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RATE OF ADVANCED PLACEMENT (AP) EXAM TAKING AMONG AP-ENROLLED STUDENTS: A STUDY OF NEW JERSEY HIGH SCHOOLS

A Dissertation

Presented to

The Faculty of the School of Education

The College of William and Mary in Virginia

In Partial Fulfillment
Of the Requirements for the Degree
Doctor of Philosophy

by
Ellen C. Fithian
August 2003
RATE OF ADVANCED PLACEMENT (AP) EXAM TAKING AMONG AP-ENROLLED STUDENTS: A STUDY OF NEW JERSEY HIGH SCHOOLS

by

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The primary purpose of this study was to explore the phenomenon of AP exam taking among AP-enrolled students in the 309 New Jersey public schools that had at least one AP exam taken in 2001-02. New Jersey was chosen because its School Report Card, available on the New Jersey Department of Education web site as a downloadable data file, contains an unusual amount of course-level AP data along with a rich assortment of other school-level information. A second data source was a survey mailed to the 2001-02 AP schools that asked principals whether their school required AP-enrolled students to take the AP exam in 2002-03 and whether the school paid the exam fee. A total of 256 schools (83%) responded.

The major findings were the following. 1. Approximately 31% of schools required AP-enrolled students to take the AP exam. 2. The percentage of schools that required students to take the exam was greatest in districts with the lowest socioeconomic status and tended to decrease as the socioeconomic status of districts increased (although not in a linear pattern). 2. A similar, more linear pattern was observed for the percentage of schools that paid the exam fee. 3. There was a strong linkage between schools’ exam-requirement and fee-payment policies. Among schools that paid the exam fee, approximately 82% required students to take the exam. Conversely, among schools that required the exam, approximately 63% also paid the exam fee. 4. Schools that required AP-enrolled students to take the AP exam had lower AP enrollments per 100 11th and 12th graders and a lower percentage of graduates going to four-year colleges. They also
had lower SAT scores and lower percentages of students scoring Advanced on the statewide High School Proficiency Assessment Math and Language Arts sections.

The findings suggest a possible equity issue in that schools in which students were required to take the AP exam tended to be those that had lower academic achievement and socioeconomic status than schools in which students were not required to take the exam.

ELLEN C. FITHIAN

PROGRAM IN EDUCATIONAL POLICY, PLANNING, AND LEADERSHIP

THE COLLEGE OF WILLIAM AND MARY

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RATE OF ADVANCED PLACEMENT (AP) EXAM TAKING AMONG
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CHAPTER ONE

INTRODUCTION

Begun in the 1950s as a program designed to meet the needs of high-achieving students in a small number of elite, largely northeastern high schools, the Advanced Placement (AP) Program today serves students from every state and every type of high school (College Entrance Examination Board [CEEB], 2002e). In 2002 almost 940,000 students took close to 1.6 million exams (CEEB: 2003b) at an estimated 62% of American high schools (National Research Council [NRC], 2002). Further, the Cooperative Institutional Research Program’s (CIRP) national survey of freshmen at baccalaureate-degree granting institutions revealed that 59% had taken at least one AP course, and among students at the most selective private institutions, this figure rose to an impressive 92%. Even more impressive, almost two thirds (65.5%) of this latter group of freshmen had taken 4 or more courses (Sax, Lindholm, Astin, Korn, & Mahoney, 2001). These statistics attest to the significance of the Advanced Placement Program to high-achieving high school students.

The AP Program in the Context of Gifted Education

AP course work has been endorsed by several prominent researchers in gifted education as a means of providing an advanced curriculum appropriate to high-achieving learners (Feldhusen, 1998; VanTassel-Baska, 2001; Winner & von Károlyi, 1998). Feldhusen (1998) noted that “The major offering for gifted and talented students in most
secondary programs is special academic classes,” (p.230) and described three categories of such classes; honors, Advanced Placement, and seminar classes. While Feldhusen endorsed all three categories of classes, Herr (1992) found that teachers who had taught both Advanced Placement and honors courses in the same science subject to students of comparable ability and achievement regarded the AP curriculum as “significantly broader and deeper” (p. 526) than the curriculum of comparable honors courses.

A major advantage for the Advanced Placement Program at the secondary school level is that it allows for gifted programming that is domain-specific, i.e. targeted to high ability in a particular academic discipline, an approach that has been advocated by both Feldhusen (1998) and Winner and von Károlyi (1998). AP courses are also appropriate for secondary gifted learners in that they allow for acceleration, a practice that has received solid support in the field of gifted education (Benbow & Stanley, 1996; Feldhusen, 1991, 1998; Kolitch & Brody, 1992; Kulik & Kulik, 1992; Rogers, 1991; VanTassel-Baska, 1986, 2001). Moreover, this acceleration is flexible (VanTassel-Baska, 2001). Because students can begin taking AP courses in 9th grade (or potentially even earlier), the same AP Calculus course might represent one year of acceleration for some students in a class and three or four years of acceleration for others. Thus, in addition to providing a vehicle for differential programming that takes into account different levels of abilities across domains for individual students, AP is also able to take into account different levels of abilities within one domain across students.

A final criterion that gifted programming should ideally meet is that of providing smooth articulation between levels of schooling (VanTassel-Baska, 1986), and the AP Program fulfills this criterion admirably. The standardized, externally graded exams for
each course provide an efficient means for students to demonstrate their mastery of advanced course work and receive credit or advanced placement into higher level courses in college. In conclusion, the structure of the Advanced Placement Program allows participating high schools to meet many of the differentiated programming needs of their gifted students.

Beyond its practical advantages, VanTassel-Baska (2001) has pointed out that the program fits nicely within the conceptual framework of talent development proposed by Gagné, in which native abilities are converted into developed talents through a process of learning, training, and practice (Gagné, 1995). Finally, research focusing on students’ perceptions of their high school AP course work has attested to the high regard in which they held the AP Program (Casserly, 1968, 1986; Ralston, 1962; Sisler, 1989; Timoney, 1993). Casserly’s 1968 study in particular provided powerful testimony that for some students, AP courses offered a lifeline out of the undemanding tedium of high school.

The Impact of the Education Reform Movement on the AP Program

The AP Program began in the early 1950s as an outgrowth of two collaborative projects between elite colleges and outstanding high schools whose purpose was to improve high school to college articulation. In 1955-56, the College Board began administering the program (CEEB, 2002f), and with the exception of a few years in the early 1970s, its growth, measured as increases in the number of schools offering exams, students taking them, and exams taken, has been sustained (CEEB, 2003b). Over the last twenty years this growth has been fueled, at least in part, by two educational trends, the education reform movement and the increasingly competitive nature of selective college admissions.
The publication of A Nation at Risk in 1983 focused critical scrutiny on the American high school and spawned the education reform movement (Angus & Mirel, 1999; NRC, 2002). In an effort to increase the rigor of academic course work in high school, the National Commission on Excellence in Education (NCEE), author of the report, made two recommendations that have become foundations of the education reform movement. The first was a recommendation that states require all students to master a core academic curriculum in order to graduate, and the second was that states and localities administer standardized achievement tests at transition points of schooling (NCEE, 1983).

Following publication of A Nation at Risk, the education reform movement became and has remained a national priority, culminating most recently in passage of the No Child Left Behind Act of 2001 (NCLB), which requires states to develop challenging standards in reading and math and to test students annually in grades three through eight ("Executive Summary," 2002). Indeed, NCLB directly addresses AP exam taking, with one of its stated goals being

To encourage more of the 600,000 students who take advanced placement [sic] courses each year but do not take advanced placement [sic] exams each year, to demonstrate their achievements through taking the exams. (NCLB, 2002, Sec. 1702, p.1)

In summary, the education reform movement has focused on promoting a rigorous curriculum for all students and on performance-based accountability. These emphases have impacted the AP Program in several ways. First, the Program has received significant endorsement from some influential reform proponents. While the college

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bound curriculum proposed in *A Nation at Risk* did not include an AP course, the taking of at least one AP course has since been included in model curricula for college bound students by a National Center for Education Statistics (NCES) report (Horn, Kojaku, & Carroll, 2001) and by the Southern Regional Education Board (SREB), (SREB, n.d.a). Further, AP courses have been endorsed by The Education Commission of the States (Weiss, 2001) and former U.S. Secretary of Education Richard Riley (Riley, 1999).

Even more powerful than endorsement, however, has been state-level legislation enacted by twenty seven states aimed at promoting the AP Program through such measures as subsidizing exam fees, paying for teacher training, and mandating that credit be awarded for AP course work at public postsecondary institutions. Similarly, the federal government's AP Incentive Program provides grants to states aimed at promoting the taking of AP courses and exams by low-income students (CEEB, 2002b).

A third factor related to education reform that has likely spurred the offering of AP courses in high schools has been the collection and publication of AP participation data. This has been performed by many states in the form of school report cards (French & Bobbett, 1995), and by such influential organizations as The National Education Goals Panel (NEGP) and the Southern Regional Education Board (NEGP, n.d.b; SREB, n.d.b).

Finally, high schools in California face a fourth pressure - legal pressure brought about by two 1999 lawsuits on behalf of Black and Latino students. Both allege that these groups have less access to AP courses than White and Asian students, and that they are therefore unfairly disadvantaged by a University of California admissions policy that awards an extra point to grades earned in AP courses ("Advanced Placement: 2 Lawsuits," 1999; Hebel, 1999).
The problem of unequal access to AP courses is a serious challenge faced by the Program. A study of a national sample of 1217 public high schools in 1985 revealed that 72% of schools with 1000 or more students offered an AP Program compared to only 18% of schools with under 300 students (Hammer, 1990). Another study of all regular public high schools in California in 1997 found that when school size was controlled for, the number of AP subjects offered by schools tended to decrease as the percentage of Black and Latino students increased and as the percentage of low-income students increased (though to a lesser extent). The study also found that large schools tended to offer more AP subjects than small schools, and that rural schools tended to offer fewer AP subjects than urban and suburban schools, even when school size was controlled for (Pachon, Federman, & Castillo, 2000).

Urban schools, on the other hand, suffer by having lower AP performance than other schools. A 2001 study, undertaken jointly by the Council of the Great City Schools (CGCS) and the College Board, compared the test performance of AP test takers in 58 large urban school districts (GCS students) with the performance of a national sample of AP test takers on selected AP subject tests. The study found that overall, GCS test takers had lower mean AP test scores than the national sample in all 12 subject areas examined (CGCS & College Board, 2001). These disparities in AP participation and performance were identified by the Commission on the Future of the AP Program as one of the major challenges facing the AP Program in the future (Commission on the Future of the Advanced Placement Program, 2001).
The Impact of Increased College Admission Competition on the AP Program

In addition to the education reform movement, a second major educational trend that has contributed to expansion of AP is the increased competition for admission to selective colleges and the importance that AP course taking has assumed in this process (CFAPP, 2001; Johnstone & Del Genio, 2000; NRC, 2002; Rothschild, 1999). Surveys of admissions officers have indicated that AP course taking has become an important factor in admissions (Dillon, 1986; Herr, 1991) and is regarded by admissions deans as indicative of students’ motivation to take demanding course work (Herr, 1991; NRC, 2002). Further, AP courses are regarded as being more demanding and having greater quality control than honors courses (Herr, 1991).

The conclusion that AP course work plays an important role in competitive college admissions is one that many high school educators and students have reached (Gorman, 1999; Hebel, 1999; Kladko, 2000; Strauss, 2002), resulting in significant pressure for high schools to offer Advanced Placement courses and for ambitious students to take them. Thus, high schools in communities where the prestige of schools and the successful admission of graduates to prestigious colleges are considered important are hypothesized to face pressure to offer an extensive array of Advanced Placement courses.

Having examined two major educational trends that have fueled the growth of AP and created substantial pressures on states, school districts, and high schools to offer courses and on students to take them, it is time to take a critical look at the structure of the program itself. Does it justify the presumption of rigor accorded it?
The Structure of the AP Program

In keeping with its original mission, the College Board goes to significant lengths to develop courses whose content is equivalent to that of introductory college level courses and whose grading accurately predicts students' ability to progress successfully into higher level courses at college. New courses are developed by a committee of high school and college faculty who survey colleges and universities to ascertain the content of introductory courses in the discipline. Once the content domain of the course is established, the development committee collaborates with AP content experts, outside faculty, and statisticians to design the exam, which consists of multiple choice and free response sections (except in Studio Art, which has no multiple choice section) (CEEB: 2002g).

The multiple choice section that is drawn up is typically pretested on college students, and the exam undergoes multiple stages of review before being administered to AP students for the first time. Afterward, the results of the exam are subjected to statistical analysis to assess such factors as reliability, difficulty, and grade distributions (CEEB: 2002g). Exams are graded on a scale of 1 to 5, with 5 being the highest score and grades of 3 to 5 considered to reflect student achievement high enough to justify the awarding of college credit and/or advanced placement into higher courses in college (CEEB, 2002h). When the course content and exam have been established, the curriculum is made available to teachers through published materials including detailed course descriptions and teachers' guides (CEEB: 2002j).

With respect to teacher qualifications, the College Board recommends that teachers selected to teach AP be those who are experienced, have an advanced degree in
the content area, and attend College Board sponsored professional development
workshops (CEEB & Educational Testing Service, 1996). Thus, when the AP Program is
administered as intended by the College Board, it is an exemplary program that sets high
standards of teacher quality and professional development, a detailed curricular
framework, and an externally administered assessment of student performance. However,
the major problem with the AP Program is that these high standards are merely
recommendations, not requirements.

In the words of the NRC (2002) report,

Systematic information is lacking about the AP and IB programs as they are
actually implemented in U.S. high schools, including the instructional strategies
used in individual classrooms, the structure of the syllabi in different schools, the
quantity and quality of the facilities available, the preparation of teachers who
teach the courses, and the ways in which students are prepared prior to advanced
study. What is known, however, is that there is wide variation among teachers and
schools. (p.155)

In light of the lack of standardization in the administration of AP courses, the AP
exam assumes critical importance in ensuring course integrity. Unless a majority of
students take, and score well on, the end-of-course AP exam, there is no way of verifying
the rigor of a course or the material that students have learned. Herein lies a major
challenge facing the AP Program today, for the College Board has estimated that
nationally, the overall percentage of course enrollments culminating with a student taking
the AP exam was only 70% in 2002 (R. Morgan, personal communication, December 20,
2002). Apart from this global statistic, what do we know about AP exam taking?
Research on AP Exam Taking

Baseline information on national rates of exam taking among AP-enrolled students comes from unpublished information collected by the Educational Testing Service (ETS) for the College Board. An annual fall survey of AP coordinators at high schools asks schools for the number of students enrolled in each AP course. By comparing these numbers to the numbers of students in each course who take the AP exam in the spring, ETS has calculated the percentage of exam takers by state and nationally. Of note, these percentages have increased steadily, from 58% in 1996 to 70% in 2002 (R. Morgan, personal communication, October 4, 2002 and December 20, 2002).

The percentages of AP exams per course enrollments have also been calculated by ETS for individual AP subjects. These percentages ranged from a low of 38% for Studio Art: Drawing to a high of 99% for Physics C – Electricity and Magnetism (R. Morgan, personal communication, December 20, 2002), indicating that the rate of exam taking varied across subjects and was not a uniform 70%.

The increase in the rate of exam taking over the past six years provides encouraging evidence that at the national level, the rate of exam taking is moving in the right direction. What this data does not tell us, however, is the extent to which course enrollments in individual courses, or in individual high schools, are culminating in AP exams, or the extent to which the rate of exam taking varies across courses or high schools.

For example, an overall exam-taking rate of 70% could be achieved by 70% of students in every AP course taking the exam, or by all students taking the AP exam in 70% of courses and no students taking the exam in 30% of courses. These would present
very different scenarios. If the rate of exam taking were uniform across courses and high
schools, i.e. if all AP courses had an exam-taking rate of 70%, we might see this as a
situation that needs improvement, but is not alarming, especially considering that the
national percentage of exams taken in AP courses has been increasing. If, on the other
hand, it were true that 30% of courses had no students taking AP exams, this would be a
cause for greater concern, particularly if the courses where no students took exams were
not randomly distributed across high schools. The situation would be worst of all if such
courses were in fact overrepresented in the high schools serving predominantly low-
income or underrepresented minority students.

What do we know about the phenomenon of exam taking; about which students
take exams, or about which types of courses, high schools, or school districts are
characterized by high or low rates of exam taking? The short answer is that we know very
little, but what is known is presented herein.

Herr (1990) surveyed 197 teachers of both AP and honors science courses in
California, New York, and New Jersey high schools. Teachers’ reports of test-taking
rates in their classes revealed that the average rate was 70%, but there was a wide range
of rates, and in 10% of courses no student took the AP exam. This situation prompted
Herr to wonder what defined an AP course. Four other studies involving interviews
and/or surveys of former and current AP students revealed that while students had
positive perceptions of the AP Program overall, in a certain percentage of courses they
had not felt adequately prepared for the exam (Casserly, 1968; Murray, 1980; Sisler,
1989; Troidl & DeGracie, 1985). In the case of former AP students from twelve AP high
schools in Hawaii, fully 59% of students felt inadequately prepared for the AP exams.
Even more surprising, only 67% of teachers felt their students were “being adequately prepared” (Murray, 1980, p.111).

The Hawaii study also revealed that 26% of former and 13% of current AP students reported that the exam fee had kept them from taking the exam (Murray, 1980).

Another dissertation consisting of a comparative case study of two schools, one located in an affluent area and serving predominantly White students and the other located in an economically depressed area and serving primarily African American students, identified two other factors that impacted exam taking. The school policy in the affluent school required students enrolled in AP courses to take the exam, while the less affluent school granted dual enrollment credit whether or not the student took the exam. As a result, all students took the exam at the affluent school whereas only two students took the exam in the two AP classes studied at the low-income school (Miller, 1994).

A further difference between the schools was found to be the academic achievement/ability of the students, with students at the affluent school having much higher average PSAT scores than students at the low-income school. Teachers at the affluent school described their courses as college level and focused on the exam, whereas teachers at the less affluent school commented that their students did not have the skills to do college level work, and consequently the course was not taught at a college level. Thus, in this qualitative study, school policy, student academic achievement/ability and teacher expectations could have contributed to the different rates of exam taking (Miller, 1994).

Two last sources of information on exam taking, while not scholarly works, do have relevance for the issue. The first is a report from the Connecticut Commissioner of
Education to the Connecticut Board of Education (available online) detailing many AP statistics. One table contained the percentage of AP-enrolled students who took the AP exam within Education Reference Groups (ERG), a socioeconomic categorization used by the Connecticut Department of Education to provide for fair comparisons between schools of similar socioeconomic status. An examination of the rates of exam taking for different ERGs revealed that schools in the highest socioeconomic status ERGs had the highest rates of exam taking (Sergi, 2002).

Finally, two news articles in a northern New Jersey newspaper addressed the issue of AP students opting out of the exam, and contained some relevant, though anecdotal, data. First, strategies that had been adopted by high schools to encourage AP exam taking were requiring students to take the exam, reimbursing students for their exam fees for exam grades of 4 or 5, and excusing students who took the AP exam from taking the teacher's final exam. Moreover, one principal speculated that one reason for students not taking AP exams was that some students were taking so many AP courses that expecting them to take all the exams would be unreasonable (Kladko, 2000, 2002).

The foregoing studies document that considerable variation exists in the percentage of AP students who take AP exams in different contexts. With the exception of the College Board/ETS data on the differing percentages of AP students taking exams in the different subjects (R. Morgan, personal communication, December 20, 2002), however, the data presented do not shed much light on patterns of exam taking in different types of courses and in different types of high schools, or on relationships between the rate of exam taking and district- and school-level characteristics. In short, a systematic study of the exam-taking phenomenon has not occurred, and this study aims to
begin to fill that void through an analysis of data on New Jersey public schools made available through the New Jersey School Report Card.

The Rationale for Studying New Jersey

The study focuses on New Jersey public schools for several reasons. First and foremost is the unusual amount and quality of data available. New Jersey School Report Cards, mandated by state law in 1995, consist of a wide assortment of data on all New Jersey public schools. In 2002, up to six years of school level data are included for several broad categories of information; demographic and organizational data, test results for the state-administered tests, SAT and AP tests, post-high school plans of graduates, and information on the finances and personnel of the school district (NJDOE, 2003a).

With respect to AP data, information is available for each AP course offered in each high school. This data includes the numbers of students enrolled in the course, the number who took the AP exam, and the frequency distribution of AP grades (NJDOE, 2003c).

New Jersey is an excellent state in which to study the AP Program for other reasons as well, however. It had the highest percentage of public schools offering AP Programs in the nation, an impressive 98.1%, in 2001 (CEEB: n.d.a). Furthermore, with 282 exams taken per 1000 11th and 12th graders in 2001-02, New Jersey ranked higher than all but seven other states on that AP participation indicator (CEEB: n.d.b).

New Jersey also participates in a federally funded fee reduction program that allows low-income students to take AP exams at no cost (NJDOE, n.d.a), which should ensure that the exam fee is not a barrier for the most economically disadvantaged students in the state. For all of the foregoing reasons, New Jersey is a model state in which to investigate the phenomenon of AP exam taking and to begin to gain insights into patterns
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of AP exam taking and relationships between exam taking and district-, school-, and course-level variables.

The variables chosen to be investigated were those that met two criteria; they seemed likely to be related to the rate of exam taking based on the literature reviewed and they were included in the New Jersey School Report Card database. The course-level variable to be studied is AP subject, and the district- and school-level variables are:

• District Factor Group (a measure of the socioeconomic status of the districts in which schools are located),
• AP enrollment per 100 11th and 12th graders
• Percentage of graduates going on to four-year college
• Sum of the 50th percentile Verbal and Math SAT scores
• Percentage of 11th graders scoring Advanced on the state-level High School Proficiency Assessment in Math and Language Arts
• Percentage of faculty and administrators with an M.A. or Ph.D.

Conceptual Framework of this Study

This study views the phenomenon of AP exam taking within Gardner's (1984) conceptual framework regarding equity and excellence. Gardner explained the conflict between equity and excellence in a free society, one where status is not determined by family stature, as follows:

When a society gives up hereditary stratification, there are two ways in which it may deal with the dramatic individual differences in ability and performance that emerge. One way is to limit or work against such individual differences, protecting the slow runners and curbing the swift. This, roughly speaking, is the
path of equalitarianism. The other way is simply to let individual differences determine the result. As we shall see, in their moderate forms each of these points of view-equalitarianism and unfettered individual performance—is a necessary ingredient of a healthy society (p.17)

Thus, equalitarianism regards equity as the highest virtue, while champions of individual achievement prioritize excellence. Both positions have ideological merit, but Gardner noted that either, taken to its extreme, is destructive to society. Extreme equalitarianism risks creating a society in which there is no reward for high performance, while unbridled emphasis on individual achievement may lead to a potentially volatile situation in which there are large gaps in the rewards accorded those who possess socially valued abilities and those who do not (Gardner, 1984).

Gardner asserted that “Americans love the idea of equality” (p.27) and that their concept of it encompasses a belief in the basic entitlement of all individuals to “care and concern” (p.28), legal rights, and equality of opportunity. This last is particularly relevant to American education, in that while schools face the necessary but difficult task of differentiating education for students of varying abilities, equality of opportunity can be honored by avoiding the labeling of students and premature sorting of them into pathways from which they cannot deviate. On the contrary, Gardner espoused the practice of providing students with multiple opportunities to excel.

High schools, according to Gardner (1984), face the greatest challenge in dealing constructively and sensitively with students of differing abilities. He noted that “At times our desire to protect young people from invidious comparisons has produced serious confusion in educational objectives and a dangerous erosion of standards” (p.91). This
conflict between the goals of equity and excellence speaks directly to the central issue facing the AP Program today. Assigned the task of charting AP’s future course, The Commission on the Future of the Advanced Placement Program (CFAPP) (2001) stated that, “the dual challenges of providing equitable access to AP and maintaining the high quality of AP as the Program grows dominated our discussions and became the central themes for our report and its recommendations” (p.vi).

Honoring the ideal of equity prompts educators to broaden access to AP course work to students in a wider range of geographic areas and types of high schools as well as to students in a wider range of abilities than was previously the case. However, such an expansion has the potential to significantly erode the quality of courses designated as AP. It is immediately apparent that this would threaten the excellence of the program, but upon further consideration, it can be appreciated that diminished quality of AP course work would threaten equity as well in two ways.

First, if AP courses become a mere facade for rigor, then improving access to them will only constitute improving access to the facade of rigor instead of to rigor itself. The CFAPP alluded to this when it asserted, “there is no true AP equity without AP quality” (CFAPP, 2001, p.5). Moreover, if weak AP courses become more common in schools serving disadvantaged students, an outcome that does not seem unlikely, then inconsistent quality of AP course work will widen societal inequity.

Second, if the result of AP Program expansion is the watering down of courses, then the students most hurt will be gifted students, for whom appropriately rigorous programming is a vital ingredient of talent development. Benbow and Stanley (1996) address the conflict between excellence and equity for gifted students directly, citing

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Gardner and making the point that the “dumbing down” (p.261) of curricula and textbooks that began in the 1960s has led to an educational environment wherein gifted students are not sufficiently challenged. They concluded that the overzealous effort to promote equity in the form of instructional material accessible to all has led to inequity for gifted students in that they have been denied the opportunity to fully develop their abilities. Gardner (1984) also identified the vulnerability of gifted education to overzealous advocates of equity, and spoke to the need for education to “provide opportunities and rewards for individuals of every degree of ability so that individuals at every level will realize their full potentialities, perform at their best, and harbor no resentment toward those at any other level” (p.113).

Within the current structure of the AP Program, the exam is the sole means of accountability and quality control. Unless a majority of students in an AP course take the exam, there is no way of knowing the extent to which the AP curriculum was successfully taught and mastered by students. At the extreme, if few or no students take the exam, there is no way of knowing whether the AP label has any meaning. For this reason, exam taking is the lynchpin that will allow the AP Program to expand with confidence that the quality of course work is being maintained. It provides the critical link that will ensure that increased access to AP courses (equity) does not threaten course quality (excellence). This study, which will examine the phenomenon of exam taking in New Jersey high schools and the district-, school- and course-level factors that are related to it, should provide an important first step toward understanding the current exam taking situation and devising ways to improve it.
Statement of the Problem

The AP Program began as an outgrowth of two collaborative programs between a small number of elite, largely northeastern high schools and colleges. Moreover, it was originally intended to serve highly able students (CEEB, 2002e). The program has experienced phenomenal growth, however, with the number of AP schools increasing from 104 in 1955-56, the first year the College Board began administering the Program, to 14,157 in 2001-02. A mere 2,199 exams were taken that first year, compared to over 1.5 million in 2001-02 (CEEB, 2003b). Two factors that have contributed to the program’s growth have been the education reform movement (CFAPP, 2001) and the increased competition for admission to selective colleges (along with the importance that AP course taking has assumed in this process) (CFAPP, 2001; Johnstone & Del Genio, 2000; NRC, 2002).

The consequence of the AP Program’s expansion was aptly stated in the NRC (2002) report:

With the growth of AP as a perceived standard of excellence and school quality, the incentive to use the AP name inappropriately has also increased. Some schools may label non-AP courses as AP, while others may sponsor AP courses without providing proper facilities and personnel resources. (p. 11)

As long as the AP Program continues to operate on an honor system, the AP label on a course will communicate no meaningful information about the quality of the course or the learning of individual students unless students have taken, and scored well on, the AP exam. In the words of the Commission on the Future of the Advanced Placement Program (2001),

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Examinations are at the heart of AP, serving as the external, objective standard of success and so providing colleges and universities with valid measures of accomplishment. As curricula change and educational reforms continue, the examinations give the College Board the means to exercise quality control over what is called an AP course. (p. 14)

Certification of student learning in AP courses has never been so vital, yet in 2002, only 70% of AP course enrollments culminated in an AP exam. While this percentage has been increasing steadily from 58% in 1996 (R. Morgan, personal communication, December 20, 2002), a number of studies reveal that considerable variation in rates of exam taking exists across different courses and contexts (Herr, 1990; Kladko, 2000, 2002; Sisler, 1989; Troidl & DeGracie, 1985). Four of the studies also revealed variation in the extent to which students who had taken AP courses felt prepared for the AP exam (Casserly, 1968; Murray, 1980; Sisler, 1989; Troidl & DeGracie, 1985).

These studies provide snippets of information about AP exam taking, but provide no thorough description or understanding of the phenomenon. Given the critical importance of the AP exam, it is time to redress that situation.

Overview of Methodology

This study will primarily consist of a descriptive statistical analysis of New Jersey School Report Card data from 1997-98 through 2001-02, with particular focus on the years 2000-01 and 2001-02. A secondary source of data comes from a survey of AP high schools in which at least one AP exam was taken in 2001-02. The data sources are described below.
Data Sources

New Jersey School Report Card (SRC) Data

The primary data source for this study was the New Jersey SRC data from 1997-98 through 2001-02, which was available as a downloadable, online data file entitled NJ.CSV-Files.zip located at http://nj.evalsoft.com/. Additional data sources which were available through the NJDOE web site were Individual School Report Cards for each school (in a pdf format) located at http://nj.evalsoft.com/njPDF/default4632.asp and the School Directory, which was available as a downloadable Microsoft Excel file located at http://www.state.nj.us/njded/directory/dl_schools.shtml.

New Jersey SRC data consist of a rich collection of school and district-level information including an unusually detailed degree of information on AP course and exam taking. The AP course enrollment and number of exams taken are listed, by high school, for every AP course given in the state. Data for each year is entered electronically by district personnel in the fall of the following year (2001-02 data was due October 18, 2002). Data collection methodology for the 2002 Version of the Electronic Data Collection Software was outlined in detail in an online User’s Manual (NJDOE, Division of Deputy Commissioner, 2002) and consisted of the following steps. The district data entry person (the user) logged on to an NJDOE network, the DOEnet, and downloaded the Report Card software. The user chose county and district and school numbers for each school, and then entered information into an electronic worksheet on which certain information had already been entered by the NJDOE.

