual	<i>(Target Group)</i>			2.71	1.59	
	Predicted				2.23	1.74	
	Difference				.48	-.15	.63
AP Grades for AP English Literature and Composition							
Mex. Am. & P.R. Students	Actual	3.05	1.77		<i>(Target Group)</i>		
	Predicted	2.37	2.06				
	Difference	.68	-.29	.97			
White Students	Actual	3.33	2.37		3.11	2.58	
	Predicted	3.08	2.82		2.97	2.91	
	Difference	.25	-.45	.70	.14	-.33	.47
AP Grades for AP English Literature and Composition							
African American Students	Actual	<i>(Target Group)</i>			2.62	1.73	
	Predicted				2.42	1.90	
	Difference				.20	-.17	.37
Mex. Am. & P.R. Students	Actual	2.43	1.80		<i>(Target Group)</i>		
	Predicted	2.40	2.04				
	Difference	.03	-.24	.27			
White Students	Actual	3.25	2.48		3.18	2.74	
	Predicted	3.18	2.96		3.16	3.01	
	Difference	.07	-.48	.55	.02	-.27	.29

Table 13. The Relationship Between Success in Teaching African American students and Success in Teaching Mexican American and Puerto Rican Students

	Calculus	Literature
Correlation	.40	.11
N	43	44

Table 14. Relationship of Teacher Rating of Student Quality to Success in Teaching

Rating Category	Calculus				Literature			
	All*		Minority*		All*		Minority*	
	AA	MP	AA	MP	AA	MP	AA	MP
Academic background on arrival in HS	X	X	X	X	X			-X
Attitude toward academic achievement		X		X	X	X	X	
Regard for school property	X	X	X					
Aspirations to attend college		X		X				
Academic preparation of AP students		X		X	X	-X		
Parents' level of education	X			X	X			
Parents' support for student achievement								
Parents understanding/support of AP					X	-X		-X
Prelim courses to prep students for AP	X	X		X				
Sum of above quality ratings		X		X	X		X	-X

Correlations between +.20 and -.20 are not noted.

* Teacher questions D3 and D4. D3 rates the student body as a whole ("All"), D4 rates the minority student body ("Minority").

Table 15. Calculus: Relationship of AP Curriculum Emphases to Success in Teaching Minority Students

Calculus Curriculum Topic*	AA	M&P
Functions		
Analysis of graphs		X
Limits of functions		
Asymptotic unbounded behavior		
Continuity as a property of functions		
Derivatives		
Concept of a derivative		
Derivative at a point		
Derivative as a function		
Second derivatives		
Applications of derivatives	X	X
Integrals		
Riemann sums	X	X
Interpretation and properties of definite integrals	X	
Applications of integrals	X	X
Fundamental theorem of calculus		
Techniques of antidifferentiation		
Applications of antidifferentiation	.X	X
Numerical approximations to definite integrals	X	

Correlations between +.20 and -.20 are not noted.

*Question C3a – C3q.

Table 16. Literature: Correlation of AP Curriculum Emphases with Success in Teaching Minority Students:

Literature Curriculum Topic*	AA	MP
Literature		
Experience – subjective dimensions of reading and responding		
Interpretation – close reading for multiple meanings	X	
Evaluation of artistic achievement; social and cultural value		
Identifying and discussing structure, style, and themes		X
Identifying and discussing figurative language, imagery, symbolism, tone		X
Observing textual detail and establishing connections	X	X
Developing and organizing ideas in clear, coherent, persuasive language		X
Composition		
Writing to understand a literary work		
Writing to explain a literary work		
Writing to evaluate a literary work		X
Using a wide range of vocabulary	-X	X
Using a variety of sentence structure		X
Having a logical organization		
Balancing generalization with specific illustrative details		
Effectively using rhetoric		X
Writing under time constraints		

Correlations between +.20 and -.20 are not noted.

* Question C3.

Table 17. Relationship of Other Teacher Characteristics and Practices to Success in Teaching Minority Students

Teacher's Questionnaire, Common Questions	Calc.		Lit.	
	AA	MP	AA	MP
Teacher is a woman	X			X
Teacher is White (non Hispanic)			X	X
Professional development in discipline		X	X	
Knowledge of field now	X		X	X
Knowledge of AP program and exam now	X	X		X
Trend in all students dropping AP		X		
Trend in minority students dropping AP	X	X		
AP goal: students earn 3+ on AP exam	X	X		

Note: Correlations between +.2 and -.2 are not reported.