According to the online User’s Manual, AP information was collected as follows. The number of students taking each of the AP exam subjects in each high school,
provided to the NJDOE by the Educational Testing Service (ETS), was preloaded into one field of the Electronic Data Collection Software. The user was then instructed by the User’s Manual to enter into a separate field the number of students who were enrolled in an AP course in the subject corresponding to each AP exam (NJDOE, Division of Deputy Commissioner, 2002).

While this is how collection of AP data was described in the User’s Manual, it does not completely describe the process, according to an employee in the School Report Card office (who prefers not to be named and is therefore referred to throughout this dissertation simply as SRC Office employee). This further information about data collection came to the investigator’s attention on June 18th after preliminary data analysis raised questions about possible data artifact. Specifically, the trend analysis of the rate of exam taking for New Jersey high schools had revealed that the percentage of schools reporting 100% AP exam taking had increased from approximately 19% to almost 49% from 2000-01 to 2001-02, prompting the investigator to contact the SRC Office to inquire whether there had been any change in data collection methodology that might have contributed to the observed increase in the number and percentage of schools reporting 100% exam taking.

In response to closer questioning about AP data collection, the investigator was informed that not only was the AP exam field preloaded with the number of AP exams taken; the AP enrollment field for each subject was also preloaded with the same number (SRC employee, personal communication, June 18, 2003). In other words, the default entry for AP enrollment for every AP subject was the same number as the number of students who took AP exams in the subject in that high school. District personnel were
intended to change the preloaded number to the correct number, according to the SRC Office employee, but this investigator’s examination of the User Manual did not uncover any notation that the AP enrollment field had been preloaded with exam data, nor explicit instructions to the user to change the AP enrollment field to the correct number, if different from the exam number (NJDOE, Division of Deputy Commissioner, 2002).

This situation raises the possibility that rates of exam taking of 100% for a school might reflect a user not having understood that he was intended to change the preloaded number in the enrollment field. Similarly, if a user had missed that section of the worksheet completely and entered nothing, the rate of exam taking for the high school would have been recorded as 100%. If the AP enrollment field had been preloaded with AP exam numbers for the first time in 2001-02, this could certainly account for the marked increase in number of schools reporting 100% exam taking that year compared to the previous year. However, the SRC Office employee also asserted that the AP data collection situation just described had not changed over the past five years (SRC employee, personal communication, July 14, 2003). If this is correct, the preloaded enrollment field could not have accounted for the change between 2000-01 and 2001-02, although it might have contributed to an inflated number of schools reporting 100% exam taking in all affected years.

An analysis of the extent to which this data collection artifact might have affected rates of exam taking, particularly for 2001-02, is presented in Chapter Four and its implications discussed in Chapter Five. For the purposes of this chapter, however, what is important to note is that the questions raised about the potential data collection artifact
prompted the experimenter to analyze 2000-01 data as well as 2001-02 data for those portions of data analysis whose credibility were threatened by the potential artifact.

The Survey Instrument

A secondary source of data for this study came from a two-question survey sent to high schools that had at least one AP exam taken in 2001-02. (A copy of the questionnaire is included in Appendix A). The instrument was addressed to the principal, with instructions indicating that it could be completed by him/her or given to another individual knowledgeable about the relevant policies. The first question asked whether the school pays the exam fee for all students and the second asked whether the school requires AP students in all (or almost all) AP courses to take the AP exam. The second question was patterned after a similar question included on the annual College Board AP Participation Survey sent to AP schools in the fall (provided to me by R. Morgan, January 9, 2003) so that the New Jersey results could be compared to the national College Board findings.

Research Questions and Corresponding Data Analyses

In general, the approach taken was to describe patterns of data and relationships between different variables, with the main focus on the years 2000-01 and 2001-02. Because so little is known about the phenomenon of rate of exam taking, and because evidence will be presented in Chapter Two that AP Program implementation is likely to vary widely from state to state, the results of this study of exam taking in New Jersey for two particular years cannot reasonably be generalized to other states. For this reason, and because the schools studied represented the population of all AP schools in New Jersey in the two years rather than a sample, it was decided to limit the analysis to descriptive
rather than inferential statistics. The main elements of the analysis, by research question, are as follows.

Research Question 1

What were the patterns of AP exam taking among students enrolled in AP courses in New Jersey public schools in 2001-2002? Specifically, what is the rate of exam taking for:

- The state
- All AP high schools
- All AP courses
- All AP subjects

Analysis.

The rate of exam taking, essentially the percentage of course enrollments culminating in an AP exam, was calculated for each course, high school, AP subject across the state, and for the state overall. Frequency distributions for the rates of exam taking of all high schools, courses and subjects were examined. Descriptive statistics and histograms were also used to characterize distributions of the various rates of exam taking. An analysis of the likelihood that data from 2001-02 was impacted uniquely by the collection artifact discussed earlier was included in this question.

Research Question 2

What was the statewide trend in rate of AP exam taking among AP-enrolled students in New Jersey public schools from 1997-1998 through 2001-2002?
Analysis.

The statewide rate of exam taking was calculated for each year, along with the percentage of schools that reported 100% rate of exam taking.

Research Question 3

What relationships exist between district- and school-level variables and the rate of AP exam taking among AP-enrolled students in New Jersey public schools?

The specific variables included in the study are:

- District Factor Group (DFG)
- AP enrollment per 100 11th & 12th graders
- Percentage of graduates going to four-year college
- Sum of 50th Percentile SAT Verbal and Math Scores
- Percentage of 11th graders scoring Advanced on Math Section of the High School Proficiency Assessment (HSPA)
- Percentage of 11th graders scoring Advanced on the Language Arts Section of the HSPA
- Percentage of faculty and administrators with an M.A. or Ph.D.

Analysis.

District Factor Group (DFG) is used in this study as the proxy for socioeconomic status of a school (or, more accurately, of the district in which the school is located). The DFG categorization is a ranking of the socioeconomic status of districts based on seven indicators. It was developed to allow for student test scores to be compared against the test scores of other schools whose students had similar socioeconomic backgrounds (NJDOE, n.d.c).
Accordingly, districts have been placed by the NJDOE into one of eight categories, of which District Factor Group A encompasses districts with the lowest socioeconomic ranking while District Factor Group J includes those with the highest socioeconomic status. A preliminary analysis compared mean and median rates of exam taking of the schools in each DFG. Then, for a more complete picture of the relationship between DFG and rate of exam taking (RET), high schools were placed into one of three groups based on their RET; high (RETs of 90 to 100%), medium (RETs from 60 to less than 90%), and low (RETs of less than 60%). Then, the percentage of schools within each DFG that fell into high, medium, and low RET groups was calculated and charted.

For each of the remaining six school-level variables, the median values of the variable for each of the three RET groups were compared. Thus, for the variable SAT score, the median 2001-02 SAT score for schools in the high RET group was compared to the median SAT scores for schools in the medium and low RET groups.

**Research Questions 4A and B**

4A. What are the characteristics of New Jersey public schools that require students in all (or almost all) AP courses to take the AP exam?

**Analysis.**

The preliminary analysis examined the responses to the survey question asking whether schools required all (or almost all) students enrolled in AP courses to take the exam. Next, the percentage of schools that required the exam within each DFG was calculated and presented graphically. Finally, schools were divided into two exam requirement groups; schools that required the exam versus those that did not so that these groups could be compared. For each of the remaining six school-level variables, the
median values of the variable were compared for each of the exam-requirement groups. Of note, school policies were those that were in effect in 2002-03, while school variables were those reported for 2001-02, as 2001-02 is the most recent year for which School Report Card data is available.

4B. What percentage of New Jersey public schools that require students to take the AP exam pay the exam fee?

Analysis.

The first step in this analysis was an examination of the responses of schools to the question asking whether they paid the exam fee for all students. Next, the specific research question was answered, and finally, the percentage of schools that paid the exam fee was calculated for each DFG and was presented graphically.

Research Question 5

How does the assessment of an AP course based on the percentage of AP test takers who achieve an exam grade of 3 or better compare to the assessment of the same course based on the percentage of AP-enrolled students who achieve an exam grade of 3 or better?

Analysis.

For this analysis, all English Literature and Composition courses offered in New Jersey in 2001-02 for which exam grades were reported were identified and two different indexes were calculated for each; the percentage of test-takers who earned exam grades of 3 or better and the percentage of AP-enrolled students who earned exam grades of 3 or better. English Literature and Composition was chosen as the course to be analyzed because it was the second most commonly offered course that year. (The first, Calculus
AB, was not chosen because students sometimes take the test even though they have been enrolled in a Calculus BC course (R. Morgan, personal communication, July 31, 2003).

Of note, the word “course” used here does not denote a single class, but rather all the students at a particular high school who took English Literature and Composition in 2001-02.

Once these two indexes had been calculated for each course, two analyses were performed. First, the Pearson correlation coefficient between the two percentages was calculated. Then, to assess the extent to which these indexes can differ from another vantage point, all courses in which the percentage of exam grades of 3 through 5 per test takers was 100% were identified. Then, the range of the second index, percentage of exam grades of 3 through 5 per AP-enrolled students, was examined to determine how much the second index varied across a group of courses that had the same value for the first index.

Statement of the Purpose

It is unarguable that the AP Program would be stronger if all students enrolled in AP courses took the corresponding AP exam. Such a situation would allow teachers and high school administrators to evaluate how effective their AP courses were in transmitting the AP curriculum to students. It would help students assess their learning and identify weaknesses before they go on to college. Finally, it would help colleges make fair evaluations of student achievement by ensuring that all students are being compared against a standardized metric.

Currently, we know very little about the phenomenon of AP exam taking. How much do rates of exam taking vary across courses and across high schools? What
characteristics of school districts and public high schools are related to the rate of exam
taking? What percentage of schools require students to take the AP exam, and what
percentage pay the exam fee? We do not know the answer to any of these questions, and
by not knowing them we limit our ability to effect positive change. The purpose of this
study is to begin to explore the phenomenon of AP exam taking among the population of
AP high schools in New Jersey over the five years between 1997-98 to 2001-02 and,
more closely, in the two years 2000-01 and 2001-2002.

Because so little is known about patterns of AP exam taking among AP-enrolled
students, the analytic approach was designed to minimize assumptions about what would
be found. To use a simile, this study is like an exploratory journey into an uncharted
territory whose terrain could as easily be desert as rain forest, river valley as mountain
peak. The logical first step in such an expedition would be to describe the character of
the landscape, noting whether there are rivers or mountains, or neither, so that future
explorers could determine how wide the rivers or how high the mountains. Thus, the
initial questions to be addressed in this study of AP exam taking in New Jersey will be
aimed at describing that landscape in order to determine what additional questions would
be meaningful.

To extend the analogy, this study will only provide information on the landscape
of AP exam taking in New Jersey. Just as exploring one region of a large territory would
not necessarily provide accurate information on other regions, so the exam-taking
situation in New Jersey may not reflect exam taking elsewhere. As will be discussed
more fully in Chapter Two, state legislation, the prevalence of AP courses in high
schools, and other variables that have not yet been clearly identified make it likely that
AP course taking and exam taking vary substantially from state to state. Without such an understanding of the variables that impact AP exam taking, it is impossible to generalize from one state to another or even, as the data will show, from year to year within New Jersey. As a consequence, the analytic approach utilized is a descriptive one, meant to generate potential future hypotheses, but not to generalize to other populations.

In conclusion, then, it is hoped that this study will begin the vital task of charting the frontier of AP exam taking and discovering meaningful questions for future investigations.
CHAPTER TWO

REVIEW OF THE LITERATURE

The Advanced Placement (AP) Program began in the 1950s as a program designed to meet the needs of high-achieving students in a small number of elite, largely northeastern high schools. Today, however, it serves students from every state and every type of high school (CEEB: 2002e). In 2002 almost 940,000 students took close to 1.6 million exams (CEEB: 2003b) at an estimated 62% of American high schools (NRC, 2002). The prevalence of AP course taking among college-bound students is further revealed by data from the Cooperative Institutional Research Program’s [CIRP] national survey of freshmen at baccalaureate-degree granting institutions. Among freshmen at all institutions, 59% had taken at least one AP course (Sax, Lindholm, Astin, Korn, & Mahoney, 2001).

For students attending very high selectivity private universities, the subgroup of institutions with the highest mean combined SAT score (1310 or higher), the percentage of students who had taken at least one AP course rose to a whopping 92.3%. More impressive still, almost two thirds (65.8%) of this group of freshmen had taken four or more courses, and 23.3% had taken seven or more courses (Sax, Lindholm, Astin, Korn, & Mahoney, 2001). These statistics bear compelling testimony to the fact that the AP
Program constitutes a significant component of education for high achieving students at the secondary school level today, particularly those bound for the most selective colleges.

The AP Program in the Context of Gifted Education

AP course work has been endorsed by several prominent researchers in gifted education as a means of providing an advanced curriculum appropriate to high achieving learners (Feldhusen, 1998; VanTassel-Baska, 2001; Winner & von Károlyi, 1998).

Feldhusen (1998) noted that “The major offering for gifted and talented students in most secondary programs is special academic classes,” (p.230) and described three categories of such classes; honors, Advanced Placement, and seminar classes. While Feldhusen endorsed all three categories of “special classes,” Herr (1992) found that teachers who had taught both Advanced Placement and honors courses in the same science subject to students of comparable ability and achievement regarded the AP curriculum as “significantly broader and deeper” (p. 526) than the curriculum of comparable honors courses.

Support for Advanced Placement courses for gifted learners was also found in Rogers’ 1991 best evidence synthesis of twelve different accelerative options. Advanced placement was defined in that study as the “provision of courses with advanced or accelerated content, usually at the secondary school level, which affords the student an opportunity to ‘test out’ of or be given credit for completion of college-level coursework” (p.11). Such courses included College Board sponsored Advanced Placement courses but were not limited to them. While the effect size for advanced placement coursework did not rise to Rogers’ standard for significance (ES=. 30), it was found to be positive. The effect size for academic outcomes in the sixteen studies in which effect size could not be
calculated from the study data was estimated at .12, while the effect size for academic outcomes in the five studies in which effect size could be calculated was .27.

**AP as a Form of Differentiated Programming for Gifted Learners**

Another argument in favor of AP courses can be found in Winner and von Károlyi’s (1998) advocacy of a “domain-specific” approach to gifted education wherein advanced course work is offered to students in need of extra challenge in specific areas. This approach is endorsed by Feldhusen (1998) as well, who asserts that by the time gifted students reach high school they should have developed some understanding of their differential abilities so that they can begin to work toward talent development in a particular area. Perhaps the strongest support for the domain-specific approach to gifted programming, however, comes from Bloom’s (1985a) retrospective study of the talent development process of 25 individuals from each of six talent domains who had attained worldwide levels of excellence by the age of 35.

Bloom and his team of researchers (1985b) found that although the talent domains studied covered three categories; aesthetic/artistic, psychomotor/athletic, and cognitive/intellectual, common patterns of development could be ascertained across domains. Specifically, as talent development progressed, individuals mastered the existing knowledge base in the talent domain, devoted increasing time and energy to talent development, and ultimately found a way to make their own unique contribution to the field. Extrapolating from Bloom’s findings, AP courses represent an opportunity for high school students to begin mastering sophisticated academic content to serve as a foundation for more extensive study in the field.
VanTassel-Baska (2001) has pointed out that support for the Advanced Placement Program can also be found in the talent development model proposed by Gagne. In this model, aptitude in specific domains must undergo a developmental process consisting of learning, training, and practicing in order to be converted into productive talents in specific fields of endeavor. This developmental process is catalyzed by both intrapersonal variables, such as motivation and temperament/personality, and environmental variables, such as events and undertakings (including courses and programs) (Gagne, 1995). According to this model, therefore, Advanced Placement courses can be seen as environmental catalysts to the development of talent in specific academic disciplines.

AP courses are also appropriate for secondary gifted learners in that they allow for acceleration, a practice that has received solid support in the field of gifted education (Benbow & Stanley, 1996; Feldhusen, 1991, 1998; Kolitch & Brody, 1992; Kulik & Kulik, 1992; Rogers, 1991; VanTassel-Baska, 1986, 2001). Further, VanTassel-Baska (2001) has pointed out that the acceleration provided by the AP program has the additional benefit of being flexible, in that students can begin taking AP courses in areas of academic strength as early as 9th grade (or potentially even earlier). Thus, Advanced Placement provides an effective means of meeting the individual needs of learners. It also provides schools with an administratively efficient, cost-effective means of providing differential levels of acceleration for students of different levels of talent. For example, a single course offering of AP Calculus could provide four years of acceleration for a ninth grader, but only one year of acceleration for a twelfth grader in the same class.
Finally, in order to be maximally effective, accelerative options in school systems must incorporate smooth articulation from “preschool through college entry” (VanTassel-Baska, 1986, p. 194) so that students do not encounter problems moving from one level of schooling to another, or run out of courses to take in the last years of high school. Advanced Placement takes this articulation one step further, providing an efficient means for students who have mastered college level content in high school to receive credit and/or advanced placement that permits them to avoid redundancy in college.

In conclusion, the structure of the AP Program offers differentiated programming that is uniquely suited to meeting the needs of gifted high school students in that it is domain-specific (i.e. a student can be placed in AP courses that correspond to her academic strengths) and allows for flexible acceleration (i.e. students can be accelerated by as many years as is appropriate).

Rigor of AP Courses

Further support for AP courses for gifted students stems from studies indicating that AP courses tend to be more rigorous than other types of advanced high school courses. An extensive survey of New York and California AP and honors science teachers asked a subgroup of 155 teachers who had taught both honors and AP courses to students of comparable ability, academic preparation, and grade level to compare the two different types of courses. Teachers responded that the AP curricula were “significantly broader and deeper” than the honors curricula (Herr, 1992, p. 526).

The superiority of AP to other advanced science courses was further supported by Ferko’s 1989 dissertation. She examined the performance of 1700 public and private students from 118 schools across the nation on the Second International Science Study.
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(SISS) Advanced Science Achievement Tests. While all students were taking some type of second year course in biology, chemistry, or physics, it was found that students taking AP courses had significantly higher mean scores than students in non-AP advanced courses in all three sciences tested. She also noted that "the AP students who had studied at least 3 years each of mathematics and science had science achievement scores that were NOT significantly different from the international mean score for the respective tests" (p.126).

Dickey's 1982 dissertation went one step further to compare the performance of AP students in BC Calculus to college students taking first year calculus. His sample, geographically stratified to contain students from four regions of the country, consisted of 247 AP Calculus BC students from 15 high schools and 229 first year calculus students in nine postsecondary institutions. Of note, the calculus exam, devised by the author so as not to favor either group, consisted of elements common to the AP calculus exam and exams from 16 colleges. The results indicated that nationally and in the Southeast, Central, and West regions, AP students had higher mean scores on the calculus exam than did college students from the corresponding regions. (There was no significant difference between the groups in the Northeast region.) Further, even when SAT math scores were statistically controlled for, AP students scored significantly better than the college students in the Southeast and Central regions, and as well as the college students in the Northeast and West regions.

These studies support the rigor of AP course work in math and science and corroborate the benefit to students of such courses, but the benefits of the AP Program
have been found to extend beyond the students taking the courses to teachers and non-AP curricula as well.

Benefits of the AP Program for Teachers

A survey of all AP teachers in Broward County, Florida revealed that teachers regarded their AP experiences very favorably. A large majority of teachers indicated that their AP experiences had challenged them intellectually (95%) and personally (85%). Moreover, they reported that the AP curriculum had a positive effect on other curricula within the same department, including “strengthening of all feeder classes,” “expanded course offerings,” and “sharpening of AP teachers’ skills and broadening of knowledge base” (Timoney, 1993, p. 81).

In his dissertation thesis involving the study described earlier, Herr provided more detail on the impact of AP on professional development. Teachers rated AP courses significantly higher than college preparatory and honors courses with respect to stimulating them intellectually and providing both content and methodological “overflow” into other classes (Herr, 1990, p.174). Further, they also rated AP courses significantly higher than both other types of courses with respect to the number of new concepts learned in the discipline. Finally, when a larger group of 478 AP science teachers (including those who hadn’t taught honors courses to comparable students) was asked whether they would prefer to teach their current AP course or teach an honors course to the same group of students, 69% expressed a preference for the AP format (Herr, 1992).
Criticism of the AP Program

Despite the advantages it conveys to gifted students, the Advanced Placement Program has been the focus of some criticism. Herr's survey of 155 biology, chemistry, and physics teachers who had taught both AP and honors courses revealed that AP courses were perceived as providing less curricular freedom than honors courses and requiring a very fast pace in order to cover the curriculum in time for the exam. Further, teachers spent significantly more time on lecture in AP than in honors courses, and biology and physics teachers (but not chemistry teachers) reported having devoted fewer class hours to lab work (1992).

A second concern about the quality of the laboratory component of science courses was raised by Herr in the lengthier report of the study found in his dissertation. Specifically, when AP physics and chemistry teachers were asked to categorize the majority of their labs, only 20% of physics teachers and 37% of chemistry teachers categorized them as comparable to laboratories offered in college level courses. The remaining teachers considered the majority of their labs to be either simplified versions of college labs (approximately 50% of each group of teachers) or standard high school labs (10% of chemistry teachers and 27% of physics teachers) (Herr, 1990).

When asked to identify the main obstacles to developing the laboratory portion of their AP courses, the most frequent responses were “too much material to cover for AP exam” (26% of chemistry and 29% of physics teachers), “lab periods are too short” (32% of chemistry and 19% of physics teachers), “lack of funds” (18% of chemistry and 21% of physics teachers), and “lack of facilities” (14% of both groups) (Herr, 1990, p. 256).
In summary, Herr’s study reveals that in 1989, AP courses in biology and physics in California and New York devoted fewer class hours to lab work than honors courses taught to comparable students and that the majority of AP courses in chemistry and physics featured labs that were not comparable to college level labs (Herr, 1990). However, Herr also noted that after the addition of 12 recommended laboratory exercises to the AP course description in the late 1980s, along with assessment of them on the exam, biology teachers responded by increasing the time spent in lab by 11% (Herr, 1992). To what extent are laboratory exercises specified in AP course curricula and covered on the respective AP exams today?

A review of 2003 AP course descriptions for biology, chemistry, and physics revealed that all three strongly recommend that a significant laboratory component be incorporated into the corresponding AP course. Both biology and chemistry course descriptions contain recommended labs, and all three course descriptions indicate that the AP exam may include laboratory-based questions (CEEB, 2001a, 2001b, 2001c). As a result of the inclusion of laboratory-based questions on these AP exams, it seems reasonable to hypothesize that time devoted to lab work in these courses may be somewhat greater today than was reported in Herr’s survey. However, given that several of the problems identified by the AP chemistry and physics teachers in developing laboratory components of their courses related to lack of funds, resources, or time, it also seems likely that discrepancies between AP and true college science courses still exist. This is an important issue that needs to be investigated further.

A more recent critique of calculus and science AP course work is the two-year study undertaken by a committee of the National Research Council (NRC) (2002). The
major theme of the report was that rather than designing courses intended to simulate typical introductory classes at colleges, the College Board should design courses based on learning principles. These include specifying the prior knowledge students must have to succeed and utilizing such instructional strategies as teaching metacognitive skills, incorporating collaborative learning and stressing interdisciplinary connections. Overall, the AP calculus course, which was reorganized in 1994 with the help of 23 calculus reform experts, received the best evaluation, but science courses were criticized for emphasizing breadth over depth and not giving sufficient emphasis to the key concepts underlying each discipline.

The NRC's recommendations that science curricula should be reorganized so as to be better than college survey courses merits serious consideration, and the Commission on the Future of the Advanced Placement Program (CFAPP) made the same recommendation in its 2001 report, *Access to Excellence*. The report stated that the College Board should “Engage leaders in the disciplines, pedagogy, and research to ensure that current reforms and best practices are reflected in AP” (CFAPP, 2001, p. 12). However, changes must be made carefully. A guiding philosophy of the AP Program at its inception was to provide efficient articulation between high school and college by providing high school courses that were equivalent to college courses (CEEB, 2002f). Therefore, any effort to craft courses that deviate significantly from introductory college courses, even if such courses prove to be better than college courses, must be undertaken with caution to avoid creating problems with high school to college articulation.

A second defense of a traditional, content-rich curriculum such as might be found in a typical introductory college-level survey course can be found in cognitive science
research. Bruer (1995) summarized a body of such research suggesting that the development of problem-solving strategies is domain-specific, and depends on individuals first acquiring an extensive knowledge base in the domain. One of the most interesting experiments that he cited to illustrate this point was one by Chase and Simon (1973). According to Bruer, the experimenters asked novices and expert chess players to look at the placements of 25 chess pieces on a chessboard for 5 to 10 seconds and then try to remember them. Experts were able to recall 90% of the placements of the chess pieces while novices could recall only 20% of placements. However, the experts’ memory advantage held true only when the pieces were placed in meaningful positions that came from actual chess games. When pieces were positioned randomly on the chessboard, experts exhibited no better recall than novices did. Summarizing this and other studies, Bruer (1995) noted that

Expertise, these studies suggest, depends on highly organized, domain-specific knowledge that can arise only after extensive experience and practice in the domain. Strategies can help us process knowledge, but first we have to have the knowledge to process. (p. 343)

Viewed in this light, the teaching of an extensive body of knowledge as the introduction to a discipline appears to be an appropriate first step to mastery of the domain and provides support for the content-rich orientation of the AP curricula.

A different criticism of Advanced Placement course work was recently raised in a presentation of ongoing research into the appropriateness of both AP and International Baccalaureate (IB) Programs for gifted learners. The study involves fifteen AP and/or International Baccalaureate schools in four states, with data collection consisting of...
classroom observation, interviews of teachers, students, administrators, and counselors, focus groups of teachers and students, and document analyses. Researchers reported that AP and IB teachers were generally found to be experienced and dedicated, and that both teachers and students had overall positive perceptions of the programs. However, the authors voiced the concern that “Teachers approach students as though they are all the same, not considering the individual students so much as the content” (Kyburg, Callahan, Brighton, & Hertberg, 2003).

In addition to noting that little differentiation geared to meeting the unique needs of learners was observed, the authors also hypothesized that the uniformity of instruction, along with the recruitment strategies of many schools, tends to result in the inclusion of students who are motivated, focused, and high in ability, and the exclusion of those with unique cognitive needs, unusual circumstances, or inadequate prerequisite skills (Kyburg, Callahan, Brighton, & Hertberg, 2003). These are legitimate and important concerns, and there can be no question that the AP Program would be a better one for gifted students if they were addressed. However, as noted above, smooth articulation between Advanced Placement course work and more advanced college level work requires that AP courses cover a curriculum comparable to introductory college level courses, and therefore significant modifications to the content coverage of AP course work must be approached very cautiously.

The adoption of recruitment and instructional strategies that provide for more differentiation without compromising content coverage, however, would constitute an undeniable improvement for the courses. Having examined criticisms of the Advanced Placement Program, a last, but certainly not least, element of support for it will be
examined; namely the perceptions of those high achieving students who have participated in the program.

**Perceptions of Former AP Students**

A survey of 448 former AP students from among seven high schools in Duval County, Florida found that 95% of respondents agreed or strongly agreed that “AP classes were a valuable experience,” and that they were “more challenging than most other classes” (Sisler, 1989, p.133). A second survey study of former AP students (44 high school seniors and 46 college freshmen) in Broward County, Florida revealed similar findings. A majority of respondents (84% of high school seniors and 91% of college freshmen) rated the intellectual challenge of their AP courses overall as high or very high compared to other courses, and 84% of respondents indicated that AP course work had had a positive effect on their “self-concept or self-confidence” (Timoney, 1993, p.47).

By far the most substantive studies of the perceptions of former AP students, however, have been those of Educational Testing Service researcher Casserly. In her 1968 study she interviewed students at 20 colleges from among those colleges that admitted the largest number of AP examinees. A total of 419 college seniors who had gotten at least one 3 on an AP exam and 57 AP student freshmen chosen by their colleges (and not further defined) were interviewed by the author. Overall, students’ perceptions of the AP program were resoundingly positive. Of students who considered their AP courses to have constituted college level work, 90% ranked those courses as their most valuable high school courses. Students praised the quality of their teachers and the more challenging nature of the course content, characterizing it as going beyond facts and
"busywork" (Casserly, 1968, p.8). Rather, AP course work was felt to have entailed more complex thinking, critical reading, writing, research using primary sources, and dealing with issues in which there can be more than one right answer.

As a result of AP participation, students reported increased self-confidence and a kindling of interest in a variety of areas, and in a small percentage of cases, AP experiences encouraged students who had intended to go to junior college or not go to college at all to raise their aspirations (Casserly, 1968). A follow-up 1986 study, in which Casserly interviewed 278 students at 9 universities that received large numbers of AP candidates and that tended to grant placement or credit for exam grades of 3 or higher also revealed positive perceptions of the AP program overall. (Of note, students had all earned at least one 3 in an AP exam and 81% had taken at least 2 exams.) Students in this study cited getting top teachers, challenging themselves, and developing increased self-esteem as advantages to the program (Casserly, 1986).

Conclusion

In conclusion, there is strong empirical and theoretical support for Advanced Placement as an administratively convenient and effective vehicle for providing suitably differentiated programming for gifted high school students. Moreover, survey data from college freshmen indicate that AP courses have become a significant component of the high school experience of high-achieving students. A majority (59%) of students at all baccalaureate-degree granting institutions in 2001 had taken at least one AP course, and two thirds of students at the most selective private universities had taken 4 or more courses (Sax, Lindholm, Astin, Korn, & Mahoney, 2001).
Evidence has been presented that in the sciences, AP courses are more rigorous than other advanced courses (Ferko, 1989; Herr, 1992), and finally, student perceptions of AP support the concept that the program affords them intellectual challenge (Casserly, 1968, 1986; Sisler, 1989; Timoney, 1993) and increased self-confidence (Casserly, 1968, 1986; Timoney, 1993). For these reasons, safeguarding high standards of curricular rigor for AP courses is vital to gifted education. For if AP courses become slower-paced and less academically demanding, it is gifted students who will suffer most. The remainder of this literature review will address the challenge of maintaining quality control in the face of current pressures on high schools and students to increase AP participation.

The AP Program: Past and Present

In this section, the AP Program will be traced from its origins to the present, with the focus on how the Program has changed and the challenges it is currently facing.

The Beginnings of the AP Program

In 1951, the Fund for the Advancement of Education, an offshoot of the Ford Foundation, undertook to investigate ways to improve the articulation between high schools and colleges. Specifically, the Fund was looking for ways to reduce the redundancy of course work in the last year of high school and the first years of college that was believed to exist for high-achieving students (Eurich, 1952). Toward this end, the Fund sponsored two projects whose outcomes would, together, shape the philosophy and structure of the College Board’s Advanced Placement Program (CEEB, 2002f).

The first study involved a collaboration between three colleges: Harvard, Yale, and Princeton, and three of their independent feeder high schools: Andover, Exeter, and Lawrenceville. Educators from all six institutions examined high school and college
transcripts of students who had attended one of the three preparatory schools and then one of the colleges to explore the articulation between high school and college for these particular institutions. The investigators also reviewed how 10 subjects were taught in the last two years of high school as well as in the first two years of college. Finally, they administered a 20-page survey on the topic of high school-to-college transition to 58 students (Blackmer, 1952).

The educators found redundancy between what was studied in the last two years of high school and the first two years of college in many academic areas. In the sciences, they found that college students frequently repeated elementary courses in the same subject matter in which they had taken similar course work in high school. Surprisingly, they also noted that college grades in introductory science courses of repeaters were only negligibly better than grades of boys from the same high school who had not taken a high school course in the subject, a finding that is puzzling and casts some doubt on the equivalency of the high school and college courses. Nevertheless, Blackmer (1952), then Chairman of the English Department of Andover and a main architect of the study, noted in an article describing it that

we include in the report a specific proposal for an experimental development of valid advanced placement tests. Constructed, we hope, under the direction of the College Board, these would be offered to all qualified students on a national basis and used, not for admission to college, but for placement after admission. (p. 303)

A second project sponsored by the Fund for the Advancement of Education originated at Kenyon College and consequently came to be known as the Kenyon Plan. The Plan began with four "opinions or prejudices," among them that "For the bright
student who is well taught, the American system wastes time” (Chalmers, 1952, p. 309). Moreover, such time-wasting was noted to be increasingly problematic in light of the fact that more and more students would need to spend several years in graduate training and young men were expected to have to spend time in the military. Finally, two last foundational premises were that 17 year old boys were better off in high school than at college and that they could be taught as well by high school teachers as by college instructors.

Building on these premises, college educators at Kenyon and 10 other elite liberal arts colleges (Bowdoin, Brown, Carleton, Haverford, Middlebury, Oberlin, Swarthmore, Wabash, Wesleyan, and Williams) collaborated with lead educators from 13 outstanding public and private high schools to define standards and a “scope of work” (Chalmers, 1952, p. 310) that would describe freshman courses in 11 core academic areas. The purpose of doing so was to provide a curricular outline for secondary schools to follow in designing courses that would permit their students to enter college with advanced credit (Chalmers, 1952).

The group of college and high school educators involved in the Kenyon plan was called the School and College Study of Admissions with Advanced Standing (SCSAAS). The SCSAAS appointed committees consisting of both college and secondary school faculty to write course descriptions for the 11 core academic subjects, and then courses derived from the descriptions were successfully piloted by 18 secondary schools (CEEB, 2002c). One such school was Newton High School in Newton, Massachusetts, a school that joined the Kenyon Plan in 1952, participated in the original study, and then offered courses to its students. Newton was a particularly good candidate for the program; two
thirds of its students progressed to four-year colleges and many members of the high school faculty already taught college courses at the public junior college that shared its campus with Newton High School (Gores & Barry, 1956).

In the first year of course offerings, 15 sections of advanced courses in five academic areas were offered, and the following year the sections increased to 19 with the addition of three new courses of study. Reporting on the first three years of the program, the authors viewed it as a resounding success, endorsed by parents, students, and teachers alike. Indeed, the program was credited with having a salutary effect on the entire school, not just the small number of participants. Interdepartmental communication was reported to be increased, faculty enthusiasm recharged, and the use of the library reinvigorated. To summarize, the authors stated that, “The general effects of the Advanced Standing Program at the Newton High School have been numerous and far-reaching” (Gores & Barry, 1956, p. 9). In 1954, the SCSAAS group asked the College Board to administer the program, and in the following year the College Board’s AP Program was born (CEEB, 2002e).

This paper has provided extensive detail on the precursors of the Advanced Placement Program for a reason; namely to establish that the program originated as a means of attempting to meet the unmet needs of high-achieving students at elite private and suburban high schools (Blackmer, 1952; Chalmers, 1952; Gores & Barry, 1956). Indeed, the tone in which the Kenyon Plan is described is distinctly elitist. Gordon Chalmers (1952) wrote that, “Any school will be welcome to prepare its ablest students, though it is clear that only the strongest of the public and independent schools will be able to do so” (p.311).
Specifically, the goals of the two precursor projects were to accomplish the following objectives for highly able students:

- To reduce curricular redundancy and wasted time (Blackmer, 1952; Chalmers, 1952)
- To provide more stimulating instruction than the lecture and memorization instruction decried by the Andover, Exeter, and Lawrenceville graduates surveyed (Blackmer, 1952)
- To provide for a progression of work that could be adapted to the “needs and pace of individual students” (Blackmer, 1952, p.302)
- To foster students' self-directed learning (Blackmer, 1952)
- And to allow students to progress in an area of intellectual strength so as to keep them challenged and motivated (Blackmer, 1952).

It is also noteworthy that for both precursor studies, acceleration was considered a key goal; it was hoped that granting advanced placement would allow students to streamline and shorten their progress through college (Blackmer, 1952; Chalmers, 1952).

In summary, the Advanced Placement program originated as a collaboration between a small group of elite colleges and high schools aimed at providing rigorous course work to the ablest students. Within this context, quality control of the courses for the first several years of the program was most likely fostered by the following circumstances. First, the high schools and colleges that participated in the Kenyon Plan and the first few years of the AP Program were probably well known to each other to a large extent. AP schools in the early years of the program were predominantly
independent and suburban schools in the Northeast whose AP students were frequently preparing to attend prestigious northeastern colleges (CEEB, 2002e).

The number of high schools participating in the program increased substantially between 1955-56 and 1959-60, from 104 to 890, but participating schools remained a small percentage of American high schools. Similarly, while AP students enrolled in an increasing number of colleges during the same time period (567 in 1959-60 compared to 130 in 1955-56), a small number of colleges received a disproportionate number of students. In 1959, 18 colleges enrolled about half of the students who took AP exams that year (Radcliffe & Hatch, 1961). Thus, at the outset, the relative insularity of the AP program would probably have tended to promote high standards of rigor in AP courses.

Second, the suburban and independent schools participating in the AP program in its infancy were schools that, in general, would likely have possessed an adequate supply of the resources necessary to offer quality courses, i.e. financial support for curricular needs, high quality teachers, and well-prepared, able students. Thus, it could be said that such schools had the capacity to provide high quality courses.

A third factor that is herein conjectured to have contributed to uniformly high course quality in the beginning years of the AP program is the likelihood that most students took the end-of-course examinations. While this author has encountered no data to document this, there are three reasons to suppose that it may have been true. First, the development of examinations was a focus of the Kenyon Plan (CEEB, 2002e). Second, anecdotal data from Newton High School, one of the original pilot schools in the plan, revealed that all students were required to take the exams there (Gores & Barry, 1956). Third, the three-school/ three-college study that contributed to the birth of AP (CEEB,
2002e), explicitly called for examinations to determine student placement in college (Blackmer, 1952).

In summary, three characteristics of the AP Program in its infancy have been hypothesized to have fostered a high degree of quality among the courses offered. These characteristics are the insularity of the program, the capacity of participating high schools to offer high quality courses, and the hypothesized linkage between the courses and the examinations. As we trace the transformation of AP from an elite program for a small group of high-achieving students to a national educational movement fueled by education reform and competitive college admissions, however, we shall see that these characteristics of the early program are less and less applicable, and that as a consequence, the uniform quality of AP courses can no longer be as confidently assumed.

Through the first decade of its existence, from 1955 to 1965, the AP Program experienced impressive growth, with the number of schools offering AP courses increasing from approximately 100 to 2500, and the number of students taking exams increasing from about 1200 to 38,000 (CEEB, 2003b). The educational climate of egalitarianism of the late 1960s and early 1970s, however, coupled with attacks on grades and standardized examinations, took a toll on the growth of the program. As a result, the rate of growth slowed in the early years of the 1970s, and the number of exams taken actually decreased by 6% in 1973, the only year in the history of the program to post a decline. By the end of the 1970s, however, the program had resumed a healthy rate of growth (Rothschild, 1999), and in 1983, the publication of A Nation at Risk spearheaded the education reform movement and with it, an era of state and federal support for the AP program (NRC, 2002).
Education Reform

A Nation at Risk focused critical scrutiny on the American high school (Angus & Mirel, 1999; NRC, 2002). The report began by documenting an array of indicators of educational decline in America, including steadily decreasing SAT scores from 1963 to 1980, poor performance of American students on international comparison tests, and a decline in the achievement of students both in college and in the workplace. Having noted these deficiencies, the report laid the blame at the feet of American high schools, identifying such problems as decreased expectations for homework, the “dumbing down” of textbooks, inadequate time spent in school, and problems with the teaching force. Of central importance was the criticism that students were spending too much time in courses like home economics, driver education, and non-academic electives, and far too little time on core academic subjects (National Commission on Excellence in Education [NCEE], 1983).

A number of recommendations followed from the problems described, but two in particular have formed foundations for the education reform movement. The first of these was a recommendation that states require all students to master a minimum curriculum in order to graduate. This curriculum, entitled the Five New Basics, consisted of four years of English, three years each of mathematics, science, and social studies, and one-half year of computer science (with an additional two years of foreign language recommended for college-bound students). The report’s second recommendation was for the implementation of a state and locally administered system of standardized achievement tests at transition points of schooling (NCEE, 1983).
While efforts by some states to improve education preceded the publication of *A Nation at Risk*, the report is generally credited with having provided a catalyst for the national education reform movement (Pipho, 1992). By 1986, three years after its publication, 45 states and the District of Columbia had enacted legislation to increase graduation requirements (Angus & Mirel, 1999). In 1989, President Bush and the nation’s governors gathered together at an Education Summit and formulated six National Educational Goals, which were expanded to eight and enacted into law in 1994 as the Goals 2000 Act (Angus & Mirel, 1999; Hansen, 1993; NEGP, n.d.a). Indeed, the federal government today remains more committed than ever to the concepts of high standards for all students and test-based accountability for states and school districts. The *No Child Left Behind Act* (NCLB) of 2001 requires states to develop challenging standards in reading and math and to test students annually in grades three through eight (“Executive Summary”, 2002).

**A Challenge for AP: Raising Achievement for Underrepresented Minorities**

Another component of NCLB reflects a goal of the education reform movement that goes beyond high standards for all students to attempting to narrow the gap between minority and disadvantaged students and their White and more affluent counterparts. Specifically, NCLB requires states to test students annually, to formulate yearly progress objectives toward achieving proficiency for all students within 12 years, and to report assessment results and progress objectives “by poverty, race, ethnicity, disability, and limited English proficiency to ensure that no group is left behind” (“Executive Summary,” 2002, p. 1)
The problem of raising minority educational achievement to high levels is a daunting one. The National Task Force on Minority High Achievement, convened by the College Board, noted that underrepresented minority students (Black, Latino, and Native American) lag far behind White students in both educational attainment (the earning of degrees) and academic achievement (superior performance at each level of education). In the area of attainment, underrepresented minorities earned less than 13% of bachelor’s degrees in the mid-1990s, despite the fact that they represented 24 to 30% of the under-18 population between 1980 and 1995 (National Task Force on Minority High Achievement, 1999).

Data on academic achievement are equally discouraging. A 1999 analysis of group differences in standardized testing by College Board researchers indicated that African-American and Hispanic students had lower test scores than White students on a wide spectrum of tests, including SAT I, ACT, GRE, LSAT, MCAT, and 12th grade National Assessment of Educational Progress (NAEP) tests in reading, science, and math. Further, self-reported data from 1997 SAT test takers revealed that African American and Hispanic students were less likely than White students to have an A average or be in the top 10% of their high school class, even when socioeconomic status was controlled for (Camara & Schmidt, 1999). This pattern of underachievement extends to the AP Program as well. While the percentage of total AP exams taken by African-American and Hispanic students together increased from 5% in 1979 to 15% in 1999, it dipped to 13% in 2000 and had only rebounded to 14.1% in 2002 (CEEB, 2002i). With respect to exam performance, Black and Hispanic students had lower mean scores in all of the seven most common AP tests in 1998-99 than White and Asian-American students for a
Overcoming the educational disadvantages of minority students poses a serious challenge, but the taking of a rigorous high school curriculum appears to be a promising strategy. A 1999 report revealed that for students who attended four-year colleges, the rigor of a student's high school curriculum was a more powerful predictor of bachelor's degree attainment than scores on an abbreviated SAT-like test administered in 12th grade, or of rank/GPA data. Further, this effect was stronger for African American and Latino students than for White students (Adelman, 1999). Similarly, a 2001 National Center for Education Statistics (NCES) study revealed that 87% of students at four-year colleges who had taken a very rigorous high school curriculum remained enrolled continuously three years later, compared to 71% of students who had taken a mid-level curriculum and 62% of those who had taken a basic curriculum (Horn, Kojaku, & Carroll, 2001). In conclusion, the education reform movement has focused on performance-based accountability and on promoting a rigorous curriculum for all students, including minority students.

The Impact of the Education Reform Movement on the AP Program

How have these emphases impacted the AP program? First, the program has received significant endorsement from some influential reform proponents. While the college bound curriculum proposed in A Nation at Risk did not include an AP course, recommendations for what constitutes a rigorous curriculum have since become more stringent. Specifically, the completion of at least one AP course has been included in model curricula for college bound students in an NCES report (Horn, Kojaku, & Carroll,
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2001), and by the Southern Regional Education Board (SREB, n.d.a). Further, AP courses were cited as a means of injecting rigor into high school curricula by The Education Commission of the States (Weiss, 2001). Finally, former U.S. Secretary of Education Richard Riley endorsed the AP Program in his annual address to The National Press Club, stating “I believe that every high school in America should be offering advanced placement (AP) or other advanced courses in the core subjects within the next two years, and a fuller range of AP courses within the next three to five years” (Riley, 1999, p.5).

Even more powerful than endorsement, however, has been state level legislation aimed explicitly at promoting the AP program. The College Board reports that 27 states have passed legislation to promote AP courses in a variety of ways, ranging from subsidizing exam fees to paying for teacher training to setting policies regarding the awarding of credit for AP course work at public postsecondary institutions. Similarly, the federal government’s AP Incentive Program provides grants to states aimed at promoting the taking of AP courses and exams by low-income students (CEEB, 2002b).

In addition, one last factor related to education reform that has likely spurred the offering of AP courses in high schools has been the proliferation of state and school level report cards consisting of a variety of performance indicators (Hansen, 1993; Kirst, 1990). Such report cards, currently compiled by 43 states (Education Week, 2002), often include AP participation data (French & Bobbett, 1995). Further, state level data on AP participation is frequently collected and publicized by such influential organizations as The National Education Goals Panel (NEGP), the SREB, and the publication Education
Week, in its yearly Quality Counts report (Education Week, 2002; NEGP, n.d.b; SREB, n.d.b).

In summary, high schools today face many pressures to add AP course work to their curricula, including ideological pressure to conform to the recommendations of influential organizations, legislative pressure from state governments, and political pressure from the organizations publicizing indicators of AP participation. High schools in California face an additional pressure - legal pressure brought about by two 1999 lawsuits on behalf of Black and Latino students. Both allege that these groups have less access to AP courses than White and Asian students, and therefore are unfairly disadvantaged by a University of California admissions policy that awards an extra point to grades earned in AP courses in the calculation of GPA (“Advanced Placement: 2 Lawsuits,” 1999; Hebel, 1999). To document the extent of the problem, Mark Rosenbaum, legal director of the ACLU chapter that is bringing one of the lawsuits, alleged that 333 public high schools in California, many of which had large minority populations, offered 4 or fewer AP courses. Conversely, another 144 public schools, a majority of which had predominantly White and Asian students, offered 15 or more classes (Carnevale, 1999).

The Problem of Unequal Access to AP Courses

Allegations that AP courses are not equally available to all groups of students in California are supported by a study of 870 public high schools (all of the regular high schools in the state) in the fall of 1997. The study found that schools with large enrollments tended to offer more AP subjects than those with low enrollments. Furthermore, when enrollment was controlled for, schools with higher percentages of
Black and Latino students tended to offer fewer AP courses, as did schools with higher percentages of low-income students and schools in rural settings (Pachon, Fedeman, & Castillo, 2000). Subsequent to the filing of the above-mentioned lawsuits, a number of inner city schools in California have added AP courses. However, according to an anecdotal report in the Los Angeles Times, the quality of AP course work at some such schools can be quite low. In one inner city high school, a first year teacher assigned to teach AP Chemistry revealed that students were woefully unprepared for the rigor of the class. Most had not studied chemistry previously and had poor reading and math skills. In addition, they balked at doing homework. In another inner city Los Angeles school, students themselves complained that during a semester of an AP English class, they didn't read a single book (Banks, 2002). California's difficulties with achieving AP equity for students of all races, ethnicities, and socioeconomic levels are not unique. Across the country, 38% of American high schools still offer no AP courses (NRC, 2002).

A study of a national sample of 1217 public high schools in 1985 sheds further light on the kinds of schools in which the AP Program may be absent. It was found that 48% of schools in large districts (those with more than 50 schools) and 45% of schools in medium-sized districts offered AP Programs, compared to only 30% of schools in small districts (1-5 schools). Further, schools in large districts offered, on average, a larger number of AP subjects than schools in medium or small districts (Hammer, 1990), a finding that was mirrored in a more recent study of California schools (Betts, Rueben, & Danenberg, 2000).
The size of a school, as well as the size of the district it is located in, plays a significant role in its likelihood of offering an AP Program. In the national study mentioned above, 72% of schools with 1000 or more students offered an AP Program, compared to only 18% of schools with under 300 students (Hammer, 1990). Large schools were also found to offer more AP subjects than smaller schools in both the national study and two California studies (Betts, Rueben, & Danenberg, 2000; Hammer, 1990; Pachon, Federman, & Castillo, 2000).

Urban schools, on the other hand, suffer by having lower AP exam performance than other schools. A 2001 study, undertaken jointly by the Council of the Great City Schools (CGCS) and the College Board compared the test performance of AP test takers in 58 large urban school districts (GSC students) with the performance of a national sample of AP test-takers on selected AP subject tests. The study found that overall, GCS test-takers had lower mean AP test scores than the national sample of test-takers in 12 subject areas examined. More telling still, when students with similar household incomes were compared, it was found that within each household income band, national test takers attained higher mean AP scores than GCS test-takers on the 7 most common AP tests. (One exception to this was found for AP US History students with household incomes of $10,000 - $25,000, for whom GCS and national mean scores were the same.) (CGCS & College Board, 2001). These data suggest that urban schools face particular challenges in providing AP courses that prepare students adequately for the AP exam.

The anecdotal experiences of the Los Angeles schools mentioned earlier provide some insight into the challenges such schools might face, particularly those that are attempting to add AP courses in the face of limited resources. The Commission on the
Future of the Advanced Placement Program (CFAPP) has noted that avoiding such problems requires providing additional resources for the school, professional development for teachers, and adequate preparation for students, but notes that “political and legal pressures to rapidly expand access can cause some schools to fail to provide these supports” (CFAPP, 2001, p. 5).

In conclusion, the evidence presented herein supports the assertion that the education reform movement has exerted significant pressures on high schools and states to participate in the AP Program and has fundamentally affected the program’s very mission. Indeed, spokesmen for the College Board itself have noted the impact of the education reform movement on the AP Program. The director of the program in 1985, Harlan Hanson, noted in that year that the “‘natural,’ self-catalytic growth of the program in participating schools and entire districts has been supplemented by state-wide plans to use AP as part of general educational improvement” (Hanson, 1985, p.11). And by 2002, the senior vice president for K-12 education at the College Board, Peter Negroni, was reported to have articulated a shift in the program’s basic mission, from serving elite students to providing high schools with “an anchor of reform” (“College Board Plans,” 2002, p.1).

The Impact of Increased College Admission Competition on the AP Program

A second major educational trend that has contributed significantly to the program’s expansion is the increased competition for admission to selective colleges and the importance that AP course taking has assumed in this process (CFAPP, 2001; Johnstone & Del Genio, 2000; NRC, 2002; Rothschild, 1999). Indeed, numerous articles in the popular press have attested to the conviction of high school students and educators...
that taking AP courses is critical to gaining admission to the most selective colleges (Gorman, 1999; Hebel, 1999; Kladko, 2000; Strauss, 2002). What is the evidence to support this belief?

To begin with, there is solid data to support the perceptions of the general public and the media that admission to a four-year college is becoming more competitive, particularly where private institutions are concerned. A 1999-2000 national survey of 1644 two- and four-year colleges and universities documented perceptions of admissions directors at both public and private four-year institutions that general selectivity and admission test scores were higher in 2000 than they had been five years earlier. Higher standards were accompanied by a decreased “ratio of total acceptances to total applications” (Trends in College Admissions, 2002, p.20) from .68 to .60 for private institutions between 1992 and 1999. (Acceptance rates for public institutions remained stable at .68.) Finally, the percentage of private four-year institutions describing their admissions as competitive (meaning that only a limited number of applicants meeting specified admissions standards are admitted) increased from 13% in 1979 to 20% in 2000. Among public four-year institutions, the increase in the percentage of colleges describing their admissions as competitive was smaller, from 10% to 13%, and was not noted to be statistically significant in the report. Taken together, these findings support the conclusion reached that “The data analyzed in this report confirm what we have known for years- that college admission decisions are made in an increasingly competitive landscape” (Trends in College Admissions, 2002, p. vii).
The Role of AP Courses in College Admissions

What role do AP courses play in college admissions? There is not a great deal of direct data available on this question, but information obtained from the four-year institutions included in the 1999-2000 national survey of two and four-year institutions cited above does corroborate the fact that AP course taking is considered in admissions decisions (Trends in College Admission: 2000, 2002). Directors of admission were asked to rate the importance of various admissions factors on a scale of 1 to 5, with 1 being “not considered” and 5 being “the single most important factor” (p.67). For the admission factor “AP Course Enrollment” the mean rating was 2.2 for four-year public institutions (and 3.0 when schools that did not consider this factor at all were excluded from the analysis). This rating placed AP enrollment fifth in importance, behind “High school rank or GPA” (mean rating of 4.0) “Admissions test scores” (3.7), “Pattern of HS Coursework” (3.0), “and “College-level work in HS” (2.8), a category that probably included AP course work (p.67). For four-year private institutions, the “AP Course Enrollment” had a somewhat higher mean ranking, 2.5 (and 3.1 when colleges that did not consider it were excluded), but it still ranked fifth in importance (Trends in College Admission: 2000, 2002).

The above findings from a survey sent to all accredited four-year institutions would seem to suggest that AP course taking is not a terribly important factor in college admissions. However, in order to understand the role that AP course taking might play at competitive colleges, rather than among colleges in general, one must recognize that admissions procedures vary dramatically among different types of postsecondary institutions. In the category of institutions that are least competitive, i.e. those that admit
the majority of students who apply, the taking of AP courses is not an important factor in admission (NRC, 2002).

A second, more selective, category of institutions uses numerical formulas that utilize some combination of data, including such things as class rank, GPA, test scores, and completion of specified types of courses. In this case, the taking of AP course work can increase a student’s score on the formula if grades in AP courses are given extra weight in calculating GPA or class rank (NRC, 2002). The most selective colleges, however, typically do not use numerical formulas, but rather take a holistic approach, evaluating a student’s entire application in the context of his high school and home circumstances (Blackburn, 1990; Kleiner, 1999; NRC, 2002; Paul, 1995).

The role of AP courses in admissions at these colleges was addressed by the NRC (2002), which conducted an informal survey of admissions deans from 264 colleges, including the 50 most selective national universities and the 50 most selective national liberal arts colleges. Results of the survey, which had a yield of about 50%, revealed that AP course taking was viewed as an indicator of the student’s motivation to tackle academic challenges, and that the impact of AP courses on admission was greatest at highly selective schools. While all deans averred that the absence of AP course work would not disadvantage a student whose school did not offer such courses, the same would not be true for a student whose school did provide access to AP course work. If a student chose not to avail himself of AP opportunities available to him, the report noted that “Deans from the most selective schools responded consistently that this decision would likely place an applicant at a disadvantage” (NRC, 2002, p. 56).
Another study that investigated the impact of AP courses on college admissions was one by Herr (1991). He surveyed "admissions deans and directors of the 200 colleges that received the greatest number of Advanced Placement Examination reports in 1988" (p. 48), and received responses from 79% of them. More than half of the respondents expressed sentiments along the lines of one dean who commented that "AP or honors courses are critical elements in admission selection" (p. 49), so much so, in fact, that it had become difficult to be admitted without such course work. Beyond the perceptions of the deans, however, many colleges had policies that favored AP applicants.

Herr reported that "75% of those colleges which used GPA as an admissions criteria made no attempt to standardize or recalculate grades, but rather accepted them in the form provided by the high schools" (p. 50-51). This practice would clearly advantage AP students attending high schools that weighted their AP grades. Other advantages accruing to AP students were that many colleges gave priority processing (49%) or special points (67%) to applicants with "substantial honors or AP credit" (Herr, 1991, p. 51). Finally, admissions officers had much better perceptions of AP than of honors courses. Over two thirds of officers believed that AP courses were "more academically demanding" (75%), "more effective in preparing students for college-level work" (70%), more suggestive of "high academic motivation" (68%), and had "a higher degree of 'quality control'" (74%) (Herr, 1990, p.52). Thus, Herr's study convincingly documented the advantages gained by AP students in admissions.

Dillon (1986) surveyed over 50 selective colleges from among those institutions receiving the largest number of AP scores and found much the same as Herr. Asked how
much benefit students would derive from having taken AP courses in each of several academic disciplines, over 70% of respondents indicated that a student would derive “considerable benefit” from AP course work in the discipline for all of the major academic areas. An additional 22 to 26% of respondents indicated that students would receive “some benefit” from such course work (p.16). Equally important, admissions officers identified the number of AP courses offered by a school as an important indicator of school quality. Dillon did not identify the method by which she selected her sample institutions, which limits the extent to which we can confidently generalize from her findings, but they do corroborate those of Herr (1990).

Having substantiated the supposition that AP course taking confers an advantage to a student in the admissions process, the question remains as to what the magnitude of that advantage might be. Could it mean the difference between acceptance and rejection? While this author has encountered no direct data on this question, an understanding of the admissions situation at the most selective institutions today sheds some light on the issue.

*The Special Case of Competitive College Admissions*

At the most selective end of the admissions spectrum are the fewer than 100 colleges where “as many as 10 to 15 students apply for each spot” (CEEB, n.d.c, p.1). At these colleges, competition for admission has never been so intense. For example, in the 2000-2001 admissions cycle at Harvard, less than 20% of high school valedictorians who applied were accepted (Shea & Marcus, 2001), and the following year, the competition was even steeper. The acceptance rate was the lowest in Harvard’s history, a mere 10.5% (“Class of 2006,” 2002). And Harvard is not alone in having to make agonizing choices among stellar students. Stanford’s 2000-2001 admissions pool of 19,000 applicants
contained 5,000 students with a GPA greater than 4.0 and 3,000 students with SAT scores over 1500 (Marcus & Sohn, 2001).

A 1998 internal study of admissions by Princeton University sheds light on the changes that have taken place in college admissions over the past thirty years. The study revealed that the acceptance rate had halved from the Class of 1972, the last class to be exclusively male, to the Class of 2002 (from 25.3% to 13.1%). In addition, the quality of the student body increased substantially, with students rated Academic 1s and 2s, the most outstanding students, increasing from 51.2% of the Class of 1993 to 72.2% of the Class of 2002. Finally, there was a substantial increase in the geographic diversity of the student body from the Class of 1976 to the Class of 2002 (Princeton University: Report of the Undergraduate, 1998), a finding that is consistent with a larger trend for students to conduct a national search for colleges (Reich, 2000).

Thus, admissions officers at highly selective colleges today face a daunting task in having to select a fraction of applicants from a highly qualified pool. The task is made even more difficult by several additional factors. The first is grade inflation. With 40% of SAT test-takers reporting A to A minus averages in 2000 (“SAT Math Scores for 2000,” 2001), GPA has become a less sensitive instrument with which to differentiate between students. A different problem exists for the use of class rank data to compare applicants. Specifically, many high schools no longer rank their students. Profiles of applicants to the Class of 2007 at Brown and Cornell Universities revealed that 42% and 54% of applicants to those colleges, respectively, came from high schools that did not rank (Cornell University, n.d.; Brown University, n.d.). A final factor that has complicated admissions for selective colleges is the trend for students to apply to schools
across the country instead of within their own state or geographic region (Reich, 2000),
resulting in the likelihood that admissions deans are having to evaluate applicants from
high schools with which they may be relatively or wholly unfamiliar.

It seems reasonable to suppose that the consequence of all these factors – large
numbers of outstanding applicants, grade inflation, uneven class rank data, and
unfamiliarity with students’ high schools – is to make it harder and harder to make
meaningful comparisons between applicants. Thus, if admissions officers regard AP
courses as academically demanding classes with a high degree of quality control (Herr,
1991), then it seems likely that they might ascribe a significant amount of importance to
AP course taking, possibly enough to make the difference between acceptance and
rejection at the most competitive institutions.

**Pressure on High Schools to Offer AP Courses**

The belief of high school educators and students that AP courses are important in
selective college admissions has been widely reported in the lay press (Gorman, 1999;
Hebel, 1999; Kladko, 2000; Strauss, 2002), resulting in significant pressure for high
schools to offer Advanced Placement courses and for ambitious students to take them.
This pressure is most likely felt particularly keenly by high schools serving constituencies
that care a great deal about competitive college admissions. For example, a regular real
estate column in *The New York Times* that provides an overview of the real estate market
and quality of life in metropolitan New York communities frequently includes
information on the availability of AP courses in area high schools (Brenner, 2002;
Cheslow, 2002; Rather, 2002). In a similar vein, a New Jersey Monthly Magazine
ranking of “The Top 75 Public High Schools in New Jersey” (Nusser & Faris, 2000) and
a New York Magazine ranking of the “Best High Schools in New York” (“Best High Schools,” 2001) include AP participation data in their evaluations. Indeed, the NRC (2002) noted that Newsweek derived a list of “The 100 Best High Schools in America” from “the number of AP and IB tests taken, divided by the number of graduating seniors” (p.185).

Corroboration that high school administrators perceive AP courses to be important to pleasing the parents of advanced students and promoting a school’s image in the community was provided by the Herr (1990) study previously mentioned, in which he surveyed all high schools in California with a graduating class of at least 60 plus a sample of New York and New Jersey high schools. When 199 administrators from schools that offered both honors and AP courses were asked to rate their perception of the importance of honors and AP courses to the parents of advanced students and to the image of the school in the community, both were rated very highly. On a scale of 1 to 9, with 9 being “much more than standard college preparatory classes” (p.402), administrators rated the importance of AP to parents as 8.13 and to the school’s image as 7.89, both of which were significantly higher than the ratings assigned to honors courses (Herr, 1990). Given the extent to which the college admissions atmosphere has become even more competitive since 1989, it seems likely that administrators today would perceive the importance of AP courses in these two dimensions as greater still.

Thus, high schools in communities where the prestige of schools and the successful admission of graduates to prestigious colleges are considered important would be hypothesized to face significant pressure to offer an extensive array of Advanced Placement courses. A possible example of such a school is a particular high school
(whose name is withheld herein) in Northern New Jersey that was recently ranked as one of the 50 public schools in the United States that sent the largest number of graduates to Harvard, Princeton, and Yale from 1998-2001 (Yaqub, 2002). In this affluent suburban high school, where 90% of students went on to four-year colleges, a total of 24 Advanced Placement courses were offered in 2001-2002 (NJDOE, 2003c). Yet an article in an area newspaper noted that in 1998-99, 59% of AP students at this school did not take the AP exam, and the author went on to question the quality of some AP courses. Students in AP European History and AP Art History, for example, were quoted as claiming that the academic rigor of those courses was low and that they did not prepare students for the AP test (Kladko, 2000).

An examination of School Report Card data for this same school in 2001-2002 reveals that many AP students continued to skip the exam, and that the percentage that did so varied widely from course to course. Thus, while 79% of the 19 students in French Language took the AP exam, only 5% of the 20 students enrolled in Studio Art-General did so. In general, there were a number of courses in which the percentage of students taking the exam was surprisingly low (NJDOE, 2003c). This variability among exam taking within the same high school suggests the possibility that there may be significant variation in the degree to which courses meet AP standards.

Having examined two major educational trends that have fueled the growth of Advanced Placement and created substantial pressures on states, school districts, and high schools to offer courses and on students to take them, it is time to take a critical look at the structure of the program itself. Does it justify the presumption of rigor accorded it?
Structure of the AP Program: What Should an AP Course Be?

In keeping with its original mission, the College Board goes to significant lengths to develop courses whose content is equivalent to that of introductory college level courses and whose grading accurately predicts students' ability to progress successfully into higher level courses at college. New courses are developed by a committee of high school and college faculty who survey colleges and universities to ascertain the content of introductory courses in the discipline. (Content surveys are also repeated periodically after the course has been introduced to ensure that the AP course remains equivalent to current college-level courses.) Once the content domain of the course is established, the development committee collaborates with AP content experts, outside faculty, and statisticians to design the exam, which consists of multiple choice and free response sections. (The exception is Studio Art, which has no multiple choice questions) (CEEB, 2002g).

The multiple choice section that is drawn up is typically pretested on college students, and the exam undergoes multiple stages of review before being administered for the first time. Afterward, the results of the exam are subjected to statistical analysis to assess such factors as reliability, difficulty, and grade distributions (CEEB, 2002g). Exams are graded on a scale of 1 to 5, with 5 being the highest score and grades of 3 to 5 considered to reflect student achievement high enough to justify the awarding of college credit and/or advanced placement into higher courses in college. One manner in which AP grades are aligned with college performance is through periodic studies in which AP exams are administered to college students in introductory courses. The performance of the college students allows the College Board to calibrate AP grades such that “the lowest
AP 5 is equivalent to the average score earned by college students receiving grades of A in college, the lowest AP 4 is equivalent to the average B,” and so on (CEEB, 2002h, p. 11).

Exams are administered by the high schools in which students are enrolled, and a fee is charged by the College Board for each exam. In 2003, the exam fee was $80.00, of which the high school retains $8.00 to help offset expenses associated with test administration. The College Board offers fee reductions to needy students ($22 reduction per exam) and many states use federal and/or state money to pay all or part of the remaining portion of the fee (CEEB, 2002d). However, the extent to which schools and students are knowledgeable of and take advantage of these policies has not, to this author’s knowledge, been thoroughly investigated.

When the course content and exam have been established, the curriculum is made available to teachers through published materials. Course descriptions for each course are available online through the College Board web site, and provide a general overview of objectives and approaches to teaching the course followed by a detailed Topic Outline. Also included is a discussion of skills students should acquire, a detailed description of the exam, and sample multiple choice and essay questions. A more comprehensive Teacher’s Guide, including sample syllabi from AP teachers and college faculty, detailed course outlines, instructional strategies, and recommended resources, is also available for purchase, along with booklets containing previous exams (CEEB, 2002j).

With respect to teacher qualifications, “The College Board suggests that AP teachers have experience and, usually, an advanced degree in the area of the proposed AP course before undertaking an AP class” (CEEB & ETS, 1996, p.38). In addition, the
College Board sponsors many professional development opportunities. For beginning teachers, a one-day workshop introducing the AP Program and the fundamentals of planning a new course is followed by a weeklong (or longer) Summer Institute that focuses on subject-specific content and instructional strategies. One to two day workshops are also offered to experienced teachers to help them update their knowledge (CEEB & ETS, 1996). Finally, the College Board provides teachers with feedback on the performance of students on the AP exam. When five or more students in a class take the exam, teachers are sent a report that compares the class performance data with national performance data on the overall multiple choice and free response sections, multiple choice subsections, and individual free response items (CEEB, 2002a).

In summary, if the Advanced Placement Program were always administered as intended by the College Board, it would be an exemplary program that sets high standards of teacher quality and professional development, a detailed curricular framework, and an externally administered assessment of student performance.

*The Real vs. the Ideal: What is an AP Course?*

Unfortunately, the AP Program is not always administered as intended. In the words of the NRC (2002) report, Systematic information is lacking about the AP and IB programs as they are actually implemented in U.S. high schools, including the instructional strategies used in individual classrooms, the structure of the syllabi in different schools, the quantity and quality of the facilities available, the preparation of teachers who teach the courses, and the ways in which students are prepared prior to advanced
study. What is known, however, is that there is wide variation among teachers and schools. (p.155)

Some courses labeled AP do not even follow the AP curriculum, seemingly the most basic component of what it means to be an AP course. The College Board recently addressed this problem in a January 17, 2003 letter sent to high schools, superintendents, and state-level curriculum directors. Noting that some schools have gone so far as to attach the AP label to courses in subjects, like sociology, that are not even part of the AP Program, the letter admonished schools to affix the AP designation only to courses that follow AP curricular guidelines. The letter states that

Courses receive their AP designation by following the content and curricular goals outlined in the AP Course Description booklets. A course that fails to follow the AP Course Description in a particular subject is not, and should not be designated, an AP course. Such a designation is an improper use of a College Board registered trademark. (Jones, 2003, p.1)

The letter also asserted that colleges and universities have told the College Board that they “often will not attach value to a course labeled AP that was taken during a student’s sophomore or junior year, unless an official AP Exam grade is also presented for that course” (Jones, 2003, p.1). The evidence for (or against) this assertion will be discussed later in this paper, but the point to be noted here is that the College Board has recognized that the AP label is being used improperly by some schools, and has taken a preliminary step to address the problem. The comments of the NRC (2002) and the letter from the College Board attest to the generalization that AP courses are not always
administered according to the recommendations of the College Board. Much more persuasive of this fact, however, is an examination of the AP Program in Texas.

*A Disconnect Between the AP Course and the Exam: AP in Texas*

The AP Program in Texas serves as a vivid illustration of the fact that the simplistic conceptualization of Advanced Placement as a standardized program in which students study AP curricula in AP courses and then take the AP exam can be far from accurate. Consider the astounding statistic that in the 1992-93 school year, only 27.2% of students taking AP exams in Texas public schools had taken an AP course in the corresponding subject. Further, only 34.8% of students who took an AP course took the AP exam (Texas Education Agency [TEA], 1995). This means that most students who took the AP exam in a given subject had not taken an AP course, and most students who took the AP course did not take the exam, a situation that is a far cry from what the College Board intends.

The small percentage of Texas AP exam takers who had taken an AP course in 1993-94 may have been due, in part, to the fact that that many schools did not offer AP courses. As the number of AP high schools (defined as those with students who have completed AP courses) rose from 158 in 1992-93 to 1,088 in 2000-01, the percentage of AP exam takers who had completed the corresponding AP course rose to 75.8%. Of note, the percentage of AP course takers who took the AP exam in the same subject also rose, to 44.8% (TEA, 2002). While this reflects a substantially greater concordance between AP course-taking and exam taking, it is still somewhat surprising that almost a quarter of AP examinees in Texas public schools did not take the corresponding AP course, and over one half of course takers did not take the exam. The linkage between AP
courses and exams in Texas is further challenged by the fact that in 2000-2001, those AP examinees who had not taken the corresponding AP course in the exam subject earned the same percentage of exam grades of 3 or better on all exams combined as did AP examinees who had taken the AP course, and the non-course takers had a higher overall mean score (TEA, 2002).

What is the explanation for these surprising findings? With respect to the superior overall exam grades of AP examinees who had not taken the AP course compared to examinees who had, the TEA (2002) noted that one exam in which non-course takers outperformed course takers was the Spanish Language exam. Since three fourths of the AP examinees who took this test were Hispanic, the possibility was raised that many students may have been native Spanish speakers, which could have accounted for their high performance on the exam without having taken an AP course. The TEA further noted that for the majority of other subject tests, AP examinees who had taken an AP course had higher mean scores than those who had not. In fact, of the 25 exam subjects reported on, there were only 5 subject areas apart from Spanish Language in which non-AP course takers had higher mean scores than course takers (TEA, 2002).

The Variation in AP Program Implementation Across States

The Texas AP Program stands as compelling evidence that in the absence of requirements governing the administration of the AP Program, such administration is more likely to respond to state and local variables than to recommendations promulgated by the College Board. Features of Texas’ AP Program that may have contributed to its pattern of AP course and exam taking have been identified, but this should not be construed to mean that Texas is unique and that the AP Program in the rest of the states is
standardized. Across the country, states have adopted a wide variety of AP incentives that impact patterns of AP test taking. In South Carolina, legislation enacted in 1984 required high schools to offer AP courses and public colleges and universities to grant credit for scores of 3 and over. Moreover, the state assumed all costs for the program, including instructional materials, teacher training, and student exam fees (Burke, 1989).

Florida passed legislation the same year that provided baseline funding for AP Programs and additional funding to schools for every student scoring 3 or better on an AP exam. Kentucky required that students who wish to earn a Commonwealth Diploma must not only complete four AP courses, but also take the corresponding AP exam in three of them. Further, if students achieve a composite score of 5 or better on three exams, their exam fees are reimbursed by the state (Burke, 1989). These differing incentive programs, along with other differences in educational systems across states, suggest that the AP Program is probably not uniformly administered across the country, but more likely responds to the variety of state-, district-, and high school-level contexts in which it exists.

In light of the lack of standardization in the administration of AP courses, the AP exam assumes critical importance in ensuring that the AP label designates a course in which students have demonstrated their mastery of the AP content. Unless a majority of students take, and score well on, the end-of-course AP exam, there is no way of verifying the rigor of a course or the material that students have learned. Herein lies a major challenge facing the College Board today, for the College Board has estimated that nationally, the overall percentage of course enrollments culminating with the taking of the AP exam was only 70% in 2002 (R. Morgan, personal communication, December 20,
This estimate is based on a comparison of two College Board data sources. The first is an annual fall survey of participating AP schools, whose yield was 71.8% in 2001, that asks schools for the number of students enrolled in each AP subject. Later, these figures are compared to the number of students from each school who actually took the exam in each subject to determine the percentage of enrolled students who took exams (R. Morgan, personal communication, October 4, 2002 and August 8, 2003).

Data from 1996 to the present indicate that there has been a distinct increase in the percentage of enrolled students taking the exam, from 58% in 1996 to 70% in 2002 (R. Morgan, personal communication, December 20, 2002). It is encouraging that the percentage of course enrollments culminating in an exam is increasing. However, the fact that 30% of enrollments failed to culminate in an exam in 2002 suggests the possibility that many AP courses had low rates of exam taking and that these courses might not have met the standards recommended by the College Board. Given that AP courses are not standardized, it seems reasonable to assume that some are more rigorous than others, and evidence that course rigor may be positively associated with large numbers of students taking and passing AP exams is provided by the following study.

The Association of High AP Exam Performance of High Schools with Outstanding Achievement of Students

The study examined the performance of students enrolled in AP Calculus and Physics courses on the calculus and physics Third International Mathematics and Science Study (TIMSS) tests. Significantly, however, it did not report on the performance of American students in the original TIMSS tests administered in 1995, but rather on a later administration of the same tests to a different group of American students. It is of
particular relevance to the current study in that the purpose of the re-administration was to assess the performance of "certifiable" (Gonzalez, O'Connor, & Miles, 2001, p. 4) AP students as compared to the performance of the national sample of AP students included in the original testing.

The authors noted that in the original testing, American AP students were identified as those who "were taking or had taken AP Calculus or AP Physics" (p.4). In that testing, AP Calculus students scored slightly above the international average and AP Physics students scored below the international average, a finding that did not serve as a ringing endorsement of the AP Program. In the re-administration of the TIMMS test that this study reported on, however, AP students were limited to those taking AP courses in calculus and physics at the time of the testing. More importantly, the probability of schools being selected for the sample was "proportional to the number of students passing any of the AP Calculus or AP Physics exams in 1999" (Gonzalez, O'Connor, & Miles, 2001, p.7). Thus, schools in which large numbers of students took and passed the AP test were overrepresented in the sample.

A last factor that may have even further biased the sample in favor of schools with "certifiable" AP programs is that only 104 of the 395 schools invited to participate agreed to do so, introducing the possibility that these were the schools in which administrators believed their AP Calculus and Physics courses were strong ones.

Not surprisingly, when scores of the sample of AP students drawn from the "certifiable" schools were compared to 1995 test scores of the earlier American AP student sample, they were found to be significantly higher. Indeed, the score of the re-test sample of AP Calculus students on the TIMMS Advanced Mathematics test topped
scores of students in all 16 participating countries, and was significantly higher than all countries except France. AP Physics students outperformed 13 of 16 countries tested in 1995 (including the United States students from that test administration). This study lends strong support to the supposition that “certifiable” AP science students, i.e. those from schools in which large numbers of students traditionally have taken and passed the AP tests, are higher achievers in high school than AP students overall (Gonzalez, O'Connor, & Miles, 2001). The next section reviews several studies establishing that taking and scoring well on an AP exam also serves to predict higher achievement in college.

The AP Exam as a Predictor of College Achievement and Course-Taking

A large number of dissertations, many undertaken in the late 1960s and 1970s, have studied the performance of specific groups of AP students in college, such as those from a particular school district or those at a particular college. Since an exhaustive analysis and critique of all such studies was beyond the scope of this report, the following section represents a selective review of studies involving the following three types of research about the utility of AP exam taking and exam scores in predicting students' achievement and course taking in college:

1. Research about students’ performance in sequent courses (i.e. those beyond the level of the AP course) in the subject of the AP exam

2. Research about students’ general performance in college as measured by such criteria as freshman and four-year GPAs, and

3. Research about the number of college courses that students take in the same subject as the AP exam.
Performance in Sequent Courses in an AP Subject

In the earliest years of the program, institutional reports from MIT, Williams, and Harvard stated that AP students granted course credit (presumably on the basis of a qualifying exam score) were succeeding in more advanced course work, and at Harvard, they were noted to be performing better than non-AP students (Radcliffe & Hatch, 1961). Then, in 1971, Burnham and Hewitt compared freshmen entering Yale in 1963 and 1967 who had submitted AP exam scores to those who had not. (Of note, the latter group might have included students who took an AP course, but simply did not take or submit an AP exam score.) In seven subject areas, students who had taken an AP exam had higher mean grades in freshman and sophomore courses in the same subject area than non-AP students not matched for academic ability. When AP students were compared with non-AP students matched for SAT I and II scores, however, it was found that the AP and non-AP students performed comparably. However, only four courses in three subjects were examined, and the number of students in each course was small, ranging from 15 to 21 students. Finally, the utility of a student’s grade on the AP exam was suggested by the fact that there was a positive correlation between a student’s AP exam score in a particular subject and the average of all freshman and sophomore courses he took in that subject.

Another early study corroborated the finding that AP students who took advanced courses in college could do as well as non-AP students matched by academic ability (Bergeson, 1967). The author found that AP freshmen at Northwestern University in 1962 through 1964 received grades in sequent courses in English (52 pairs of students),
mathematics (28 pairs), and the sciences (24 pairs) that were as high as grades of non-AP students matched for gender and relevant SAT subscore.

Another dissertation study in 1999 found that performance of AP students was superior to that of comparably talented non-AP students. In this study, students entering Clemson University in the fall of 1991 who were intending to be math, science, or engineering majors were divided into those who had taken either a Calculus AB or BC test and those who had taken neither. Stratified random samples of each group were then formed and mean second semester calculus grades compared while statistically controlling for SAT score (although it is not clear whether this referred to SAT math score or the SAT Verbal plus Math). It was found that the mean grade of 322 students who had earned AP credit for first semester calculus was superior to the mean grade of the 264 non-AP students. The methodology for controlling for SAT score was as follows: “a two-by-two ANOVA was done using the residual course grades (removing the shared variability of SAT and each respective dependent variable) for the students in each group” (Wainscott, 1999, p.49).

A similar analysis of mean grades for the third semester calculus course again demonstrated a higher mean score for AP students (N=270) than non-AP students (N=180). This study demonstrates that among a sample of students at one large university in a particular year, AP Calculus students outperformed non-AP students in second and third semester calculus courses (Wainscott, 1999).

In 1986, ETS researcher Casserly undertook a nine-college study of the performance in sequent courses of students who had scored 3 or better on an AP exam. She encountered numerous problems in data collection, and her analysis consequently
became somewhat convoluted, but she concluded that overall, the AP students “do better than a generality of local upperclassmen in those courses” (meaning sequent courses) (p. 13). More convincing evidence of the ability of a qualifying AP exam grade (three or better) to identify students who would be successful in sequent courses was provided by a 1998 unpublished statistical report from ETS.

The authors studied AP students who earned exam grades of 3 or higher and received advanced placement at 21 colleges, and compared their performance in sequent courses in the AP exam subject to the performance of students who had taken the introductory course at college (non-AP students). It was determined that students with exam grades of 5 outperformed non-AP students in all 25 subject areas studied. Students with exam grades of 4 and 3 also outperformed non-AP students in a majority of subjects (Morgan & Ramist, 1998).

**General Performance in College**

In contrast to the above studies that looked at how well AP students granted credit were able to perform in sequent courses in the AP field, this category of studies examines the broader performance of AP students in college as measured by such criteria as freshman or four-year GPA. Stock’s dissertation study (1982) compared AP students who had submitted at least one exam grade to non-AP students across the four years of college at California State, Fresno. The two groups were matched by high school attended, sex, and year of college entry, but not by academic ability. Three groups of students were compared: those who had earned AP credit by having at least one exam grade of 3 or higher, those who took at least one AP exam but had scores of 1 or 2, and students who did not submit any AP exam scores. Stock found that the AP students with scores of 3 or
higher had higher SAT scores at entry and earned higher freshman and graduation GPAs in college than the other two groups. There was no significant difference between the students who earned AP scores of 1 or 2 and non-AP students with respect to freshman and graduation GPAs. In this study, therefore, the prediction of higher college achievement was limited to the earning of a qualifying grade rather than simply the taking of an AP exam.

The most extensive comparison of AP to non-AP students in college, however, was the large-scale study undertaken by ETS researchers Willingham and Morris (1986). In this study, in which AP students were defined as those who had submitted at least one AP grade to their college, the authors compared the performance of about 1100 AP students to approximately 3700 non-AP students at 9 private liberal arts colleges. They found that AP students whose average exam grade was 4 or higher were substantially different from those whose exam grade averaged below 3. Students with exam grades averaging 4 or higher had higher freshman GPAs than were predicted on the basis of their high school class rank and SAT scores, whereas students with exam grades averaging below 3 had freshman GPAs that were slightly lower than predicted (Willingham and Morris, 1986). Again, this study corroborates the predictive value of the exam grade for college achievement.

**Number of College Courses Taken in the AP subject**

The last category of research examines the predictive value of AP exam taking for the number of courses taken in college in the subject area of the exam. The Willingham and Morris (1986) study cited above demonstrated that college seniors who had submitted AP exam grades in particular areas reported a higher frequency of having taken at least a
year of course work, or of having majored in, the AP subject than their classmates as a whole. This finding was corroborated by Morgan & Maneckshana (2000), who found that for 27 of 28 AP subjects, AP exam takers at 21 colleges took a larger number of courses in the discipline than did students who had not taken an AP exam in the subject. In addition, students’ grades in AP exams also served as predictors of their college behavior. Specifically, for students who took AP Calculus, the likelihood of majoring or minoring in math increased as the AP exam grade increased, from 12% of students who earned exam grades of 1 to 37% of those who earned exam grades of 5.

Generalizations Drawn from the Above Studies

The following generalizations can be drawn from the studies presented.

1. When AP students who had earned college credit were compared to non-AP students without matching for ability, AP students tended to outperform non-AP students in sequent courses in the AP subject area (Casserly, 1986; Morgan & Ramist, 1998; Radcliffe & Hatch, 1961). This was especially true for students with exam grades of 4 and 5 (Morgan & Ramist, 1998).

2. When AP students submitting exam scores to college were compared to non-AP students matched for some measure of ability, the findings from one study showed the groups to perform similarly in four sequent courses (Burnham & Hewitt, 1971). However, the number of students in each class was small (15 to 21), and the data came from one university, Yale, over 30 years ago, so the findings are not widely generalizable to the AP Program overall today. A second dissertation study, also limited to one university, did, however, provide more convincing evidence that AP Calculus students
outperformed non-AP students in second and third semester calculus courses (Wainscott, 1999).

3. When overall college achievements of students who had submitted at least one AP exam grade were compared to non-AP students, AP students attained higher freshman grades (Burnham & Hewitt, 1971; Willingham & Morris, 1986) and four-year GPAs, and this remained true in one study even when students were matched for academic ability (Willingham & Morris, 1986).

4. Students who submitted exam grades in particular subjects were more likely to have taken a year or more of course work in the subject (Willingham & Morris, 1986) and took more courses overall in the subject (Morgan & Maneckshana, 2000) than other students.

5. Systematic differences have been noted between AP students with high AP exam grades and those with low exam grades. Students with higher AP exam grades in particular subjects have been found to also have higher average SAT II scores (Burnham & Hewitt, 1971) and college grades in the same subject (Burnham & Hewitt, 1971; Morgan & Ramist, 1998). Furthermore, students who had at least one AP exam grade of 3 or better were found to have higher freshman GPAs than students earning grades no higher than 1 or 2 at one college (Stock, 1982). Similarly, students at 9 liberal arts colleges whose average AP exam grade was 4 or above had freshman grades that were higher than predicted on the basis of class rank and SAT scores. Students whose average AP exam grade was less than 3, by contrast, had freshman grades that were slightly lower than predicted (Willingham & Morris, 1986). Finally, among AP Calculus students at 21 colleges, students with higher exam grades were more likely to major or minor in math
than students with low exam grades (Morgan & Maneckshana, 2000). Taken as a whole, these findings lend strong support to the utility of the AP examination and the grade as predictors of college behavior.

If we accept the premise that AP exam taking is vital to safeguarding the integrity of AP courses and that exam taking and exam grades provide useful predictors of academic performance in college, then we turn next to the question of the extent to which AP students are taking the AP exams. What is known about the issue of exam taking? The next section addresses this question.

Research on AP Exam taking

As mentioned earlier, baseline information on national rates of exam taking among AP-enrolled students comes from unpublished information collected by ETS for the College Board. To review, an annual fall survey of AP coordinators at high schools (whose yield was 71.8% in 2001), asks schools for the number of students enrolled in each AP course. By comparing these numbers to the numbers of students in each course who take the exam in the spring, ETS calculates the percentage of enrolled students who took the AP exam for the nation and each state (R. Morgan, personal communication, October 4, 2002 and August 8, 2003). Data on the national rate of exam taking, represented in Table 1, documents that the percentage of AP course enrollments culminating in the AP exam nationally has increased steadily, from 58% in 1996 to 70% in 2002.
Table 1.

*Percentage of AP Enrollments Culminating in an AP Exam from 1996–2002*

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Note: Source of data is R. Morgan, personal communication, December 20, 2002

The percentages of AP exams per AP course enrollments have also been calculated by ETS for individual AP subjects. These percentages ranged from a low of 38% for Studio Art: Drawing to a high of 99% for Physics C – Electricity and Magnetism in 2002 (R. Morgan, personal communication, December 20, 2002), indicating that the rate of exam taking varies across subjects and is not a uniform 70%.

The trend data for the national percentage of AP enrollments culminating in an exam is positive, showing an impressive increase of 12% in six years, from 58% in 1996 to 70% in 2002, and providing encouraging evidence that the rate of exam taking, viewed on a national scale, is moving in the right direction. What this data does not tell us, however, is the extent to which course enrollments in individual courses, or in individual high schools, are culminating in AP exams, or the extent to which the rate of exam taking varies across courses or high schools.

For example, an overall exam-taking rate of 70% could be achieved by 70% of students in every AP course taking an exam, or by all students taking the AP exam in 70% of courses, and no students taking the AP exam in 30% of courses. These would present very different scenarios. If the rate of exam taking were uniform across courses...
and high schools, i.e. if all AP courses had an exam-taking rate of 70%, one might regard this as a situation that needs improvement, but is not alarming, especially considering that the national percentage of exams taken in AP courses has been increasing. If, on the other hand, it were true that 30% of courses had no students taking AP exams, this would be a cause for greater concern, particularly if the courses in which no students took exams were not randomly distributed across high schools. The situation would be worst of all if such courses were in fact overrepresented in the high schools serving predominantly low-income or underrepresented minority students.

What do we know about the phenomenon of exam taking, about which students take exams, what types of courses, high schools, or school districts are characterized by high or low rates of exam taking? In order to answer these and other questions, an extensive search of educational literature, governmental and College Board/ETS research studies was undertaken. While it uncovered no studies whose major focus was to investigate what percentages of students enrolled in AP courses take the AP exams or what factors influence exam taking, some studies were found that contained related data or discussion of exam taking, and these will be discussed below.

Review of Literature on Rate of Exam taking

Two Casserly studies (1968, 1986) addressed student perceptions surrounding the exam-taking decision. In her 1968 study, she noted that “The advice of guidance counselors was also mentioned as the prime factor which influenced 10 percent of my sample not to take an AP Examination after they had participated in an AP course” (p. 29). It is not entirely clear whether this quote implies that only 10% of students interviewed opted out of the exam, or whether 10% of students were influenced by their
guidance counselor not to take the exam. In either case, however, the guidance counselor's rationale was allegedly that a student who repeated an AP course in college would be assured of at least one easy course. Casserly reported her own perception that there was an increasing trend for schools to require all AP students to take the exam, though she did not present data to confirm this. These statements, taken together, seem to imply that most students in the 1968 sample took the AP exams in the courses in which they were enrolled, or at least that this was Casserly's impression.

Casserly (1968) also questioned students about the courses they had taken to prepare for AP exams. A majority of students (70%) reported that their AP courses followed the AP course outline and prepared them for the exam. Another 10% of students had taken advanced courses that were not specifically labeled AP but that also provided adequate exam preparation, but 15% of students commented that their Advanced Placement courses were not geared to the AP curriculum and did not prepare them for the exam.

Casserly's 1986 study addressed students' decisions regarding the taking of the exam more explicitly. Despite the impression conveyed by the 1968 study that most students were taking the AP exam, Casserly apparently believed that even more students were taking the exam in 1986, noting that since 1968, there had been a "shift toward prior commitment to taking the examination" (p. 8). She attributed this to teachers' desire for information on their teaching success, the positive feedback about AP benefits in college coming from former students, and the financial advantages of earning college credit through AP courses.
Casserly (1986) did provide two reasons reported by students for opting out of the exam; either that the student wanted to repeat the course in college to get a high grade, or that the student and/or teacher did not feel the student would do well on the test. However, she implied that these reasons applied to a small proportion of AP students. Casserly's studies are, in general, informative and thorough, but her treatment of the exam-taking decisions of students is quite cursory. In addition, the lack of any quantitative data on the percentages of students opting out of the AP exam in either year (1968 or 1986), or the percentages of students opting out of exams for particular reasons, limits our understanding of this phenomenon.

The only other College Board report found by this author that addresses the question of why students choose to take or not take exams is the multi-institutional study comparing AP to non-AP students by Willingham & Morris described earlier (1986). No data on the percentages of students taking exams, how students made exam decisions, or factors that might have influenced those decisions was provided, but the authors speculated on possible reasons for students not taking exams (or not having the scores sent to their college). These included indecision about whether to attend college or which college to attend, poor performance in the course, desire to repeat the course in college, or a decision that advanced standing would not be worth the cost of the exam fee.

A 1970 dissertation that included survey data on comparative perceptions of former AP students who had taken the AP exam compared to those who had not provides some interesting findings. The study consisted of a mail survey of 140 students who had taken AP English and/or American History at three Salt Lake City High Schools from 1965 through 1968 and who had then gone on to the University of Utah. A total of 80
students (57%) responded, and the survey responses of the 59 students (74%) who had taken the AP exam were compared to the 21 students who had not. While the author did not employ statistical testing to directly compare the responses of these two groups, the percentages of students who strongly agreed, agreed, disagreed, or strongly disagreed to a number of questions about their AP courses was presented. A consistent pattern emerged in which the test takers strongly agreed with positive statements about AP courses substantially more often than non-test takers (Fowler, 1970).

Among these statements was one that AP was “a stimulating, worthwhile and rewarding experience” (p.48), which was strongly agreed with by 64.9% of test takers compared to only 25% of non-test takers. Similarly, a larger percentage of test takers strongly agreed that AP courses “were superior to other non-AP academic courses” (66.7% vs. 20%) (p.50) and “were as challenging as college courses” (42% vs. 10%) (p.52). A strong majority of both groups agreed that they would “choose to participate in the AP Program again” (p.61), but the test takers agreed in a higher percentage of cases (96.5% vs. 80%). The one area in which non-test takers had a higher percentage of strongly agreeing with a positive statement about the AP Program than test takers was in response to the question of whether “APP aided in making the transition from high school to college” (p.53) (45% of non-test takers vs. 29.8% of test takers). One cannot generalize from the findings of such a small number of students from three Salt Lake City high schools in 1965-1968. However, the study suggests that among sample students, at least, those who did not take the AP exam had somewhat less positive perceptions of their AP courses than test takers. Finally, of 20 students who provided reasons for not taking the test, 14 noted that it was because they had not felt prepared for it (Fowler, 1970).
Herr also addressed the exam-taking issue in his 1990 dissertation survey of AP science teachers and administrators from all California high schools with a senior class of 60 or greater as well as a large number of New York and New Jersey high schools with AP Programs (Herr, 1990, 1992). Asked to identify their school policy on AP exam taking, 25% of teachers responded that all students in their class were required to take the AP exam, 57% "recommended that all of their students take the examination," and 18% "recommended that only the better students in their class take it" (p.166). When further asked what percentage of students in their classes did take the exam, the mean response was 70%, and in approximately 10% of classes, 0% of students took the exam. Commenting on this situation, Herr said, "it should be reemphasized that nearly one third of all students from the schools in our sample apparently have AP recorded on their transcripts, but yet never take the examination, raising the question as to what actually defines a class as being an 'AP' class" (p.168).

Another dissertation that included information on exam-taking patterns was that of Sisler (1989). She reported on a survey of 448 former AP students (representing a yield of 60.9%) from high schools in Duval County, Florida that had the highest number of examinations in each of the four years preceding her study. Students were asked one group of questions about the AP Program as a whole and other group of questions that were keyed to each AP course that they had taken. Course-level responses indicated that overall, 83.6% of course enrollments culminated with the taking of the AP exam, but this figure varied considerably across AP subjects, from a low of 33.3% to a high of 94.9%.

While student perceptions of AP courses overall were very good, students had mixed reviews of individual courses; they responded that they had not felt adequately
prepared for the AP exam in 27.7% of courses, and this figure varied from 15.2% to 89.6% across subjects (Sisler, 1989). The student sample here was not representative of high schools in Duval County (high schools with large numbers of AP examinations in previous years were sampled), so generalizations of the findings to the AP Program in general are not warranted.

Wide variations in students' perceptions of individual AP courses were also reported in a survey of all former AP students in a five-year period from the Mesa Public School District in Arizona. This survey had a low yield, with only 182 of 579 surveyed students responding (31%), so its findings must also be viewed cautiously, but it still sheds some light on the issue of exam taking. Like the Sisler (1989) study, students were asked questions about the AP Program in general, as well as about the specific courses they had taken. While over 90% of students agreed or strongly agreed that AP courses overall were a valuable experience and were more interesting and challenging than other courses, when questioned about specific courses, only 57% of students felt they had been prepared for the AP test. As in the Sisler study, there was substantial variation in the percentage of students who felt prepared for the AP test across subjects, with percentages ranging from 38% to 75%. Unlike the Sisler sample, however, only 45.5% of AP course enrollments had culminated in the AP exam in this group (Troidl & DeGracie, 1985).

Schinzel's 1996 dissertation examined AP science courses in Catholic schools served by the Midwestern Regional Office of the College Board. Surveys of 66 administrators and 83 AP science teachers from 81 schools examined several aspects of the AP Program, one of which was the AP exam. It was found that rates of exam taking differed across subjects for the sample as a whole, with 44.7% of biology students, 57%
of chemistry students, and 42.3% of physics AP students having taken the AP exam.

More interesting, however, were two survey questions asked of both administrators and AP science teachers. Respondents were asked to rate statements on a scale of 1 to 4, with “1 = strongly disagree,” “2 = disagree,” “3 = agree,” and “4 = strongly agree” (p.84). It was found that administrators and teachers had similar mean responses, at 2.754 and 2.864, to the statement, “I think all students enrolled in an Advanced Placement course should be required to take the Advanced Placement Examination” (p.84).

However, when asked to agree or disagree that “I think Advanced Placement science courses offer benefits for students who do not take the Advanced Placement examination,” administrators disagreed, with a mean rating of 1.646, while teachers agreed fairly strongly, with a mean rating of 3.580. This difference was found to be statistically significant, and suggests that the confidence that teachers felt for the value of AP courses in which students do not take the exam was not shared by their administrators (Schinzel, 1996).

The above studies, while limited in their number and scope, reveal that AP courses varied in the extent to which students took the AP exam, and the Sisler (1989) and Troidl & DeGracie (1985) studies reveal variability in the extent to which students felt prepared for the exam across subjects. Further, the Fowler dissertation suggested that for one small sample of students, AP test takers tended to have better perceptions about their AP courses than non-test takers (Fowler, 1970). It should be noted, however, that none of these reports provided more than cursory information about exam taking.

A study that gave somewhat more attention to the issue of exam taking was a dissertation by Miller (1994) that involved a comparative case study of two AP classes
(English and American History) at two very different high schools in the same southeastern city. Anderson was a high school located in an affluent area of the city that served predominantly White students, while Baker, located in an economically depressed area, served predominantly African American students. Miller’s investigation, consisting of interviews with students (90 of the 101 students in the four classes), faculty, and administrators, classroom observations, and student testing data, provides a nuanced and thought-provoking analysis.

Several differences emerged between the AP classes at the different schools. In addition to the marked socioeconomic gap between schools, a substantial gap in academic ability between AP students was identified. Students at Baker had scored in the 28th and 29th percentiles on the Verbal and Math PSAT, respectively, compared to their counterparts at Anderson, who had scored in the 80th and 70th percentiles. School policies regarding the AP exam also differed in important ways. Students at Anderson were required to take the AP test, while those at Baker were not only not required to take the test; they received dual enrollment credit for the course even if they did not take the exam.

Given these differences between students, schools, and AP policies, it is not surprising that the exam-taking rates varied greatly between schools. At Anderson, all students took the exam in both courses (26 in English and 29 in History) while at Baker, only 2 students took the English exam and none took the History exam. Of note, both AP teachers at Anderson said they taught the course at a college level and focused on preparing students for the AP exam, whereas at Baker the AP teachers said that students did not have the skills they needed to succeed at college-level work. While the Baker
teachers considered the work in their AP classes to be more challenging than standard classes, they did not think the students were working at a college level (Miller, 1994). One cannot draw generalizations of any kind from a study of four classes at two schools, but the Miller study does help to highlight some of the issues, such as socioeconomic status of schools and students, student ability, teacher expectations, and school policy, that can play a role in exam taking.

One further dissertation that sheds light on the issue of exam taking is a study of the AP Program in the public schools in Hawaii. Interestingly, there were only 39 public schools in Hawaii in 1979, the year this dissertation was undertaken, and only 18 offered AP courses. Further, only one school offered five AP courses, and no school offered more than five. The author investigated 12 AP schools on the island of Oahu, utilizing interviews with guidance counselors and AP teachers and surveys of principals, current AP students and former AP students who had graduated. Over a three year period, 1977-1979, the percentage of course enrollments that culminated in an AP exam was low, between 26 and 40%, while the percentage of exams graded 3 or better was fairly high, 74 to 78% (Murray, 1980). This pattern might suggest that students who anticipated doing poorly did not take the exam.

Murray came to such a conclusion after finding, additionally, that among former and then-current AP students, only 41 and 56% of respondents felt that they were “adequately prepared to take the formal end-of-course AP examination(s).” Even more interesting, only 67% of AP teachers felt that their students were “being adequately prepared” to take the AP exam (p.111). Murray wrote, “Apparently the low AP formal
end-of-course participation rate ... was caused in part by the perceived inadequate preparation for the examinations” (p.111).

He also found that the exam fee had some impact on exam participation. When students were asked, “Did the $32 fee for the formal end-of-course examinations prevent you from taking the AP exams?” (p.132), 26% of former AP students and 13% of then-current students answered yes. Interestingly, Murray also asked school personnel and AP students whether they were aware that “there is a fee reduction for students with financial need which reduces the cost to as little as $15 per examination” (p.94), and found, surprisingly, that only 25% of principals, 75% of counselors, and 71% of AP faculty were aware of it. Equally telling, only 39% of former AP students and 53% of then-current AP students were aware of the College Board’s fee reduction program. In conclusion, Murray’s study suggests that inadequate preparation for the exam and the exam fee were two factors that negatively influenced the participation of Hawaiian students in AP exam taking (Murray, 1980).

A final source of information on exam taking that is particularly relevant to the present study is found in two previously mentioned articles by a reporter for the Bergen Record, a northern New Jersey newspaper. While these articles are not scholarly reviews, they are nonetheless of particular interest to this study because they address exam taking in New Jersey, the state that will serve as the venue for this dissertation study. In a report highlighting the threat posed to the integrity and prestige of the AP Program by students taking an AP course but skipping the exam, Kladko (2000) reported that only 59% of Northern New Jersey AP students had taken the AP exam in the previous year. (He cited the source of his data as New Jersey Department of Education data, which means it was
probably the New Jersey School Report Card. If so, the percentage would more accurately be expressed as the percentage of AP course enrollments that culminated in an AP exam.). Kladko also reported large differences in exam-taking rates across schools. Anecdotally, three students from two schools with low rates of exam taking were quoted as saying that certain courses were not rigorous and/or did not prepare students for the AP exam.

In his 2000 article and a follow-up piece in 2002, Kladko also discussed strategies that some schools had adopted to increase their rate of exam taking. One was to require all students enrolled in AP courses to take the exam. While this strategy is effective, Kladko cited concerns of some school officials that requiring students to take the exam without paying for it, which at least one high school did, is unfair or potentially even illegal (2000). Other strategies to increase exam taking included providing incentives such as reimbursing students for the cost of the exam fee for exams graded 4 or 5 (2002) or excusing students who take the AP test from taking the teacher’s final (2000).

What is most noteworthy about Kladko’s (2000, 2002) reports are that several of the high schools identified as those with especially low rates of exam taking are not schools in low socioeconomic areas. New Jersey places schools in one of eight District Factor Groups (DFG) based on seven measures of socioeconomic status (NJDOE, n.d.c), and four of the six high schools that Kladko identified as having low rates of exam taking are in the second or third highest DFGs. One school is in the fourth highest DFGs, and the last is in the sixth highest DFG, (analysis by this author, categorization of schools found in NJDOE, n.d.d). This suggests that the percentage of AP students who take the AP exam does not depend solely on school and student resources.
A report on AP exam taking in Connecticut, which categorizes districts based on socioeconomic status in a similar manner as New Jersey, lends support to this hypothesis. The report includes a table that lists the percentages of AP-enrolled students who took the AP exam in 1995-96 and 2000-2001 for each comprehensive high school. Summary data indicated that for comprehensive public high schools across the state, the rate of exam taking had increased from 60% to 73% between 1995-96 and 2000-2001 (Table 4, Sergi, 2002).

The report also included the rate of exam taking for high schools in each of nine socioeconomic status categories, called Education Reference Groups (ERGs), which are similar to New Jersey’s DFGs. Categories are formed by utilizing seven socioeconomic indicators in a cluster analysis to form the nine categories. These are roughly ranked from lowest (I) to highest (A) socioeconomic status (Connecticut State Department of Education, 1996). Although these categories are ranked from high to low, it cannot be assumed that the intervals between groups are equal. Figure 1 is a bar graph showing the percentage of students enrolled in AP courses who took the AP exam (rate of exam taking) in 2000-01. Note that socioeconomic status of groups increases from left to right.
Figure 1. Rate of exam taking of 2000-01 AP students within Education Reference Groups in Connecticut. Source: Chart derived from data provided to the Connecticut State Board of Education, VIII.D. Report from Theodore S. Sergi, Commissioner of Education, April 3, 2002 (Sergi, 2002).

It can be seen from the above graph that there is a general trend towards increasing exam taking as one moves from lower to higher socioeconomic districts, with a slump in RET in three of the middle districts. One possible hypothesis to explain this slump might be that larger numbers of students in the lowest socioeconomic status ERGs than in middle-range ERGs are eligible for exam fee subsidy. While many students in the middle-socioeconomic status ERGs may be relatively low-income students for whom the exam fee might constitute a financial hardship, they may not have a sufficiently low income to qualify for exam fee subsidies. This hypothesis is highly speculative, however. Nonetheless, the pattern depicted in the graph suggests that exam taking depends on more than simply the socioeconomic status of the districts in which high schools are located.

Table 2 provides a summary of the studies on exam taking, providing the author, date, source of the research (i.e. dissertation, news article), and major findings.
Table 2.

Summary of Literature Presented on AP Exam taking

<table>
<thead>
<tr>
<th>Author, date &amp; Source of Research</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Casserly, 1968</strong>&lt;br&gt;Article in <em>College Board Review</em></td>
<td>Interview of 476 students at 20 colleges: 70% had taken AP course that followed course outline and prepared them for exam, 10% had taken advanced, non-AP course that prepared them for exam, 15% had taken course that didn’t follow AP outline or prepare them for exam.</td>
</tr>
<tr>
<td><strong>Casserly, 1986</strong>&lt;br&gt;College Board Report</td>
<td>Interview of 278 students at 9 universities. Two reasons reported for small number of students opting out of exams: wanting to repeat course in college and student/teacher expectation of poor exam performance.</td>
</tr>
<tr>
<td><strong>Fowler, 1970</strong>&lt;br&gt;Dissertation</td>
<td>Survey of 80 former AP students from 3 Salt Lake City High Schools. Comparison of responses of 59 test takers to 21 non-test takers revealed higher percentage of test takers agreed with positive statements about AP courses.</td>
</tr>
<tr>
<td><strong>Herr: 1990-1992</strong>&lt;br&gt;Dissertation</td>
<td>Survey of 197 California, New York, and New Jersey AP teachers: 25% said students required to take AP exam, 57% recommended exam for all students, 18% recommended exam to better students. Percentages of students who did take the exam in biology, chemistry, and physics classes: mean = 70%, mode = 100%, and in approximately 10% of classes, no student took exam.</td>
</tr>
<tr>
<td><strong>Sisler, 1989</strong>&lt;br&gt;Dissertation</td>
<td>Survey of 448 former AP students from high schools in Duval County, Fla. in which a high number of AP exams had been taken in previous years. Overall, 83.6% AP courses culminated in exam, but rates for subjects varied from 33.3% to 94%. Perceptions of AP were generally good, but students had not felt adequately prepared for exam in 27.7% of courses.</td>
</tr>
<tr>
<td><strong>Troidl &amp; DeGracie, 1985</strong>&lt;br&gt;Journal article</td>
<td>Survey of 182 former AP students (representing 31% yield) from a district in Arizona. Overall, 45.5% of course enrollments had culminated in exam. AP perceptions were generally very good, but when asked about specific courses, only 57% of students reported feeling prepared for the AP test, and this varied by subject.</td>
</tr>
<tr>
<td>Author</td>
<td>Year</td>
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<tr>
<td>Schinzel, 1996</td>
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<td>Miller, 1994</td>
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<td>Murray, 1980</td>
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<td>Kladko, 2000</td>
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<td>Kladko, 2000 &amp; 2002</td>
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<tr>
<td>Sergi, Report from CT Comm. Of Ed. to CT BOE, 2002</td>
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</tbody>
</table>
The foregoing literature review has summarized the research this author has found on AP exam taking by enrolled students. The literature is neither abundant nor conclusive; what is known answers few questions about the factors that impact the percentage of enrolled students who opt to take the exam. At the heart of understanding the phenomenon of exam taking, however, is the recognition that the decision to take an AP exam, or to avoid it, rests with the individual student (except in cases where exam taking is mandated). Therefore, this review now attempts to organize the factors that the literature has suggested might influence students’ exam decisions and to hypothesize other potentially influential factors. The factors have been grouped into categories, but one factor occasionally appears in more than one category.

1. School Policies
   - Policy requiring that students take the AP exam
   - Policy regarding payment of the exam fee
   - Policy incentives to take the exam
   - Policy disincentives to take the exam

2. Exam Fee
   - Socioeconomic status of student
   - Number of AP courses being taken

3. Quality of Course/School resources
   - Socioeconomic status of students and community
   - Quality of faculty
   - Academic achievement/ability of student body

4. AP Subject
5. Characteristics of the Student

- Academic achievement/ability
- Number of AP courses being taken

6. Anticipated Effect of Exam Grade

- Desire to earn college credit
- Perceived impact of exam grade on college admissions

The first category of factors thought likely to impact students' exam-taking decisions is school policies regarding the taking of the AP exam and the payment of the exam fee.

School Policies

School policies that might influence students' exam decisions have been divided into four groups, the first of which is a requirement that all students take the AP exam.

*Policy requiring students enrolled in an AP course to take the AP exam.*

For students in some high schools, taking the AP exam in an AP course is not a choice; it is a requirement (Herr, 1990; Kladko, 2000; Miller, 1994). The College Board has collected some data on the extent to which this is true through its annual fall Participation Survey of AP coordinators, which asks, "Are students enrolled in an AP course (or its equivalent, e.g. honors) required to take the AP exam?" (2001-02 AP Participation Survey Data: Global Report, p.1, acquired from R Morgan, personal communication, June 26). In 2001-02, 27.2% of schools answered "Yes, for all AP courses (or their equivalent)" and 9.1% answered "Yes, for most AP courses (or their equivalent)," while 59.1% of schools answered "no". (An additional 4.5% answered "Yes, for some AP courses [or their equivalent]") These figures had not changed much.
from the 1999-00 school year, when 24.8% of schools answered, “Yes, for all AP courses (or their equivalent)” and 59.9% responded “no” (2001-02 AP Participation Survey Data: Global Report, p.1, acquired from R Morgan, personal communication, June 26). It can therefore be seen that many AP students, though not the majority, are required to take the AP exam. For those who do have a choice, however, the remaining factors are hypothesized to influence their exam decisions.

*Policy regarding payment of exam fee.*

Some high schools pay the exam fee for all students (Kladko, 2000), but this author is unaware of data documenting how prevalent this policy is. However, schools in many states are eligible to participate in state or federal exam subsidy programs. The U.S. Department of Education provides grants to 45 states and the District of Columbia to promote AP course and exam taking by low-income students, and some of this money is used to subsidize exam fees. In addition, eleven states provide fee subsidy for low-income students who meet eligibility criteria for the College Board’s Fee Reduction program, and ten states and the District of Columbia have fee subsidy programs that extend to students who are not low income (CEEB, 2003a).

In New Jersey in 2001-2002, the main year for which New Jersey data will be analyzed, the cost to students for each AP exam taken was $78.00. However, through New Jersey’s participation in the federal Advanced Placement Incentive Program, low-income students in that state could take AP exams at no cost (NJDOE, n.d.a). The mechanics of the program for 2001-02, the main year of the present study, were as follows. A list of eligible students was sent by each participating high school to the College Board. It reduced its fee by $22.00, the high school waived its $7.00
administration fee, and the state of New Jersey was billed for the remaining amount (NJDOE, n.d.a).

A notable aspect of this program is that it did not require students to pay the exam fee and then be reimbursed. Thus, if all high schools identified eligible students properly, no low-income student would have been prevented from taking AP exams because he or she could not afford the exam fee. While this program ensured that students meeting the low-income eligibility were not prevented from taking AP exams due to financial constraints, it seems likely that there were students who were not quite as poor, but for whom paying for one or several exams would have constituted something of a financial hardship.

Policy incentives to take the exam.

Two incentives reportedly used by high schools in Northern New Jersey to entice AP students to take the exam are policies that excuse AP examinees from the teacher's final exam (Kladko, 2000) or reimburse students for an exam fee if they achieve an exam grade of 4 or 5 (Kladko, 2002). Beyond these incentives, schools could induce students to take AP exams by weighting grades in AP courses only if the exam is taken or by finding other ways to reward exam taking, and it is expected that these inducements would influence students' exam decisions.

Policy disincentives to take the exam.

Miller (1994) noted that in one of the high schools she studied, students in AP English and U.S. History courses received dual enrollment credit. This policy, which guarantees the awarding of college credit upon satisfactory completion of the course,
whether or not a student takes the AP exam, would be expected to act as a significant disincentive for students to take the AP exam.

*Exam fee*

As alluded to earlier, the College Board has a fee reduction program for low-income students who meet certain eligibility standards. For 2002-03, the College Board reduced its fee by $22 and the high school was expected to waive its typical $8 administrative fee, leaving the student with an exam fee of $50 instead of $80 (CEEB, 2003a). While this offsets the fees somewhat for low-income students, it would still leave a student with a fee of $50 per AP exam unless the student’s state had an additional fee subsidy program.

*Socioeconomic status of students.*

Murray’s aforementioned 1980 dissertation examining the AP Program in public high schools in Hawaii also serves as a source of instructive data on the issue of the exam fee. He found that 26% of former AP students and 13% of then-current AP students reported that the exam fee prevented them from taking the AP exams. Further, only 25% of principals, 75% of counselors, 71% of AP faculty, 39% of former AP students and 53% of then-current AP students at the 12 high schools studied were aware of the College Board’s fee reduction program. These findings raise an important question as to the extent to which New Jersey students in 2001-2002 were aware of the fee waiver program available to them in New Jersey, an issue that will not be investigated by the present study, but is deserving of consideration.

Another dissertation, consisting of a survey of students from a random sample of public and private high schools in Middle Atlantic states, provided a small amount of
data on the impact of the exam fee as well. Students were selected by school personnel on the basis of being enrolled in a college preparatory curriculum, an AP course, or having been identified as gifted. A total of 290 students from 12 schools that offered an AP Program and 276 students from 11 schools that did not offer the Program participated. Asked to check all applicable reasons for not taking a first or subsequent AP course, 8% of students from schools with an AP Program and 12% of students from schools without a program selected “Cannot afford AP exam of $32” as one reason (Silsbee, 1981, p.90).

With respect to New Jersey students, those who meet the eligibility requirements for the College Board fee reduction program are eligible for a complete fee waiver through the New Jersey Advanced Placement Incentive Plan (NJDOE, n.d.a). However, for students who do not qualify as low income (or are ignorant of the fee waiver program) and who do not attend high schools that pay the exam fee for all students, the fee represents a factor that could impact the exam-taking decision. Thus, the socioeconomic status of a student might very well influence his decision regarding the taking of the AP exam.

*Number of AP courses being taken.*

Similarly, since each exam cost $80 in 2002-03, the number of AP courses a student was taking might influence whether she decided to take the exam in all courses. *Quality of the course/school resources*

Casserly (1986) identified fear of not doing well on the AP exam as one of the reasons students sometimes avoided the test. Further, the surveys of former AP students by Casserly (1986), Sisler (1989), Murray (1980) and Troidl & DeGracie (1985) revealed that students perceived that some courses had not prepared them well for the AP test.
Moreover, Murray’s (1980) dissertation revealed that only 67% of AP faculty surveyed believed that their students were being adequately prepared for the AP test (p.111). Thus, the educational quality of an AP course is expected to have a significant impact on a student’s exam decision. The first factor to be discussed relating to course quality is school resources.

_Socioeconomic status of students and community._

With respect to school resources, socioeconomic status of the students and surrounding community is the one area in which direct data, from a report on the 2001 AP Program in Connecticut, was available on the relationship between a district variable and rate of exam taking (Sergi, 2002). While there was a general trend toward higher exam taking by higher SES Education Reference Groups (ERG) s, the graph depicting the relationship between RET and ERG categorization also showed a slump in RET among ERGs in the middle range of the ERG categorization, suggesting that the relationship between socioeconomic status of schools and RET was not a straightforward one.

Another source of information for the present study of New Jersey high schools was found in a 1992 study of the relationships between school characteristics and student outcome indicators for a representative sample of 105 public high schools in New Jersey. What makes this study especially relevant to the present study is that the two studies share two school variables, namely District Factor Group (DFG) and the percentage of teachers with a master’s degree. Rather than using the rate of exam taking as the outcome indicator of interest, however, this study looked at a variety of other outcome indicators, including mean combined SAT score (Math plus Verbal), and scores on the New Jersey High School Proficiency Test (HSPT) given to 9th graders (Kanarick, 1992).
Kanarick treated the ten categories of DFG as a continuous variable coded 0 through 9 and found a correlation between DFG and combined SAT score of .71 and correlations between DFG and the HSPT Reading, Writing, and Mathematics tests between .62 to .64 (Kanarick, 1992). Thus, in this 1992 study of New Jersey public high schools, DFG was found to be related to student academic performance on two standardized tests. Even more pertinent, the correlation between DFG and the percentage of eligible students in a school who opted to take the SAT was an impressive .85. These findings suggest that DFG might have a distinct impact on the likelihood of AP enrollees taking the AP exam. (Of note, the New Jersey DFG categorization has been revised since the time of the Kanarick study. Currently, there are seven categories with intervals between categories that are not necessarily equal [A. Dupree, personal communication, April 11, 2003]. Consequently, DFG is treated as a categorical variable in the current study.)

**Quality of faculty.**

It stands to reason that the quality of faculty would impact the quality of a course and the likelihood that a student would feel confident in taking the exam. Indeed, the College Board recognized the importance of teachers’ academic qualifications in recommending that AP teachers should be those who possess an advanced degree in the content area (CEEB & ETS, 1996). Furthermore, it is hard to imagine that teacher quality did not contribute to the perceptions of several groups of former AP students that some courses had not prepared them well for the AP test (Casserly, 1986; Murray, 1980; Sisler, 1989; Troidl & DeGracie, 1985).
Academic achievement/ability of the student body.

Further, Miller’s 1994 comparative case study of a White, affluent school and a predominantly Black, low-income school in the same city highlighted that there were large differences in the academic achievement/ability of the students as documented by PSAT scores. This led to lowered expectations on the part of the faculty at the low-income schools and ultimately a perception of the two teachers interviewed that the AP courses they were teaching were not truly college level courses. Thus, the academic achievement/ability of students in an AP course can impact its rigor.

AP subject

The varying national rates of exam taking for the different AP subjects calculated by ETS for the College Board (R. Morgan, personal communication, December 20, 2002) indicate that the subject of an AP course is clearly one course characteristic that affects students’ exam-taking decisions. The variation in rates of exam taking estimated by ETS across different AP subjects nationally (R. Morgan, personal communication, December 20, 2002) was also found in New Jersey, where rates of exam taking varied from a low of 20.1% in Studio Art - 2D to a high of 77.6% in Calculus BC in 2002 (R. Morgan, personal communication, July 10, 2003). These findings suggest that the exam subject influences exam decisions for New Jersey students.

Characteristics of the Student

Academic achievement/ability of the student.

Casserly (1986) reported that one reason students cited for opting out of the AP exam was a belief by the student or teacher that the student would not do well. The recommendation by a teacher that a student not take the exam would seem to imply a
judgment that a particular student is not likely to do well rather than that the course itself was deficient. Miller's dissertation also revealed that teachers of the two AP courses in the economically depressed school did not regard their courses as being college level, which they attributed in part to the poor academic preparation of the students (Miller, 1994). Finally, Herr's 1990 dissertation revealed that 18% of AP teachers surveyed identified their exam policy as, "Only better students are encouraged to take AP exam" (p.165). Thus, academic achievement/ability of students clearly plays a role in exam-taking decisions.

*The number of AP courses a student is taking.*

In one of his news articles, Kladko cited a principal from a high school where the percentage of enrolled students taking AP exams had dropped from 74% to 33% between 1999 and 2001 who suggested that students might not take AP exams in all their AP courses because they are taking so many AP courses (Kladko, 2002). This certainly makes intuitive sense, particularly if students consider, as will be discussed below, that they will be better off having their transcripts show many AP courses, but only the exam grades that they expect to be particularly high.

*Anticipated Effect of the Exam Grade*

In addition to students' weighing how well they are likely to do on the AP exam, it is likely that their intended use of the exam grade would impact their exam decision. Two major uses of the exam grade are to earn college credit and to gain a college admissions advantage. The extent to which one or the other is most important to a particular student, however, might determine whether the student would consider it advantageous to take an AP exam. The following discussion elaborates on this point.
Desire to earn college credit.

Evidence that the desire to earn college credit is one of the reasons that students take AP courses was provided by the Murray (1980) study of the AP Program in Hawaii. Asked to choose the primary reason for participating in the AP Program, 20% of former AP students and 30% of then-current AP students cited the desire “to earn college credit and/or advanced placement” (p.106). This reason was the second most frequent choice of students, after the reason “wanted the academic challenge” (p.106), cited by 54% and 46% of the student groups. Of note, however, there were only five potential reasons provided to students on the survey, and the desire to improve college admissions prospects was not one of them. It is possible, therefore, that the percentages of students choosing the desire to earn college credit as the primary reason for taking AP courses might have been lower if more choices had been offered. Further, the survey was administered in 1980, and it may be that students’ reasons for AP course taking have changed since then. Despite these qualifying remarks, it seems very likely that the desire to earn college credit is a factor that impacts students’ decisions regarding AP exam taking.

However, the selectivity of the college a student aspires to attend might interact with the desire to earn college credit in the following manner. The College Board has publicized the American Council on Education’s recommendation that college credit be awarded in all AP subjects for exam grades of 3 or higher, and has asserted that most colleges abide by this standard (CEEB & ETS, 1996). Lichten (2000) however, took issue with a College Board quotation he cited stating that grades of 3 or above qualify students for credit or higher-level course placement “at virtually all collages [sic] and universities,
including the most selective” (p.2). He examined the AP scores required for college credit by colleges in three categories of selectivity and found that the most selective colleges typically required exam grades of 4 rather than 3. Therefore, the selectivity of the college a student aspires to attend may impact her exam decision. A student aspiring to attend the most selective colleges might choose not to take an exam unless she anticipated earning a 4 or 5, whereas a student applying to less selective colleges might take an exam if he expected to earn an exam grade of 3.

Perceived impact of the exam grade on college admissions.

Numerous students interviewed for newspaper articles about the AP Program cited improving their admissions prospects as one of the most important reasons for taking AP courses (Gorman, 1999; Hebel, 1999; Kladko, 2000; Strauss, 2002; Trounson & Colvin, 2002). And while the recent letter sent by Lee Jones of the College Board to high schools, superintendents, and state-level curriculum directors stated that, “many colleges and universities continue to tell the AP Program that they often will not attach value to a course labeled AP that was taken during a student’s sophomore or junior year, unless an official AP Exam grade is also presented for that course” (Jones, 2003), the following surveys of selective colleges do not support this assertion.

The NRC (2002) survey of a national sample of colleges and universities in which the most selective liberal arts colleges and universities were oversampled revealed that the absence of exam grades for sophomore and junior AP courses would not disadvantage students at most of the selective institutions. Similarly, Dillon’s (1986) survey of over 50 selective colleges revealed that 87% of respondents did not require students to submit grades for the AP exams they had taken, and only a handful of colleges reported actively
looking for scores. Further, of the three colleges whose admissions representatives were quoted as looking at AP grades, two merely commented that very high scores would significantly help a candidate, while only one noted that the absence of scores would lessen the weight accorded the AP enrollment.

Lastly, a survey of a convenience sample consisting of 63 selective and most selective colleges that visited a college preparatory school in 1988, while weak in research methodology, contained some interesting findings. Sixty-five percent of respondents answered yes or possibly yes to the question of whether they would “expect to see AP scores listed on the high school transcript” (Hershey, 1990, p.9) and 75% answered yes or possibly yes when asked whether they use AP grades in their admissions decisions. However, an even larger majority, 84%, responded that their evaluation of students would not be affected by the knowledge that students had opted not to take the AP exam in an AP course they had taken (Hershey, 1990).

The evidence from these admissions studies therefore suggests that contrary to the message of Mr. Jones’ letter, students who opt not to take an AP exam do not lose the admissions benefits of having taken the AP course. If students believe this to be true, then those students whose reason for taking AP courses is more weighted toward gaining admissions advantage than toward earning college credit might choose to take only those exams in which they anticipate earning a 4, or possibly even a 5.

The foregoing review of the research and hypothesizing about factors considered likely to impact students' exam decisions raise many more questions than it answers. Is the rate of exam taking in most AP classes fairly close to the national 70% rate of exam-taking figure (R. Morgan, personal communication, October 4, 2002), or is there a wide
variation in rate of exam taking across classes? What are the patterns of exam taking for different kinds of high schools? What are the characteristics of high schools that require all students enrolled in AP courses to take the AP exam? These, and others, are basic questions that will be posed by this study of public schools in New Jersey. But why has New Jersey been chosen as the site for this statistical case study?

The Framework of the New Jersey Study

This study focuses on New Jersey public schools for several reasons. First and foremost is the unusual amount and quality of data available for high schools in this state. New Jersey School Report Cards, mandated by state law in 1995, consist of a wide assortment of data on all New Jersey public schools. In 2002, up to six years of school level data are included for several broad categories of information; demographic and organizational data, test results for the state-administered tests, SAT and AP tests, post-high school plans of graduates, and information on the finances and personnel of the school district (NJDOE, 2003a). With respect to AP data, information is available for each AP course offered in every school. This data includes the number of students enrolled in the course, the number who took the AP exam, and the frequency distribution of AP grades (NJDOE, 2003c).

The availability of such unusually rich AP information linked to so many other school-level variables would, in and of itself, provide an appealing reason to choose New Jersey as the state to be analyzed. New Jersey makes an excellent statistical case study of AP for other reasons as well, however. New Jersey had the highest percentage of its public schools offering AP Programs in the nation in 2001, an impressive 98.1%, and had the fourth highest percentage, at 94.6%, in 2002. These figures were substantially higher
than the percentages of public schools offering AP nationally in the same years, which were 61.9% and 64.9%, respectively (CEEB, n.d.a). Thus, an analysis of New Jersey high schools participating in the AP Program includes almost all high schools, providing for both completeness of analysis and a wide variation in types of schools.

Beyond this exceptionally high rate of AP participation among high schools, there is also a very high rate of participation among students. With 282 exams taken per 1000 11th and 12th graders in 2001-02, New Jersey ranked higher than all but seven other states, and was well above the national average of 212 exams taken per 1000 11th and 12th graders (CEEB, n.d.b).

New Jersey also participates in two federally funded programs intended to increase AP participation by low-income students. The first program, which was previously described, allows low-income students to take AP exams at no cost, and should ensure that the exam fee is not a barrier for the most economically disadvantaged students in the state. The second New Jersey program aimed at increasing AP participation among low-income students is the Advanced Placement Incentive Expansion Program, which provides funds to 44 high-need districts for planning and teacher training. However, since that program did not begin until the 2002-03 school year, it would not have impacted the AP Program in the years in which data is being analyzed for this study, 1998-99 through 2001-02 (NJDOE, 2002).

Finally, according to the Public Information Office of the NJDOE, New Jersey has enacted no legislation pertaining to the AP Program (R. Vespucci, personal communication, July 22, 2003). As a result, high schools are free to make their own choices regarding whether to offer AP courses, require students to take the exam, or pay...
for it, resulting in a non-restrictive environment that provides an excellent natural
laboratory in which to examine the possible relationships between district-, school-, and
course-level variables and rate of exam taking.

For all of the foregoing reasons, New Jersey is an ideal state in which to
investigate the questions raised by this study regarding the rate of AP exam taking among
AP-enrolled students. Once the decision was made to use New Jersey School Report Card
data as the data source, the foregoing body of AP research was examined to identify
district-, school-, and course-level characteristics that were most likely to be related to
rate of AP exam taking and that were also available for study through the New Jersey
Report Cards. The characteristics that were identified are:

- Socioeconomic status of the students and community
- Educational level of the faculty
- Academic achievement/ability of students
- Average number of AP courses being taken by students
- College admissions emphasis of the school
- Subject of the AP course

While the relationships between rate of exam taking and such district-, school-
and course-level characteristics have not been systematically analyzed, a number of
studies have explored the relationships of district- and school-level variables to two other
types of AP indicators, AP participation and AP performance. AP participation indicators
include such things as whether or not schools offer an AP Program, the number of
subjects offered per school, the number of AP examinees, and the number of AP exams
taken. AP performance indicators measure how well students have performed on AP
exams, and include the number or percentage of AP exams graded 3 or better, the number of students earning an AP score of 3 or better, and the mean grade for AP exams.

The relationship between district-, school-, and course-level variables and rate of exam taking may be quite different from the relationships between such variables and AP participation and performance, but information on these latter two areas provides a context within which to understand exam taking. Accordingly, a brief review of research on the relationships between AP participation and performance and each of the variables of interest to this study will be presented next. Following that, mention will be made of the specific indicator that has been chosen to represent each variable in this study. For example, the indicator chosen to represent socioeconomic status of a high school’s students and community will be the District Factor Group of the district in which it is located. A more thorough discussion of New Jersey Report Card indicators chosen to represent the variables of interest is included in the Methodology chapter of this dissertation.

Much of the data that will be referred to in the next section comes from an extensive study of AP participation and performance in Texas, undertaken by the Texas Education Agency (TEA) in 2002. While this report is valuable by virtue of presenting a wealth of AP data and analysis, caution must be exercised in generalizing from Texas findings to the nation because of the unique features of the Texas AP Program described earlier. When percentage of students is referred to in the Texas study, it refers to the percentage of 11th and 12th graders. Of note, the measure of AP participation that will be looked at in most of the studies cited is the percentage of students taking one or more AP
exams, while the measure of AP performance is most frequently the percentage of examinees earning at least one exam grade of 3 or better.

*Relationship of District-, School-, and Course-Level Characteristics in this Study with AP Participation and Performance.*

The first variable to be reviewed is socioeconomic status of the student and community served by the school.

*Socioeconomic Status of Students and Community Served by the School*

Insight into the relationship between the socioeconomic status of a school and AP participation and performance comes from 2000-01 data from Texas public schools. When the percentage of students taking at least one AP exam was compared for six categories of districts that differed in their percentages of disadvantaged students, a trend toward increasing AP participation with decreasing percentages of disadvantaged students appeared. However, the percentage of students taking an AP exam in the category with the highest percentage of disadvantaged students (80% disadvantaged students and over) was surprisingly high. In fact, it was higher than all other categories except the category with the lowest percentage of disadvantaged students (under 20%). This finding was not elaborated on in the report. AP *performance*, defined as the percentage of exam takers who earned at least one AP grade of 3 or better, showed a more straightforward pattern of continuous increased performance as the percentage of disadvantaged students decreased (TEA, 2002).

The educational attainment of the community in which a school is located is another measure of socioeconomic status that has been found to be related to AP performance. A study of the 21 high schools of Montgomery County, Maryland revealed
that the number of 4 and 5 AP exam grades per 100 seniors was strongly related to the percentage of adults within the school boundaries who were college graduates (Hoven, 1995). Similarly, a study of almost all public secondary schools in Massachusetts revealed that the percentage of adults with at least a bachelor’s degree within a district was a strong predictor of the number of AP exam scores of 3 or better per 11th and 12th graders (Andersen, 1996).

The above studies strongly suggest that socioeconomic status of students and/or the community in which a school is located is strongly related to AP participation and performance. Most relevant of all to the current study, however, was the study of a representative sample of 105 New Jersey public high schools that revealed a significant positive correlation (.51) between the socioeconomic status of a high school, operationalized as the District Factor Group (DFG) of the district, and the number of AP courses offered (Kanarick, 1992). The DFG of the district in which a school is located is the measure of socioeconomic status used in the current study (although the categorization has been modified somewhat between 1992 and the present). It consists of a socioeconomic categorization based on a broad range of socioeconomic variables that include education, employment, and income of residents (NJDOE, n.d.c) and is discussed in greater detail in Chapter Three.

*Educational Level of Faculty*

In Texas, the percentage of teachers in a district with a master’s degree or doctorate showed a distinct positive association with both AP participation (the percentage of students who were AP examinees) and performance (the percentage of exam score grades of 3 or better) (TEA, 2002). In the New Jersey high school study, the
percentage of teachers with a master's degree in high schools was similarly found to be positively and significantly correlated (.39) with the number of AP courses offered (Kanarick, 1992). These findings suggest that educational level of the faculty might also be related to AP exam taking, and the present study will use the percentage of teachers and administrators with a master's or doctoral degree in a high school as the indicator to represent the educational level of teachers.

**Academic Achievement/Ability of Students**

Two different measures of the academic achievement/ability of students will be used to assess this factor. The first is the SAT and the second is the New Jersey High School Proficiency test administered to all 11th graders for the first time in 2001-02 (NJDOE, 2003b).

*The SAT.*

Returning to the Texas study, the percentage of students scoring at or above 1110 on the SAT or 24 on the ACT was positively associated with both AP participation and performance (TEA, 2002). The positive association between SAT scores of students in a school and the number of AP courses was also found in the 1992 New Jersey study, where the correlation between these two variables was found to be .55 (Kanarick, 1992).

The positive relationship between academic achievement/ability tests like the SAT and AP performance is further bolstered by a statistical analysis of correlations between the PSAT/NMSQT and 29 AP examinations for a national student population of over 700,000 students. For 17 AP exams, the correlation between some PSAT/NMSQT measure (Verbal, Math, or a combination of both) and AP exam score was .50 or higher (Camara & Millsap, 1998). This suggests a moderate positive association between
measures of the PSAT/NMSQT and AP exam scores in a variety of subjects. The SAT variable to be investigated in the current study is the sum (composite) of the 50th percentile SAT Verbal and Math scores for each high school.

*High School Proficiency Assessment (HSPA).*

This assessment, given to 11th graders for the first time in 2001-02, is intended to assess how well students have mastered New Jersey’s Core Curriculum Content Standards. It has two portions, Language Arts Literacy and Math, and students are required to pass both sections in order to graduate from high school. However, the state has included a proviso that students who have not passed the HSPA may have the opportunity to graduate if a review of alternative types of evidence persuades a team of educators that the student has mastered the required skills (NJDOE, 2003b).

The Math Section of the HSPA consists of mostly multiple choice items, along with some open-ended questions, in the areas of “basic mathematics, algebra, and geometry” (NJDOE, 2003b, p.2). The Language Arts Literacy Section consists of a critical reading portion in which most questions are multiple choice (with a few essay questions), and a writing portion that asks students to write a story and a persuasive essay in response to two different prompts (NJDOE, 2003b).

Both the Math and Language Arts Literacy (herein referred to simply as Language Arts) sections will be used in the current study as measures of student achievement that differ from the SAT in being more curriculum based. These measures also have the advantage of having been taken by all 11th graders rather than a self-selected sample, such as the sample of SAT test takers.
College Admissions Emphasis of the High School

One school-level statistic that might be construed as an indirect measure of the degree of interest in college admissions among students is the percentage of students taking the SAT or ACT. This measure was positively associated with both AP participation and performance in the Texas study (TEA, 2002). Similarly, in the study of New Jersey public high schools, a significant positive correlation (.51) was found between the percentage of eligible students who took the SAT and the number of AP courses offered (Kanarick, 1992).

A different indicator of the degree of college orientation of a high school is the percentage of students going on to college. This indicator was found to be positively related to the presence of an AP Program in a dissertation study that involved a random sample of Middle Atlantic public and private high schools (Silsbee, 1981). A national study also found that public schools in which 75% or more of the students were estimated to be applying to college were more likely to have an AP Program and to offer more AP subjects than schools with less than 50% of students applying to college (Hammer, 1990).

The present study is particularly concerned with the influence of competitive college admissions pressures on AP exam taking. Therefore, because admission to four-year colleges is more competitive than to two-year schools (Trends in College Admissions 2000, 2002), the indicator for admissions emphasis will be the percentage of the high school's graduates who report that they are going on to four-year colleges or universities.
Students' Average AP Course Load

This author has not encountered research investigating the impact of students' average AP course load on AP participation or performance apart from the comment of a New Jersey principal that a student taking many AP courses might not take the exams in all of them (Kladko, 2002). This measure will be arrived at in the current study by assessing the average AP enrollment per 100 11th and 12th graders.

The Subject of the AP Course

College Board/ETS data on national AP exam takers cited in the TEA (2002) report revealed that AP participation (defined as number of exams taken) showed extreme variation across subjects in 2001, ranging from a low of only 1527 exams taken in French Literature to a high of 204,840 exams in U.S. History. AP performance, defined as the percentage of exams scored 3 or higher, also varied nationally that same year, from a low of 50.9% for U.S. History to a high of 79% for BC Calculus (TEA, 2002).

Like AP participation and performance, the rate of AP exam taking nationally varied widely across different AP subjects according to the data compiled by the College Board/ETS from its fall survey of schools and follow-up data on spring exam-takers. In 2002 the rate of exam taking ranged from a low of 38% for Studio Art: Drawing to a high of 99% for Physics C-E&M (R. Morgan, December 20, 2002). Similarly, ETS estimates of rates of exam taking for courses in New Jersey for 2001-02 revealed a low of 20.1% for Studio Art: 2D to a high of 77.6% for Calculus BC (R. Morgan, personal communication, July 10, 2003). For this study, the statewide percentage of AP course enrollments in each AP subject that culminate in an exam will be calculated for New Jersey schools using the School Report Card data.
The above research, while not voluminous, provides some insight into how AP participation and performance are related to the variables of interest to this study. However, it is not clear how the rate of exam taking should compare to either AP participation or performance, and there is little research to guide one in speculating. On the one hand, because the exam costs money, one might predict that low socioeconomic status schools would have a lower rate of exam taking than other schools.

On the other hand, high-achieving students aspiring to competitive colleges might tend not to take AP exams because they anticipate receiving favorable considerations from admissions committees from AP course enrollments alone, and fear that any score less than a 4 or 5 might be worse than no score at all. In this case, one might expect that high socioeconomic status schools with a strong competitive college emphasis would have a lower rate of exam taking than other schools. Because rate of exam taking may very well not parallel AP participation and performance, and because there is so little direct research in the area of exam taking, the current analysis will be undertaken in an exploratory mode. In other words, no a priori hypotheses will be made.

One last issue that will be addressed in this study is a problem involved in using the commonly cited indicators of AP participation and performance to compare courses, high schools, or states. While many measures of AP participation exist, two common measures that are compiled by the College Board are the number of students taking exams and the number of exams taken (or number of exams per 1000 11th and 12th graders). With respect to performance data, the indicator utilized is typically the number or percentage of exam grades that are 3 or higher (CEEB, n.d.b). Because the College Board supplies the data it compiles to states, organizations like the NCES and Southern
Regional Education Board, and to a wide range of educational researchers (Andersen, 1996; Burke, 1989; NCES, 1999; TEA, 2002), its most common indicators are frequently those used for various kinds of evaluations of AP Programs.

An Evaluation of AP Indicators of Participation and Performance

A problem with using the numbers of students taking exams (or number of exams taken) for a participation index or using the number or percentage of exams taken that were graded 3 or better for a performance index is that these measures fail to take into account the AP-enrolled students who did not take the AP exam. This makes it difficult to accurately and fairly compare courses or high schools. Suppose that two classes, class A and class B, each had 14 exam takers, of whom 7 scored 3 or better in each class. If we were told only these facts, we would regard classes A and B as equivalent with respect to AP participation, performance and overall success. If we were to discover later, however, that there had only been 14 students in class A compared to 30 students in class B, of whom only 14 took the exam, it would very likely alter our assessment of these two classes. We would probably not view them as being equally successful in delivering, and helping students master, the AP curriculum.

Looked at another way, would a state interested in promoting educational accountability by use of a statewide achievement test allow students to decide whether they want to take the test, and then allow the school to report results on only those students who had done so? Apart from the intuitive sense that the percentage of enrolled students makes a difference in the meaning we would ascribe to the aforementioned participation and performance indicators, there is support for the concept that the percentage of students who take a voluntary exam has a significant impact on exam
scores. The following statement about the SAT by the College Board makes this point cogently.

As measures of developed verbal and mathematical abilities important for success in college, SAT scores are useful in making decisions about individual students and assessing their academic preparation. Using these scores in aggregate form as a single measure to rank or rate teachers, educational institutions, districts, or states is invalid because it does not include all students. In being incomplete, this use is inherently unfair.

The most significant factor in interpreting SAT scores is the proportion of eligible students taking the exam—the participation rate. In general, the higher the percentage of students taking the test, the lower the average scores. (CEEB, 2002c, single page document)

The foregoing statement makes very clear that as the percentage of SAT test takers increases, the average exam score decreases, raising the distinct possibility that the same could be true for AP test takers in a course or high school.

A second line of evidence that suggests that the percentage of scores of 3 or better on AP exams might tend to decrease as the rate of test taking increases is found in the related observation by the TEA (2002) that AP performance in Texas and the nation did, in fact, decrease as participation increased. Specifically, as the number of examinees and examinations increased dramatically in Texas from 1994 to 2001, the percentage of exams graded 3 or better decreased from 69.5% to 51%, and the downward trend in exam performance was seen for every ethnic group. Nationally, a gradual decline in percentage of exams graded 3 or better also occurred during the overall period for which AP
participation and performance data were included in the TEA report, i.e. 1987 to 2001. During this period, as the number of national examinees and examinations showed impressive increases, the percentage of exams graded 3 or better decreased from 67.6% to 61.3% (TEA, 2002).

The TEA (2002) suggested that this finding might be due to the fact that many schools began offering AP for the first time and others expanded their offerings. The report also points out that the number of exam scores of 3 or better increased tremendously from 1987 to 2001 (from 8,897 to 64,157), and an examination of the data presented in the report reveal that there were increases for every year. In short, there were more qualifying exams, but these represented a lower percentage of all exams taken from 1994-2001. Thus, it can be seen that an interpretation of the success of the AP Program in Texas depends upon the AP performance indicator that is examined.

Lichten (2000) addressed this issue tangentially in an article alleging that College Board claims regarding the likelihood of AP students receiving college credit were inflated. In two different analyses, he made the point that calculations involving the percentage of AP students receiving college credit or enrolling in advanced course work in college should include the approximately one-third of AP students who did not take the exam.

As noted earlier in the discussion of classes A and B, the selection of which AP data to evaluate can alter the interpretation of the extent to which a course has been successful. In order to investigate the degree to which calculating the percentage of AP exams graded 3 or better per AP-enrolled students rather than per test takers would change the evaluation of the strength of a course, this study will calculate two AP
performance indicators for every course offered in AP English Literature and Composition in New Jersey in 2001-02. The first will be the common indicator, the percentage of exams graded 3 or better per AP test takers, while the second will be the percentage of AP exams graded 3 or better per AP-enrolled students. The correlation between these two indexes will then be calculated to see how closely they approximate each other.

Conclusion

The potential for abuse of the AP's honor system has been present since its inception, but the pressures to add AP courses generated by the education reform movement and increased competition for college admission have substantially increased this potential. Looking back to the AP's beginnings, we recall that it originated as a voluntary, collaborative program among a small group of elite, largely northeastern, high schools and colleges, intended to serve highly able students (CEEB, 2002e). Within this insular context, quality control of the courses was most likely present even in the absence of any formal regulation. By contrast, we have seen that all varieties of high schools today are under considerable pressure to offer Advanced Placement courses, regardless of their resources. In the words of the NRC (2002) report,

With the growth of AP as a perceived standard of excellence and school quality, the incentive to use the AP name inappropriately has also increased. Some schools may label non-AP courses as AP, while others may sponsor AP courses without providing proper facilities and personnel resources. (p. 11)

The College Board has recently acknowledged this problem openly in its letter to high schools, superintendents, and state-level curriculum directors (Jones, 2003). The...
letter is unquestionably a positive step toward some kind of stated definition of what is meant by an AP course. However, as long as the AP Program continues to operate on an honor system, the AP label on a course will communicate no meaningful information about the quality of the course or the learning of individual students unless students have taken, and scored well on, the AP exam. The NRC (2002) has called on the College Board to "certify or regulate AP programs and teachers" (p. 189), and while this approach would undoubtedly improve quality control of courses, it poses substantial problems.

First, regulating the quality of courses in high schools across America would not only pose formidable logistical problems for the College Board administrative offices, but would also substantially increase the cost of the program. Beyond logistics, however, the requirement for schools to meet prescribed standards of teacher quality, resources, and student preparation would significantly reduce the flexibility of schools and shut many schools and students out of the program. In the long run, the central issue should not be how a high school administers an AP Program, but what the educational outcome is with regard to student learning. Therefore, rather than attempting to certify courses, the College Board would do better to certify student learning, and it already has an exemplary mechanism in place to do just that – its externally graded examination.

In the words of the Commission on the Future of the Advanced Placement Program (2001),

Examinations are at the heart of AP, serving as the external, objective standard of success and so providing colleges and universities with valid measures of accomplishment. As curricula change and educational reforms continue, the
examinations give the College Board the means to exercise quality control over what is called an AP course. (p. 14)

Similarly, the NRC (2000) came to the same conclusion in its exhaustive study of Advanced Placement math and science, stating that

All four of the panels and the committee believe that sitting for the examination should become an integral part of AP courses... Otherwise, students will miss an important opportunity to validate their performance, colleges and universities will lack information that can be highly useful in deciding on appropriate placements, and AP will be less credible as a rigorous program for high school students. (p. 170)

The foregoing quotes from two of the most recent and thorough analyses of the challenges facing the AP Program today stand as powerful testimony to the importance of the AP examination as the vehicle of accountability for the AP Program. A last quote that testifies to its importance comes from the NCLB of 2001. A stated purpose of the Act is

To encourage more of the 600,000 students who take advanced placement courses each year but do not take advanced placement exams each year, to demonstrate their achievements through taking the exams (NCLB, 2002, Sec. 1702, p.1)

Efforts to increase the rate of AP exam taking by AP-enrolled students should also be a major focus of efforts to promote equity and excellence for the AP Program.

Equity and Excellence for the AP Program

The conceptual framework for this dissertation is Gardner’s conception of the tension between equity and excellence (Gardner, 1984). For the AP Program, increasing access to AP for all students (equity) and maintaining quality (excellence) were the
central goals articulated by the Commission on the Future of the Advanced Placement Program (2001). These goals are inextricably intertwined, for there can be no genuine equity unless all AP courses meet a uniformly high standard of rigor. If, instead, the push to increase access results in high schools offering courses that do not meet the standards recommended by the College Board, then students in those courses will receive an illusion of educational excellence rather than the real thing. Achieving true equity requires that the AP courses offered to all students meet uniform standards of rigor, a sentiment that is alluded to by the Commission on the Future of the Advanced Placement Program (2009) when it stated that “there is no true AP equity without AP quality” (p.5).

Uneven quality of AP courses threatens equity in two ways. First, if inferior courses are more prevalent at schools serving disadvantaged students, then the achievement gap between the educational “haves” and “have-nots” in American society is likely to be widened. Second, uneven quality of AP course work or generally lowered quality across the board threatens the educational equity of high-achieving students. The first section of this paper indicated that the AP Program has become a significant component of secondary education for high achieving students and documented the ways in which AP courses are compatible with recommendations for differentiated programming appropriate to gifted students. The compatibility of AP course work with recommendations for gifted programming depends, however, on the assumption that such AP course work is genuine – that it lives up to the high standards recommended by the College Board.

The danger exists, however, that in the presence of pressure to accommodate more students and the absence of requirements governing course work, the standards of
AP courses may decrease. Ideally, when expanding AP access beyond the population of gifted students, a school would work to improve the preparation of all students so that a larger percentage could be successful at bona fide AP course work. Regrettably, however, it would be a great deal easier for schools to simply allow the educational rigor in AP courses to decrease to meet the lowered average achievements of the larger pool of participating students, and this would rob gifted students of programming that is appropriately differentiated to meet their educational needs.

In summary, providing educational equity and excellence for all students, including those who are disadvantaged and/or gifted, depends on ensuring that all AP courses meet uniformly high standards, and that, in turn, depends on the externally graded AP exam. Given the paramount importance of the AP exam to safeguarding the integrity of the AP Program, it is time to turn our attention to an investigation of AP exam taking; its patterns in different types of courses and high schools, and its relationships with district-, school- and course-level variables. It is hoped that this study, which will explore such patterns and relationships in New Jersey public schools, will serve as a first step toward understanding this complex, yet important phenomenon. The twin goals of equity and excellence for the AP Program hinge on the ability of the externally graded exam to certify student learning, but the exam can only serve this function if students take it.
CHAPTER THREE
METHODOLOGY

The purpose of this study is to provide a preliminary exploration of an important phenomenon that has received little investigation, namely that 30% of AP course enrollments did not culminate in the taking of the AP exam in 2002 (R. Morgan, personal communication, December 20, 2002). Because the AP Program operates on an honor system in which there are no requirements that schools must meet in order to label courses as AP, the examination provides the only means of accountability for course quality and student learning. Therefore, the fact that students opt out of the exam in a substantial percentage of course enrollments seriously undermines the accountability of the entire AP Program and of individual courses.

As discussed earlier, College Board data on this phenomenon are limited to estimates of rates of exam taking derived from two sources; AP enrollment data obtained in the fall from schools responding to the annual Participation Survey, and exam data the following spring from all students taking AP exams (R. Morgan, personal communication, October 4, 2002). Using this data, percentages of AP-enrolled students who have taken AP exams have been calculated for the nation as a whole, for states, and for AP subjects at both the state and national level (R. Morgan, personal communication, October 4, 2002; December 20, 2002; June 26, 2003). However, a systematic analysis of
the relationship of district- or school-level characteristics with rate of exam taking has not been performed (R. Morgan, personal communication, October 4, 2003). We are therefore left with very little knowledge about or understanding of the important phenomenon of AP exam taking among students enrolled in AP courses.

New Jersey School Report Card (SRC) data represent an unusually comprehensive source of AP data, including course-level information on AP enrollment and exam taking along with numerous other types of information for every public high school in New Jersey. This study utilized SRC data as the primary data source to

• Describe the phenomenon of AP exam taking in New Jersey public schools
• Explore relationships between rate of exam taking and district-, school-, and course-level variables, and
• Compare the assessment of the academic strength of AP courses by two different AP performance indexes.

A secondary source of data was a mail survey of all New Jersey public secondary schools that offered an AP course in 2001-02. The survey asked schools about their current policy (2002-03 school year) regarding whether students enrolled in AP courses are required to take the AP exam, and whether the school pays the exam fee.

Research Questions

Research Question 1

What were the patterns of AP exam taking among students enrolled in AP courses in New Jersey public schools in 2001-2002?
Specifically, what is the rate of exam taking for:

- The state
- All AP high schools
- All courses
- All subjects

This last component of the Research Question 1 analysis, consisting of examining the rate of exam taking for different AP subjects, provides the only analysis of a relationship between rate of exam taking and a course-level variable. All other study variables are school- or district-level variables.

Research Question 2

What was the statewide trend in rate of AP exam taking among AP-enrolled students in New Jersey public schools from 1997-1998 through 2001-2002?

Research Question 3

What relationships exist between district- and school-level variables and the rate of AP exam taking among AP-enrolled students in New Jersey public schools?

Variables examined were the following:

- District Factor Group
- AP enrollment per 100 11th & 12th graders
- Percentage of graduates going to four-year college
- Sum of SAT Verbal and Math
- Percentage of 11th graders scoring Advanced on Math HSPA
- Percentage of 11th graders scoring Advanced on Language Arts HSPA
- Percentage of faculty and administrators with an M.A. or Ph.D.
Research Question 4A and B

A. What are the characteristics of New Jersey public schools that require students enrolled in all (or almost all) AP courses to take the AP exam?

B. What percentage of New Jersey public schools that require students to take the AP exam pay the exam fee?

Research Question 5

How does the assessment of an AP course based on the percentage of AP test takers who achieve an exam grade of 3 or better compare to the assessment of the same course based on the percentage of AP-enrolled students who achieve an exam grade of 3 or better?

Procedure

This study consisted of a statistical analysis of data from two sources; New Jersey School Report Card (SRC) Data and a survey sent to New Jersey high schools that had at least one AP exam taken in 2001-02. These sources are described below.

Data Sources

New Jersey School Report Card Data

The primary data source for this study was the New Jersey SRC data from 1997-98 through 2001-02, which was available as an online, downloadable, data file entitled NJ.CSV-Files.zip that was located at http://nj.evalsoft.com/njDOE/data_maps4632.asp. All data tables referred to in this study that begin with “sc_” are data tables from the NJ.CSV-Files.zip file that contain data disaggregated to the school level. Additional data sources used that were also accessible on the NJDOE web site were:
Individual School Report Cards, which were available online in a pdf format for each school at http://nj.evalsoft.com/njPDF/default4632.asp; (results for an individual school were obtained by supplying county, district, and school number), and

- The School Directory, which was downloadable as a Microsoft Excel file at http://www.state.nj.us/njded/directory/dl_schools.shtml.

New Jersey School Report Card Data consist of a rich collection of school- and district-level information. Data for each year is recorded by district personnel in the fall of the following year (2001-02 data was due October 18, 2002). Data collection methodology for the 2002 Version of the Electronic Data Collection Software was outlined in an online User’s Manual (NJDOE, Division of Deputy Commissioner, 2002) and will be described in some detail here because unusual data patterns noted in the early stages of data analysis might have resulted from data collection methodology. Therefore, this issue is raised here and will be discussed further in Chapters Four and Five.

According to the User’s Manual, the district data entry person (the user) logged on to an NJDOE network, the DOEnet, and downloaded the Report Card software. The user selected the county, district, and school names for each school and then entered information into an electronic worksheet on which certain information has already been entered by the NJDOE (NJDOE, Division of Deputy Commissioner, 2002).

Once data had been entered, but before it was transmitted, the user was alerted to missing data fields and other possible errors. Further, the user was instructed and strongly admonished to print a report of entered data and review it carefully. Once the printed report and flagged errors had been checked and necessary corrections made, the user
transmitted the electronic worksheet. After transmittal, the user received a printed transmittal sheet. This had to be signed by the Chief School Administrator and mailed to the Public Information Office – Report Card (NJDOE, Division of Deputy Commissioner, 2002). Finally, about a month or two after, the School Report Card Data were typically placed on a closed web site that district personnel could check before the data was released to the public (SRC Office employee, personal communication, July 14, 2003).

According to the *User’s Manual for New Jersey School Report Card Electronic Data Collection Software 2002 Version*, AP information was collected for each high school as follows. For each AP subject in which at least one student took an AP exam, the number of students taking that exam was preloaded into one field of the Electronic Data Collection Software for the high school. (AP exam numbers were provided to the NJDOE by the Educational Testing Service.) The user was then instructed by the User’s Manual to enter into a separate field the number of students who were enrolled in an AP course in the subject corresponding to each recorded AP exam (NJDOE, Division of Deputy Commissioner, 2002).

While this is how collection of AP data was described in the User’s Manual, it does not completely describe the process, according to an employee in the School Report Card Office (who prefers not to be named and is therefore referred to throughout this dissertation simply as SRC Office employee). Further information about data collection came to the investigator’s attention on June 18th after preliminary data analysis raised questions about possible data artifact. Specifically, the trend analysis of the rate of exam taking for New Jersey high schools had indicated that the number and percentage of
schools reporting 100% AP exam taking had increased dramatically from 2000-01 to 2001-02, prompting the investigator to contact the SRC Office to inquire whether there had been any change in data collection methodology that might have contributed to the observed increase in number of schools reporting 100% exam taking.

In response to closer questioning about AP data collection, the investigator was informed that not only was the AP exam field preloaded with the number of AP exams taken in that subject at the particular high school; the AP enrollment field for each subject was also preloaded with the same number (personal communication, SRC employee, June 18, 2003). In other words, the default entry for AP enrollment for every AP subject was the same number as the number of students who took AP exams in the subject in that high school. District personnel were intended to change the preloaded number to the correct number, according to the SRC Office employee, but this investigator’s examination of the User Manual did not uncover any notation that the AP enrollment field had been preloaded with exam data, nor explicit instructions to the user to change the AP enrollment field to the correct number, if different from the exam number (NJDOE, Division of Deputy Commissioner, 2002). The exact instructions in the User’s Manual are the following:

The number of students who sat for an AP examination during the 2001-02 academic school year appears as reported by the Educational Testing Service (ETS), Princeton, New Jersey. Please enter the number of students enrolled in each AP course (e.g., “Number of Students in Class”). Once a value is entered, press the ENTER key to advance the cursor to the next AP examination listed. Values may be entered for all AP examinations that were reported for your...
school. These values appear as a whole number on the data entry screen and printed report. (NJDOE, Division of Deputy Commissioner, 2002, p.25).

This situation has obvious implications for this study, as it raises the possibility that rates of exam taking of 100% for a school might reflect a user not having understood that he was intended to change the preloaded number in the enrollment field. Similarly, if a user missed that section of the worksheet completely and entered nothing, the rate of exam taking for the high school would have been recorded as 100%. If the AP enrollment field had been preloaded with AP exam numbers for the first time in 2001-02, this could certainly account for the increase in number and percentage of schools reporting 100% rate of exam taking. However, the SRC Office employee also asserted that to the best of her recollection, the AP data collection methodology, including the preloading of the AP enrollment field, had not changed between 2000-01 and 2001-02. The employee was kind enough to ask a colleague at the SRC office the same question about data collection methodology to confirm her own recollection, and was told by the colleague that to the best of the colleague’s recollection, the AP data collection methodology had not changed in five years (SRC employee, personal communication, July 14, 2003).

The investigator wishes to stress that she does not doubt for a moment the sincerity of the SRC employee, who was unfailingly knowledgeable and helpful on numerous occasions. However, the data patterns (described and discussed in Chapters Four and Five) are striking enough to call into question whether the recollections of the employee and the colleague are accurate. Given that the AP data enrollment field is but one of a large number of fields in the SRC database, it is conceivable that the memories of the SRC employees on this point might have been flawed. Finally, if the AP
enrollment field had been preloaded with the number of students who took the corresponding AP exam for all five years of the study, then all years would have been subject to potential inflation of the number of schools reporting 100% exam taking.

An analysis of the extent to which this data collection artifact might have affected rates of exam taking, particularly in 2001-02, is presented in Chapter Four and its implications discussed in Chapter Five. For the purposes of the Methodology chapter, however, what is important to note is that the questions raised about the potential data collection artifact prompted the experimenter to analyze 2000-01 data as well as 2001-02 data for the parts of the data analysis whose credibility would have been substantially threatened by the possible artifact.

Two other points about AP data collection are also deserving of mention. First, since the electronic data collection software for each school contained only those AP subjects in which at least one student had taken an exam (SRC employee, personal communication, July 28, 2003), AP courses in which no student took the exam would not have been included. This data collection issue is discussed further in the Limitations section of this chapter.

Second, according to the SRC employee, the software was written such that a user could not enter a number in the AP enrollment field that was smaller than the AP exam field (i.e. AP exams in a subject could not exceed AP enrollment). However, when a school’s AP exams in a particular subject did in fact exceed AP enrollment, a school could contact the School Report Card Office to override the program restriction, and this was done in some cases (SRC employee, personal communication, May 12, 2003). This
situation has also been in effect for at least the past five years, according to the same employee (SRC employee, personal communication, July 14, 2003).

Identification of Schools that had One or More AP Exams Taken in 2001-02

The entire comma separated variable (csv) form of the New Jersey SRC Data File, entitled NJ.CSV-Files.zip, was downloaded from its location on the NJDOE web site (http://nj.evalsoft.com/njDOE/data_maps4632.asp) on March 26, 2003. This file consists of 57 individual data tables, which can be opened separately. Data tables of interest were copied as Microsoft Excel worksheets and/or SPSS files so that they could be manipulated and so that statistical tests could be performed.

The March 26, 2003 copy of the NJ.CSV-Files.zip was used for all analyses except the High School Proficiency Assessment data. The data file containing this information did not become available until later, and was downloaded on June 26, 2003. This is noteworthy because a small number of erroneous data entries on NJ.CSV-Files were corrected (approximately 50) between the time it was first posted online around the first week in February and some time in late March or April (SRC employee, personal communication, July 14, 2003). While it is possible that one or more data entries from March 26 that were used for this analysis might have been subsequently changed, the small number of overall changes to the data file and the fact that the correcting of entries ended in late March or April make it likely that changes affecting this analysis would have been few in number.

The population of New Jersey secondary schools that had at least one AP exam taken in 2001-2002 was identified by three separate searches of SRC data files. The searches were as follows:
1. The sc_ap.csv data table (part of the NJ.CSV-Files.zip) includes the numbers of all AP exams, by AP subject, taken in every public school in New Jersey from 1994-95 through 2001-02. Along with the number of AP exams, by subject, the file also contains the number of enrollments in the corresponding AP course and a frequency distribution of exam grades. This file served as the source file for many analyses undertaken in this study. Sorting it by school year allowed for the identification of 305 schools in which at least one AP exam was taken in 2001-02.

2. The sc_fact.csv data table (also part of the NJ.CSV-Files.zip) includes one field that specifies the unduplicated percentage of 11th and 12th graders who took an AP test. By sorting this field, schools in which the AP percentage for 2001-02 was greater than 0 were identified. Although this field might have excluded schools that had AP enrollments with no AP exams, this did not prove to be the case, possibly because the data collection software presented to district personnel included only those subjects in which exams had been taken, as previously discussed. The same 305 schools were identified as in the first search plus one additional school in which the AP percentage was noted to be 27.4%. Further investigation suggested that the 27.4% entry was erroneous, as no AP courses were listed for the school in either the online School Report Card for the individual school or the sc_ap.csv data file described above. This school was therefore not included in the database.

3. A final search for schools that had offered at least one AP course in 2001-02 was performed by identifying all schools falling into one of the following categories on the New Jersey School Directory:
- 4 year high schools
- 3 year high schools
- 6 year high schools
- Other high schools
- County vocational-technical schools or institutes
- Special secondary schools for the handicapped, and
- Special elementary/secondary schools for the handicapped
- Charter schools with grades 11 and 12 (identified from the New Jersey School Directory by using the search function).

The 305 schools already identified as AP schools by the first two searches were first eliminated from the list of all schools falling into one of the above categories. Then, to ensure that no secondary schools that offered AP courses or exams in 2001-02 had been missed by the first two searches, the individual School Report Cards for the remaining 135 schools were examined to determine whether any AP exams or course enrollments were listed. As a result of this search, an additional four schools were identified as having offered AP courses in 2001-02. All four schools had been omitted from the sc_ap.csv file (the list of all AP courses for each school) and had been listed as having 0 percentage of 11th and 12th graders taking an AP test on the sc_fact.csv file. It was assumed that the individual school report card was correct, and the four schools identified in the third search were added to the 305 detected by the first two searches. This resulted in a final list of 309 New Jersey secondary schools in which at least one AP exam was taken in 2001-02. This is the population that is used for all analyses involving the 2001-02 school year.
The Survey Instrument

A secondary source of data for this study came from a two question survey sent to the 2001-02 AP high schools identified above (see Appendix A). The instrument was addressed to the principal, with instructions indicating that it could be completed by him/her or given to another individual knowledgeable about the relevant policies. The first question asked whether the school pays the AP exam fee for all students and the second asked whether the school requires AP-enrolled students in all (or almost all) AP courses to take the AP exam. (Questions were asked in the present tense, thereby referring to a school's current, 2002-03, policies.) The second question was patterned after a similar question included on the annual College Board AP Participation Survey sent to AP schools each fall (2000-01 Participation Survey provided to me by R. Morgan, January 9, 2003) so that the New Jersey results could be compared to the national College Board findings.

Survey Design

The questionnaire, cover letter, and follow-up cover letters were designed to incorporate selected elements of Dillman’s Tailored Design Method. Dillman employed social exchange theory to identify three central means of encouraging survey response by participants: increasing the rewards, decreasing the costs, and establishing trust. He then provided specific survey implementation recommendations corresponding to each of these means. Recommendations employed in this study to increase rewards included expressing respect for the participant’s time, identifying the investigator as a fellow educator, thanking the participant, and providing the opportunity to receive an e-mail summary of survey responses (Dillman, 2000).
follow-up letter and final letter summarizing the results of the survey are reproduced in Appendix A.)

Recommendations employed to decrease costs to participants included making the survey instrument clear and short and including a self-addressed, stamped envelope. Finally, recommendations employed to increase trust were using good quality paper and sending surveys addressed to the high school principal by name (Dillman, 2000). Names of principals and addresses of high schools were downloaded from the New Jersey School Directory Microsoft Excel file.

Additional elements of the Tailored Design Method that were used for the cover letter included noting that the responses of individual high schools would be kept confidential and providing an address, phone number and e-mail address in case of questions (Dillman, 2000). Additionally, the following sentence was included to satisfy the requirements of the College of William and Mary Protection of Human Subjects Committee: “This project was approved by the College of William and Mary Protection of Human Subjects Committee (Phone: 757-221-3901) on May 14, 2003 and expires on May 14, 2004” (dates are specific to this project) (College of William and Mary Protection of Human Subjects Committee, 2002, p.20). A last element of the Tailored Design Method that was included in the follow-up cover letter was a reference to the fact that many other principals had already responded to the survey (Dillman, 2000).

Initially, the research design entailed surveying only those schools with very high rates of exam taking (87.5% or higher) to determine if such schools required AP students to take the AP exam (and whether schools requiring the exam paid the fee). In particular, the function of the survey was to confirm an assumption that most of the 150 schools that
had a 100% rate of exam taking achieved such a rate by requiring all students to take the exam. However, when the first batch of returned surveys was analyzed, it was noted that less than half of such schools did in fact claim to require exam taking. At this point, it was decided to survey all the remaining schools as well. However, because the decision to survey the schools with a lower than 87.5% rate of exam taking was made later, the dates on which surveys were sent to the two groups of schools differed.

The schools with rates of exam taking between 87.5-100% were mailed surveys on May 15th while the schools with rates of exam taking of less than 87.5% were mailed surveys on May 30th. A second round of mailed surveys was sent to non-responding schools on June 12th and June 19th, respectively.

Four schools received only one survey request because inconsistencies in the NJDOE database had caused them to be excluded initially from the list of AP schools and a fifth school received only one request due to experimenter error. Further, two schools that had been independent high schools in 2001-02 merged into one school in 2002-2003. Because the survey asked schools for their current (2002-2003) policies regarding requiring the AP exam and paying for it, the schools that ceased to exist as independent schools in that year could not be surveyed. These two schools were not included in the portion of the analysis that involved survey data, but were included in all other analyses of 2001-2002 schools. Thus, a total of 307 schools were surveyed, all but five of which received a second opportunity to respond if they had not responded initially.

Finally, it should be noted that the survey asked respondents about their current policies (2002-03 school year), and these policies were then linked in the analysis to school-level data from the SRC for the 2001-02 year. A decision was made to ask schools
about their current exam requirement and fee policies in order to maximize the ease with which school personnel would be able to access the information, the accuracy of the information obtained, and the yield. In particular, it was felt that most principals or guidance counselors would be able to easily answer the two questions about their current AP exam policies during the month in which AP exams were being administered (May), but that some might have been unsure about the previous year’s policies. Moreover, the investigator considered it likely that most school characteristics being linked to school policies (i.e. District Factor Group, SAT scores, percentage of faculty with an M.A. or Ph.D.) would be fairly stable from one year to the next. This assumption of stability proved not to be true for the rate of exam taking between 2000-01 and 2001-02, which consequently reduces the credibility of findings that attempt to link the rate of exam taking in 2001-02 with school policies the following year.

Survey Yield

Since schools with 87.5 to 100% rates of exam taking (RET) were mailed surveys two weeks before the schools with RET less than 87.5%, an analysis of the yield was performed for each group in order to ensure that the difference in mailing time did not result in a differential yield. The yield for the 87.5 to 100% RET group (181 schools mailed surveys) was 81.8 % while the yield for the group with RET less than 87.5% (126 schools mailed surveys) was 85.7%. This difference was considered small enough to justify an assumption that the different times of mailing did not substantially bias the response rates of the two groups. The yield for all schools was 83.4%, which constituted 256 of the 307 schools surveyed.
Description of District- and School-Level Variables

**District Factor Group**

As discussed briefly in Chapter Two, the NJDOE has developed a measure of socioeconomic status that allows it to place schools in distinct socioeconomic categories known as District Factor Groups (DFGs). The measure includes data on seven indicators:

- "Percent of population with no high school diploma"
- Percent with some college
- Occupation
- Population density
- Income
- Unemployment
- Poverty" (NJDOE, n.d.c, p.2)

Data based on the seven indicators were used "in a principal components analysis to produce a statistical score which was used to rank the districts. Districts were then grouped so that each group would consist of districts having factor scores within an interval of one tenth of the distance between the highest and lowest scores" (NJDOE, n.d.c, p.2).

Developed in the 1970s, the DFG system was intended to allow for student test scores to be compared against the test scores of other schools whose students had similar socioeconomic backgrounds (NJDOE, n.d.c). Accordingly, districts in this study have been placed by the NJDOE into one of eight categories, of which District Factor Group A encompasses districts with the lowest socioeconomic ranking while District Factor Group J encompasses districts with the highest socioeconomic status. Of note, the four middle
categories are named by double letters because of a revision of the District Factor Groups that resulted in the collapsing of ten categories into eight (A. Dupree, personal communication, April 11, 2003).

*AP Enrollment per 100 11th and 12th Graders*

This measure was calculated by dividing the total AP course enrollments in each school by the sum of 11th and 12th grade enrollments and then multiplying by 100. To the extent that AP courses are taken by 9th and 10th graders in a high school, this measure will overestimate the course load of 11th and 12th graders. However, if the percentage of courses taken by 9th and 10th graders is fairly similar across schools, then the comparison between schools will remain valid. Finally, College Board data cited by the TEA (2002) indicated that nationally, 11th and 12th graders comprised 88.5% of total examinees.

*Percentage of Graduates Going on to Four-year College*

This information is self-reported information about the graduates of each school (NJDOE: Division of Deputy Commissioner, 2002). It is used in this study as a proxy for the college admissions emphasis of the high school. According to a national survey, admissions at four-year postsecondary institutions in 2000 were significantly more likely to be selective or competitive than two-year colleges (92% vs. 52%) (*Trends in College Admission 2000, 2002*). Therefore, the self-reported percentage of students going on to a four-year college should reflect to some degree the amount of pressure felt by the high school and the students to maximize admissions advantages.

*The Sum of the SAT Verbal and Math Score*

This variable was calculated by adding the 50th percentile SAT Math and Verbal scores for each school. SAT data is supplied to the NJDOE by the ETS (NJDOE, n.d.b).
The SAT score is used here as a proxy for some combination of student achievement/ability. It is not an ideal measure, as not all students take the exam. However, it is particularly appropriate in a study of AP course and exam taking since correlations between some measure of a related test, the PSAT/NMSQT (i.e. the Math section, Verbal section, or a combination) and AP exam grades were found to be greater than .50 in 17 of 29 AP tests looked at (Camara & Millsap, 1998).

**Percentage of 11th Graders Scoring Advanced on the High School Proficiency Assessment (HSPA) Math and Language Arts Sections**

The HSPA is described by the NJDOE as follows:

The High School Proficiency Assessment (HSPA) is a new state test for eleventh-grade students, replacing the High School Proficiency Test (HSPT). The HSPA is designed to give educators information about eleventh grade achievement in the areas required by New Jersey’s Core Curriculum Content Standards. The test currently includes the content areas of language arts literacy and mathematics. Passing all sections of this test is a requirement for receiving a high school diploma. (NJDOE, n.d.b, Section XX. High School Proficiency Assessment – Grade 11, p.25 of a larger pdf document)

There are three possible scores that students can attain on this test; advanced proficient, proficient, and partially proficient. Students earning scores in the last category “are considered not to have met the state’s minimum level of proficiency” (NJDOE, n.d.b, Section XX. High School Proficiency Assessment – Grade 11, p.25 of a larger pdf document). Moreover, student scores are divided into scores earned by general education
students, special education students, limited English proficiency students, and all students. This study utilized the percentage of general education students scoring advanced on the HSPA math and language arts tests.

As curriculum-based tests, the math and language arts HSPA tests are intended to serve as a second measure of the academic achievement/ability of the student body.

Percentage of Faculty and Administrators with an M.A. or Ph.D.

This school-level variable, which lists the percentage of both faculty and administrators with either an M.A. or Ph.D., is the closest approximation of the educational level of a school’s faculty available in the New Jersey SRC database.

Data Analysis

Research question 1

What were the patterns of AP exam taking among students enrolled in AP courses in New Jersey public schools in 2001-02?

Specifically, what is the rate of exam taking for

- The state
- All AP high schools
- All AP courses
- All AP subjects

This question was comprised of the preceding four components, which will be discussed in turn. A detailed description of data extraction and analysis is included in Appendix B, with a brief summary included here. For all four analyses, the sc_ap.csv data table was used as the source table to create two separate Microsoft Excel spreadsheets containing all AP courses offered in New Jersey high schools in 2000-01
Rate of Exam Taking (RET) for the state as a whole.

The total number of AP exams in New Jersey in 2001-02 was divided by the total number of AP enrollments and then multiplied by a hundred so that the rate would be
expressed as a percentage. (Research Question 2 calculated the statewide RET in 2000-01 and other years.)

Rate of exam taking for all AP high schools.

Copies of the All Courses 00-01 and All Courses 01-02 Microsoft Excel spreadsheets were used for this analysis. The rate of exam taking was determined for each AP course in each high school by dividing the number of AP exams by number of AP enrollments and multiplying by a hundred. The same formula was used to calculate overall RETs for each high school (total number of AP exams divided by total AP enrollments times 100).

The subtotal page of the All Courses 00-01 Microsoft Excel spreadsheet that listed the RET for each high school was imported into an SPSS 10.0 spreadsheet for further data analysis. The same process was followed for the All Courses 01-02 spreadsheet. SPSS 10.0 statistical software was used to generate frequency distributions and histograms of the distribution of RETs across AP high schools as well as to calculate descriptive statistics including the mean, median, and standard deviation.

Rate of exam taking among all AP courses.

Copies of the All Courses 00-01 and All Courses 01-02 Microsoft Excel spreadsheets were imported into SPSS 10.0 spreadsheets and SPSS 10.0 statistical software was used as it was in the previous analysis to generate frequency distributions and histograms of the distribution of RETs across AP courses as well as to calculate descriptive statistics including the mean, median, and standard deviation.
Rate of exam taking for each AP subject.

Copies of the All Courses 00-01 and All Courses 01-02 Microsoft Excel spreadsheets were first sorted by AP subject. Rates of exam taking for each subject were then calculated and the subtotal page of each Microsoft Excel spreadsheet, containing the list of AP subjects and the RET for each, was then imported into an SPSS 10.0 spreadsheet for creation of histograms. As noted earlier, AP subject was the only course-level variable whose relationship with rate of exam-taking was explored.

Research Question 2

What was the statewide trend in rate of AP exam taking among AP-enrolled students in New Jersey public schools from 1997-98 to 2001-02?

The sc_ap.csv data file was used to construct Microsoft Excel spreadsheets, similar to the All Courses 00-01 and 01-02 spreadsheets constructed for Question 1, for all five years of the analysis. A uniform set of steps (see Steps in Trend Analysis in Appendix B) was employed to ensure that the methodology would be consistent across years. Moreover, for this analysis, whose purpose was to assess the trend in RET over five years, only the 305 schools that appeared on the sc_ap.csv file were included for the 2001-02 file in order to make the numbers for that year comparable to the numbers for the other years.

Statewide rates of exam taking were calculated for each year using the same technique as had been used to calculate the statewide RET for 2001-02. Then, an SPSS 10.0 spreadsheet was created for each year, containing the list of all AP high schools for each year, accompanied by their rate of exam taking. This was used for the trend analysis of the percentage of schools that had 100% RET in each year.
Research Question 3

What relationships exist between district- and school-level variables and the rate of AP exam taking among AP-enrolled students in New Jersey public schools?

Specifically, the district- and school-level variables examined were the following:

- District Factor Group
- AP enrollment per 100 11th and 12th graders
- Percentage of graduates going to four-year colleges
- Sum of SAT Verbal and Math
- Percentage of 11th graders scoring Advanced on Math HSPA
- Percentage of 11th graders scoring Advanced on Language Arts HSPA
- Percentage of faculty and administrators with an M.A. or Ph.D.

An SPSS 10.0 spreadsheet was created for each of the years 2000-01 and 2001-02 that included a list of AP high schools, their rate of exam-taking, and separate fields containing data on each of the above variables for each high school. These files will be titled herein High School Master File 00-01 and High School Master File 01-02. The construction of these files is described in greater detail in Appendix B.

Relationship between rate of exam taking and District Factor Group.

The analysis of the relationship between DFG and RET consisted of two parts. First, mean and median RETS of schools in each DFG were calculated using the SPSS 10.0 statistical software package. This was done for both 2000-01 and 2001-02.

Second, high schools were sorted into three groups based on their RET. The high group had RETs from 90 to 100%, the medium group from 60 to less than 90%, and the low group had RETs of less than 60%. The numerical demarcations for the high,
medium, and low groups were arrived at through an attempt to meet two objectives. The first was that the boundaries of the groups should provide a meaningful fit with the investigator's concept of high, medium, and low exam taking, and second, that the boundaries should create groups which each contained enough schools to allow for meaningful comparisons between groups.

Once schools had been placed into the appropriate RET categories, a cross-tabulation of RET category by District Factor Group was run using SPSS 10.0. From this, the percentages of schools in high, medium, and low RET categories within each DFG were determined and plotted on a bar graph. This was done for 2000-01 and 2001-02.

**Relationship between rate of exam taking and six school-level variables.**

For each of the six school level variables two separate analyses were performed using the SPSS 10.0 statistical software package. First, Pearson correlation coefficients were calculated between each of the variables and RET. Second, schools were placed in the high, medium, and low RET groups and differences in each school-level variable across groups were assessed through comparisons of medians (using the Explore function of SPSS 10.0).

**Research Question 4A**

*What are the characteristics of New Jersey public schools that require students enrolled in all (or almost all) AP courses to take the AP exam?*

This analysis used two sources of data. The first source was the SPSS 10.0 High School Master Files for 2000-01 and 2001-02 containing information on all district- and school-level variables as well as RET for each New Jersey high school. The second data source was the survey mailed to high schools that had at least one AP exam taken in
2001-02. The survey asked principals (or their designated subordinates) to choose between three statements to describe the current policy of their school with regard to requiring AP-enrolled students to take the AP exam. These options were, “For all (or almost all) AP courses, students who take an AP course are required to take the AP exam,” “For all (or almost all) AP courses, students who take an AP course are not required to take the exam,” or “other,” with a place for comments. This question was structured such that the answers could be compared with answers to a question asked by the College Board on their AP Participation Survey (provided to me by R. Morgan, personal communication, June 26, 2003).

ExamRequirement and exam-fee policy responses from schools that returned the survey were entered into the High School Master Files for both 2000-01 and 2001-02 to permit manipulation of the data. First, examRequirement responses were tallied for the total group. Then, the exam requirement policy was recoded into a dichotomous variable (i.e. the school required students to take the AP exam or did not) to answer two further questions.

“What percentage of schools reporting 100% RET in 2001-02 required students to take the exam in 2002-03?

“What percentage of schools that required students to take the AP exam in 2002-03 had a 100% RET in 2001-02?”

To answer this question, the 2001-02 RET for each high school was also recoded as a dichotomous variable (100% RET or less than 100% RET) entitled RET category and then a crosstabulation of RET category by the dichotomous examRequirement variable was employed to answer these questions (using SPSS 10.0 statistical software).
For the next part of the analysis, the association between a school's exam requirement policy, treated as a dichotomous variable, and its DFG was examined by plotting the percentage of schools within each DFG that required students to take AP exams. (A crosstabulation of exam requirement policy versus DFG was run on SPSS 10.0 to arrive at these percentages.) The last portion of the statistical analysis for Question 4A divided schools into two groups; those that required students to take AP exams and those that did not, and compared the median values of these two groups for each of the six school-level variables. (The Explore analysis of SPSS 10.0 was used to calculate group medians.) Finally, comments of respondents were sorted into categories and presented in tabular form.

**Research Question 4B**

*What percentage of New Jersey public schools that require students to take the AP exam pay the exam fee?*

This analysis also utilized the SPSS 10.0 High School Master Files for 2000-01 and 2001-02 with survey data added as described for Research Question 4A. Survey respondents were asked to choose one of three possible responses to the question of whether the school paid the AP exam fee for students enrolled in AP courses, apart from the NJDOE and College Board program for low-income students. The choices were, “The school (or district) pay the exam fee for all students who take AP exams,” “The school (or district) does not pay the exam fee,” and “other (please specify your policy).” The responses of all schools were first tallied and presented. Next, the percentages of exam-requiring schools that paid the exam fee and the percentages of fee-paying schools that also required students to take the exam were obtained from a crosstabulation of exam fee
versus exam requirement policy data using SPSS 10.0 (where both policies were recoded as dichotomous variables).

In order to explore the relationship between the socioeconomic status of the district a school is located in and the school’s policy regarding AP exam payment, the percentage of schools that paid the exam fee in each DFG was determined through an SPSS 10.0 crosstabulation of exam fee policy (recoded as a dichotomous variable) by DFG. Percentages of fee-paying schools within each DFG were then presented in a bar graph. Finally, comments of respondents were categorized and presented in tabular form.

Research Question 5

How does the assessment of an AP course based on the percentage of AP test takers who achieve an exam grade of 3 or better compare to the assessment of the same course based on the percentage of AP-enrolled students who achieve an exam grade of 3 or better?

For this analysis, the sc_ap.csv file, saved as a Microsoft Excel spreadsheet, was used to identify and isolate all English Literature and Composition courses offered in New Jersey in 2001-02 in which at least one exam grade was recorded. (Of note, the word course here refers to all students in a particular high school who took a certain AP subject rather than to an individual class.) Two different indexes were calculated for each course; the percentage of test-takers who earned exam grades of 3 or better and the percentage of enrolled students who earned exam grades of 3 or better. English Literature and Composition was chosen because it was the second most commonly offered course that year. (The first, Calculus AB, was not chosen because students sometimes take the
test even though they have been enrolled in a Calculus BC course (R. Morgan, personal communication, July 31, 2003).

Once these two indexes had been calculated for each course, the Microsoft Excel spreadsheet was imported into an SPSS 10.0 spreadsheet for the calculation of the Pearson correlation coefficient between the two indexes. Then, the difference between these two indexes for the same courses was evaluated in a second fashion. All courses in which 100% of test takers earned exam grades of 3 through 5 were identified and the range of values for the second index, the percentage of AP-enrolled students who earned exam grades of 3 through 5, was examined for that group of courses. This provided a means of determining how much the second index varied across a group of courses that had the same value for the first index.
### Table 3. Analysis and Statistics for Each Research Question

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Analysis</th>
<th>Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What were the patterns of AP exam taking among students enrolled in AP courses</td>
<td>Rate of exam taking (RET) for:</td>
<td>RET = AP exams/AP enrollments X 100</td>
</tr>
<tr>
<td>enrolled in New Jersey public schools in 2001-02? (N = 309 schools)</td>
<td>• State</td>
<td>Frequency distribution for RETs</td>
</tr>
<tr>
<td></td>
<td>• AP high schools</td>
<td>Histograms, descriptive statistics</td>
</tr>
<tr>
<td></td>
<td>• All AP courses</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• All AP subjects</td>
<td></td>
</tr>
<tr>
<td>2. What was the statewide trend in rate of exam taking among AP-enrolled students</td>
<td>• Trend in state-wide RET across five years</td>
<td>Descriptive statistics</td>
</tr>
<tr>
<td>in New Jersey public schools from 1997-1998 through 2001-2002?</td>
<td>• Trend in # and % of schools with 100% RET</td>
<td></td>
</tr>
<tr>
<td>3. What relationships exist between district- and school-level variables and the</td>
<td>Relationship between RET and the following variables:</td>
<td>Descriptive statistics</td>
</tr>
<tr>
<td>rate of AP exam taking among AP-enrolled students in New Jersey public schools?</td>
<td>• District Factor Group</td>
<td>Correlation coefficients</td>
</tr>
<tr>
<td></td>
<td>• AP enrollment/100 11th &amp; 12th graders</td>
<td>Descriptive statistics</td>
</tr>
<tr>
<td></td>
<td>• % graduates to 4 yr. College</td>
<td></td>
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<td></td>
<td>• Sum of SAT Verbal + Math</td>
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<td></td>
<td>• % 11th graders scoring Advanced on Math HSPA</td>
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<td></td>
<td>• % 11th graders scoring Advanced on L.A. HSPA</td>
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<td></td>
<td>• % faculty/administrators with M.A. or Ph.D.</td>
<td></td>
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<tr>
<td>4. A. What are the characteristics of New Jersey public schools that require</td>
<td>Review of survey responses</td>
<td>Descriptive statistics</td>
</tr>
<tr>
<td>students in all (or almost all) AP courses to take the AP exam?</td>
<td>Comparison of schools that require the AP exam to those that don't across</td>
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<tr>
<td></td>
<td>those 7 variables.</td>
<td></td>
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<tr>
<td>B. What percentage of New Jersey public schools that require students to take the</td>
<td>Review of survey responses</td>
<td>Descriptive statistics</td>
</tr>
<tr>
<td>AP exam pay the exam fee? (N = 256 schools)</td>
<td>Analysis of relationship between exam-requirement and fee-payment policies</td>
<td></td>
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<td></td>
<td>Comparison of schools that require the AP exam to those that don't across</td>
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<td>those 7 variables.</td>
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<tr>
<td>5. How does the assessment of an AP course based on the percentage of AP test</td>
<td>Comparison of two performance indicators:</td>
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<tr>
<td>takers who achieve an exam grade of 3 or better compare to the assessment of the</td>
<td>• % AP exam grades ≥ 3 per # AP course enrollments</td>
<td>Comparison of the two indexes for courses in which the % AP test takers</td>
</tr>
<tr>
<td>same course based on the percentage of AP-enrolled students who achieve an exam</td>
<td>• % AP exam grades ≥ 3 per # AP exams taken</td>
<td>who earned exam grades of 3 or better was 100%</td>
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<tr>
<td>grade of 3 or better? (N = 268 courses)</td>
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</table>
Ethical Considerations

Permission to conduct this study was obtained from the College of William and Mary Protection of Human Subjects Committee. Since this study consists only of analyzing data that has been made available online through the New Jersey Department of Education and voluntary survey data about high school policies in New Jersey, it was not anticipated that it would cause adverse effects to any individuals.

Delimitations

The data analysis is limited to New Jersey public schools and therefore generalizations to other states or to the rest of the country would be unwarranted. The purpose of this analysis is to begin to appreciate patterns of exam taking and possible relationships between exam taking and other variables. Any findings from this New Jersey study would need to be replicated in New Jersey in future years and then in other states before general conclusions could be drawn.

The variables available for testing were limited to those available through New Jersey School Report Card data.

In the analyses that examine school policies toward requiring AP exams for all (or almost all) AP-enrolled students and paying the fee for all students, schools were given a dichotomous choice along with a third option of choosing “other” and describing their policy. This did not allow for a full evaluation of the range of school policies that are intermediate between the dichotomous choices.
Limitations

The most serious limitations of the study stem from three aspects of the data collection methodology.

Limitations Involving Data Collection Methodology

First, the preloading of the AP enrollment field of the data collection software instrument with the number of AP exams taken in the same subject creates many potential problems. The data collection user might erroneously think that he/she was not supposed to change the enrollment field or might simply neglect to do so. In either case, an RET of 100% might have been recorded for all courses in the school even if the real RET was not 100%. This potential problem would tend to result in a falsely inflated number of courses and high schools with a 100% RET being reported.

A second limitation of the data collection methodology that could have artificially increased the rate of exam taking is that the only AP subjects that are listed on the SRC collection software are those in which at least one student took an AP exam. Schools could contact the SRC office and ask to have an AP subject added (SRC employee, personal communication, July 28, 2003), but it seems likely that many schools might have been unaware of this option or might not have taken the trouble to exercise it. In summary, courses in which the rate of exam taking was 0% were eliminated from the SRC database unless schools petitioned the SRC office to add the extra course.

Of note, the software was also written such that a user needed to enlist the help of the SRC office to enter a number in the AP enrollment field that was smaller than the AP exam field (SRC employee, personal communication, May 12, 2003). This would tend to hide AP exams taken in excess of enrollments in the corresponding course in each high
school. However, this situation did not affect the analysis of this study, since AP exams in excess of AP enrollment were eliminated by this investigator anyway.

Third, there are four AP areas in which students may take two exams in one year. These are Latin: Literature and Vergil, Economics: Microeconomics and Macroeconomics, Physics C: Mechanics and Electricity and Magnetism, and Government and Politics: U.S. and Comparative. According to a researcher at ETS, most students take only one of the Latin tests, but the other three paired subjects are offered in different ways at different schools. Some schools offer each of the pair as a semester course, some offer each as a year course, and some only offer one of the pairs (R. Morgan, personal communication, July 31, 2003).

This situation could create ambiguity in data entry. If a school offered both courses in a pair, each for a semester, it is not clear how course enrollment data would be reported. For example, suppose that a school offered both economics courses as two semesters of a yearlong course and that some students took one exam, some took the other, and some took both. The district data entry person would have to decide whether to consider that the student who took the Microeconomics exam but was in the full year course should also be listed as enrolled in Macroeconomics. Similarly, some schools allow students in Calculus BC classes to take the AB exam and others allow students in Computer Science AB to take the A exam (R. Morgan, personal communication, July 31, 2003). This could also create confusion in the reporting of the student’s course enrollment, and might mean that equivalent circumstances might be reported differently by different data enterers.
Limitations Involving District- and School-Level Variables

Three other limitations concern the district and school-level variables. First, DFG is a district rather than school-level variable and it is quite likely that high schools vary in socioeconomic status within a district. However, since this is the measure designed by the NJDOE for the express purpose of allowing for fair comparison of schools, it was felt that it would be an appropriate measure of school socioeconomic status for this study.

Second, the educational level of the faculty is measured by the percentage of faculty and administrators with masters and doctoral degrees. It would be a purer measure of faculty educational levels if administrators were not included, but administrators probably number far fewer than teachers, so that the combined measure probably still serves as a fairly good measure of faculty advanced degree attainment. This measure is also limited in that it does not tell us the subject of the faculty member's advanced degree. Third, the SAT is not an ideal measure of the academic ability of students since not all students take it.

Other Limitations

Another limitation is that, as mentioned earlier in this chapter, the calculation of rates of exam taking used in this study assumes that when an AP course is taught in a high school, all students taking the AP exam have taken the course in the corresponding subject. For example, if a high school listed 30 students enrolled in AP Biology and 15 students who took the AP exam, the method used in this study to calculate rate of exam taking would result in a rate of exam taking of 50% for the course. This assumes that all 15 AP exam takers were enrolled in the course, an assumption that may not be true. It is possible that 2 students who took the AP exam did not take the AP course, in which case
the number of AP enrollees who took the exam would be 13 instead of 15, and the
percentage of AP enrollees who took the exam would be 43% instead of 50%. In sum,
the method used in this study to calculate rate of exam taking has the potential to
overestimate the rate of exam taking to the extent that there are AP exam-takers who
have not taken the corresponding AP course even when such a course is offered in their
high school.

The College Board does not collect data on the percentage of students who take
AP exams without taking the AP course (T. Packer, personal communication, April 28,
2003), so it is difficult to assess the accuracy of the assumption that most AP exam takers
in New Jersey had taken the corresponding AP course when such a course was offered.
Indeed, information presented earlier that 24.2% of Texas AP exam takers in 2000-01
had not taken the corresponding AP course (TEA, 2002) suggests that the percentage in
New Jersey might also not be negligible. However, Texas had a lower percentage of
schools participating in the AP program in 2000-01 than New Jersey (65.3% vs. 87.3%)
according to College Board data cited in the TEA (2002) report. This would make it
more likely that students would take an AP exam without taking the corresponding
course in Texas than in New Jersey, a supposition that is supported by the fact that the
percentage of AP examinees who had taken the corresponding AP course rose in Texas as
the number of high schools offering AP courses rose (TEA, 2002).

A further fact was noted earlier that may help to explain the high rate of AP exam
taking without corresponding course taking in Texas. Specifically, many of the AP tests
taken in 2000-01 without the student having taken an AP course were in Spanish
Language, an exam in which three fourths of examinees were Hispanic, raising the
possibility that many students may have been native Spanish speakers (TEA, 2002). For these reasons, this investigator concluded that it was reasonable to make the assumption that when an AP course was offered in a New Jersey high school most AP examinees in that subject would be students who had taken the course. However, there is no way to verify this assumption and it remains a limitation of the study.

Another limitation in this study arises from the fact that schools are compared to each other based on their school-wide rates of AP exam taking (i.e. total AP exams are divided by total AP course enrollments and multiplied by 100). Since AP subjects have varying rates of exam taking nationally and in New Jersey (R. Morgan, personal communication, June 26, 2003), differences in the profile of AP courses offered at various high schools could impact their overall rates of exam taking. Selecting the five most common AP courses and then comparing school-wide rates of exam taking for only those courses (after weighting the rates according to the number of exams in each subject) would have been one way to address this. However, this would have led to the loss of a great deal of exam-taking data and would have restricted the analysis to only those schools that offered the five courses. As a result, there would have been an overall reduction in the number of schools analyzed and potentially a differential reduction in the number of small and low-income schools, thereby potentially biasing the part of the analysis that explored the relationship between school rates of exam taking and other school-level variables. On balance, therefore, it was felt that the approach taken in this study was a better choice.
Apart from the data collection problems already mentioned, this analysis assumes that the data reported in the New Jersey School Report Cards is accurate. To the extent that it is not, errors in the analysis may arise.

Conclusion

In conclusion, a number of limitations have been identified, many of them related to data collection methodology. However, it should be noted that while New Jersey School Report Card AP data may not be ideal, it is a unique resource in that it permits the calculation of rates of exam taking for individual courses and high schools and allows for the linking of high school rates of exam taking to a variety of other school- and district-level variables. The dearth of such data is undoubtedly one reason why so little research has been undertaken on this topic. Therefore, despite the limitations and delimitations noted above, New Jersey SRC data remains a valuable resource that allows for a preliminary exploration of the phenomenon of AP exam taking among AP-enrolled students.
CHAPTER FOUR

FINDINGS

The purpose of this study was to explore the phenomenon of AP exam taking among the population of all AP high schools in New Jersey over the five years between 1997-98 to 2001-02 and, more closely, in the year 2001-02. Because this phenomenon represents relatively uncharted territory, the analysis was designed to ask broad questions and to avoid making a priori assumptions. Further, since AP exam taking is considered likely to vary substantially from one state to another, no generalization from New Jersey data to other states will be made. Consequently, the data analysis is primarily aimed at describing the population of New Jersey schools offering AP courses in the years under study. Finally, because population rather than sample data are being analyzed, and because generalization from this population to others is not warranted, descriptive rather than inferential statistics will be employed. In the following sections, the research questions are addressed in turn. An analysis of the possible impact of the preloading of AP exam number data into the AP enrollment field of the New Jersey School Report Card data collection instrument is also included.

Research Question 1

*What were the patterns of AP exam taking among students enrolled in AP courses in New Jersey public schools in 2001-02?*
Construction of the data files used for analyses of this Question and Research Questions 2 through 4 is described succinctly in Chapter Three and in greater detail in Appendix B. In brief, the sc_ap.csv file (found within the NJ.CSV-Files.zip) was used as a source file to generate Microsoft Excel spreadsheets containing, for the years 2000-01 and 2001-02, lists of all AP subjects offered in New Jersey (identified by high school), along with the number of AP exam takers and enrolled students. These spreadsheets were titled All Courses 00-01 and All Courses 01-02. The data was not disaggregated to the individual class level, so data for a particular AP subject in one school may include data from two or more classes. The word course, therefore, refers herein to all students taking an AP subject at a particular high school, and may include students from more than one class.

For 2001-02, the identification of the 309 high schools in which at least one AP exam was taken was accomplished through a search of the sc_ap.csv data file (which identified 305 schools) and two additional searches, one of which uncovered four additional AP schools. However, due to the laborious nature of this last search, which involved examining individual School Report Cards for 135 schools, only the sc_ap.csv search was undertaken to identify AP schools in 2000-01 and the other years examined.

Once the Microsoft Excel All Courses 00-01 and 01-02 spreadsheets had been constructed, the rate of exam taking was calculated for each AP course within each high school and then for the high school as a whole. Rate of exam taking (RET) is defined as the number of AP exams divided by the number of AP enrollments in the corresponding AP course times 100.
Since this study is concerned with the percentage of students enrolled in AP courses who took AP exams, and not in the taking of AP exams in the absence of AP course taking, AP exams in which there were no corresponding AP enrollments at a particular high school were deleted from the Microsoft Excel spreadsheets for both years. Similarly, when the number of AP exams exceeded the enrollment for the corresponding course at a particular high school, resulting in an exam-taking rate of greater than 100%, the number of AP exams was reduced to the number of enrollments so that no course had an exam-taking rate of more than 100%. AP exams so deleted represented a small percentage of overall exams in all years (see Appendix B for figures); in 2000-01 they represented 3.29% of total exams and in 2001-02 they represented just 0.60% of total exams.

Of note, AP courses in which no student took an exam would also have been absent from the New Jersey School Report Card (SRC) database since the electronic data collection software included only those AP subjects in which students in a particular school had taken at least one AP exam (NJDOE, Division of Deputy Commissioner, 2002; personal communication, SRC Office employee, July 28, 2003). While high schools could have contacted the SRC Office to ask that additional courses be added (SRC Office employee, personal communication, July 28, 2003), the analysis of the 2001-02 SRC Data reveals only one course in which there were AP enrollments without any AP exams. Thus, courses in which the rate of exam taking was 0 were effectively eliminated from the database, a fact that would have artificially increased the overall RET for any high school that had such courses, and for the state overall.
Rates of exam taking (RET) for individual courses, high schools, AP subjects, and for the state as a whole were calculated using Microsoft Excel functions. At the course level, RET approximates the percentage of students enrolled in an AP course who took the AP exam. This is only an approximation because it assumes that all exam takers were enrolled in the AP course. Although AP exams in excess of enrollments were eliminated from the data files used for this analysis, the possibility still exists that some AP test takers did not take the AP course, i.e. it is possible that some enrolled students did not take the AP exam and that other, non-enrolled students did. In that case the calculated RET would not be an accurate assessment of the percentage of enrolled students who took the AP exam.

For the generation of frequency distributions and histograms of rates of exam taking across courses, high schools, and AP subjects the SPSS 10.0 statistical software package was used after data from Microsoft Excel spreadsheets was imported into SPSS 10.0 spreadsheets. Descriptive statistics were also calculated using the SPSS 10.0 software. As noted earlier, further details of data extraction from the New Jersey SRC database and data manipulation for this study are available in Appendix B.

*Rate of Exam Taking for the State, 2001-02*

The first part of Research Question 1 began with the broad overview of exam taking in New Jersey, asking what the statewide RET was in 2001-02. A total of 40,042 exams were taken out of 54,712 AP enrollments in 3101 courses, resulting in a statewide RET of 73.19%.
Rate of Exam Taking for High Schools, 2001-02

The next part of the analysis zooms in a little more to examine rates of exam taking across high schools in New Jersey. Figure 2 is a histogram depicting the RETs of the 309 New Jersey high schools that had at least one AP exam taken in 2001-02 (hereafter referred to as AP high schools). Of note, RET is expressed as a percentage carried to two decimal places in all Research Question 1 analyses.

![Rate of Exam Taking](image)

Figure 2. Rate of exam taking of 2001-02 New Jersey AP high schools (Expressed as a Percentage).

What is most noticeable about this histogram is the large band of schools whose RET fell within the 90 to 100% band. An examination of the complete frequency distribution of RETS for schools revealed that this group comprised 177 schools. What was even more striking, however, was the fact that 150 schools had a 100% RET, representing almost half (48.54%) of the total group of 309 schools. Among schools that
did not have a 100% RET, there was a wide variation in RET with some tendency for the frequencies to increase up to the 50-60% RET band and decrease after it (with the exception of the 70-80% band).

In light of the data collection methodology discussed earlier, wherein the default setting for AP enrollment was the same as the number of AP exams taken in each subject at a particular high school, the 150 schools in which there was a 100% RET must be viewed with some suspicion. Because this is such a central issue to the credibility of the data in this study, an analysis of the evidence regarding the likelihood that the data collection methodology resulted in data artifact will be undertaken here. Specifically, the question that must be addressed is to what extent the reporting of 100% RET by schools in 2001-02 was due to error in data collection. This question was looked at from several vantage points.

The first approach was to examine the RETs for high schools in the four years preceding 2001-02 to determine if the high percentage of 100% RET schools was a new phenomenon. This question required the construction of five separate spreadsheets listing all AP schools in the years 1997-98 through 2001-02. The data source was the sc_ap.csv data table. The spreadsheets constructed by the investigator for this analysis are the same files that were used for Research Question 2, the trend analysis, and further detail about them is included there and in Appendix B. For the purpose of this analysis, however, the information sought was the percentage of schools in each of the five years that had 100% RET. Table 4 depicts this information.
Table 4.

Percentage of Schools with 100% Rate of Exam Taking, 1997-98 to 2001-02.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(N=295)</td>
<td>(N=296)</td>
<td>(N=294)</td>
<td>(N=308)</td>
<td>(N=305)</td>
</tr>
<tr>
<td></td>
<td>15.93</td>
<td>17.57</td>
<td>15.99</td>
<td>19.16</td>
<td>48.85</td>
</tr>
</tbody>
</table>

(Of note, the percentage of 2001-02 schools with 100% RET for this analysis is 48.85%, which differs slightly from the percentage listed earlier because only the 305 schools found on the sc_ap.csv file were included in this analysis to make the figures comparable across the five years.)

It can be seen that the percentage of schools with 100% RET increased slightly from 1997-98 to 2000-01, from 15.93 to 19.16%, but increased dramatically, to 48.85%, in 2001-02. This represents solid evidence that something happened to increase the percentage of schools reporting 100% RET in 2001-02. It could be that the data collection methodology changed and that the increased percentage of schools with 100% RET was due to data collection artifact, despite the recollections of the SRC Office employee that data collection methodology had not changed in five years (personal communication, SRC employee, July 14, 2003). However, a widespread change in high school policies toward exam taking, such as a move toward requiring enrolled students to take the exam or providing strong incentives for them to do so, could also explain the trend pattern.
There is no way to know whether high school policies changed, but data from the survey sent to 2001-02 AP schools (which had an overall yield of 83% and which will be described in more detail in Research Question 4) are relevant. These data indicate that of the 121 responding schools that had a 100% RET in 2001-02, 52 (43%) required AP-enrolled students to take the AP exam in 2002-03. Thus, if such schools had had the same exam-taking requirement in 2001-02, this could have accounted for their having an RET of 100%. Therefore, this data suggests that an exam-taking rate of 100% might have been accurate in a substantial segment of schools.

Another analysis attempted to gauge the extent to which the 100% RET schools represented data collection artifact by looking at the RETs for high schools in the same district. Since SRC Data was supplied by district personnel, it would stand to reason that if neglect to correct the preloaded AP enrollment field were responsible for the 100% RETs among high schools in the district, then this error would have been made for all such high schools. RETs of high schools in the same district were therefore compared. In particular, when one high school in a district had 100% RET, the RETs of the other high schools in the same district were examined.

There were eleven districts that had more than one AP high school in 2001-02 and that also had at least one high school with 100% RET. Among these eleven districts, six had 100% RETs among all high schools. In one district, all three high schools reported requiring the AP exam in 2002-2003, which could account for the uniform 100% RET. In the other five districts with uniform 100% RET, four districts had only two high schools and one had three high schools, so it is conceivable that those sets of high schools had a uniform 100% RET as a result of coincidence.
Five districts, on the other hand, had at least one high school with 100% RET and at least one other with an RET that was not 100%. Therefore, if the same user completed data collection for all high schools in the district, the 100% RET recorded for high schools in these districts was probably not the result of misunderstanding the data collection methodology.

The final means employed to assess the likelihood that many schools that reported 100% RET did so as the result of data collection error was to compare the estimates of New Jersey’s statewide RET derived from the SRC data to the New Jersey RET estimates derived by the ETS for 2000-01 and 2001-02. Figure 5 shows this comparison. (Note: the SRC estimate for 2001-02 included only the 305 schools found on the sc_ap.csv file in order to make that year comparable to 2000-01. Also, rates for both years were calculated before AP exams in excess of enrollments in particular courses were deleted.)

Table 5.

Comparison of Estimates of Statewide Rates of Exam Taking (RET): Educational Testing Service (ETS) vs. School Report Card Data (SRC)

<table>
<thead>
<tr>
<th>Year</th>
<th>SRC Derived</th>
<th>ETS Estimated</th>
<th>Difference (ETS-SRC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000-01</td>
<td>67.0%</td>
<td>70.5%</td>
<td>3.5</td>
</tr>
<tr>
<td>2001-02</td>
<td>73.4%</td>
<td>69.9%</td>
<td>-3.5</td>
</tr>
</tbody>
</table>

Note: Data on ETS rates of exam taking for New Jersey were supplied by R. Morgan, personal communication, July 10, 2003).
It can be seen that in 2000-01 the School Report Card RET was 3.5% less than the ETS estimate, whereas in 2001-02 it was 3.5% more. This change between the two years argues somewhat against the explanation of the increase in RET reflected in SRC figures being due to a genuine increase in RET in the state, as that should have been reflected in the ETS figures as well. An increased School Report Card derived RET due to a change in data collection methodology would, however, be consistent with the data presented above (as would a change in data collection by the ETS).

On the other hand, looking only at these two years, one cannot know how much RETs from each of these sources tend to vary from year to year by chance, nor the degree to which these two different sources would vary from each other from year to year. In other words, we cannot assess the probability that a difference of 3.5 percentage points in any one year is due to chance. Similarly, we cannot know the probability that a shift from plus 3.5 to minus 3.5 percentage points difference between the ETS and SRC scores from one year to another is due to chance.

The possibility that the high number of 100% RET schools in 2001-02 was at least partly due to an artifact of the RET calculation methodology of this study rather than the data collection methodology employed by the New Jersey SRC office was also considered. Specifically, the elimination of AP exams in excess of course enrollments might have changed the RET of a school from more than 100% (which would not be compatible with the data entry user leaving the enrollment field untouched) to 100%. To investigate this possibility, RETs were calculated for all schools listed on the sc_ap.csv file before any AP exams in excess of AP enrollments were eliminated. Only two schools were found to have had an RET of more than 100%, and only one had an RET that was
converted to 100% after the elimination of AP exams in excess of enrollments. The possibility that the RET calculation methodology had caused significant numbers of schools to artificially show a 100% RET was therefore rejected.

Putting all of this together, one is left with a situation that cannot be definitively resolved. The surprisingly high number and percentage of 100% RET high schools in 2001-02 (150 schools out of 309, or 48.54%), along with the dramatic increase in the percentage of schools with 100% RET between 2000-01 and 2001-02, raise definite questions about the credibility of the 100% RET findings. Furthermore, the pattern of differences between statewide RETs derived by the ETS and the SRC data suggest the possibility that the RET derived from SRC data in 2001-02 may have been somewhat inflated.

On the other hand, the foregoing analyses suggest that the recording of 100% RET may have been accurate for a substantial group of schools (i.e. those that required AP exam taking in 2002-03 and those in districts in which one, but not all, high schools had 100% RET recorded). Also, the 2001-02 statewide RET derived from the SRC data is reasonably close to an ETS estimate arrived at through an entirely different methodology. Finally, an SRC Office employee asserted that there was no change in AP data collection methodology in 2001-02 (SRC employee, personal communication, July 14, 2003).

Further discussion of the surprisingly high percentage of schools with 100% RET in 2001-02 and the differences between 2001-02 and previous years will be presented in Chapter Five, but the foregoing discussion is presented herein because of its impact on the approach to data analysis. In light of the ambiguity regarding the credibility of 2001-02 SRC data, a decision was made to analyze it as planned, but to perform comparative
analyses of 2000-01 data as well to provide corroboration of the 2001-02 findings. It should be noted, however, that if, in fact, the data collection methodology had not changed in the past five years, then data from all of those years would have been subject to a potential artificial increase in the percentage of high schools with 100% RET due to preloading of the AP enrollment field with AP exam data.

Comparison of RETs for New Jersey AP Schools in 2000-01 and 2001-02.

Figure 3 displays a side-by-side comparison of the histograms showing the distributions of RETs for New Jersey AP schools in 2000-01 and in 2001-02.

A comparison of these histograms reveals a substantial increase in the 90-100% RET group in 2001-02 with a concomitant decrease across the board in the other groups. Further comparison of the rates of exam taking for these two years is afforded by a comparison of descriptive statistics of the distributions of RET for high schools in both years. Table 6 provides this data.
Table 6.

Comparison of Rates of Exam Taking for AP High Schools in 2000-01 and 2001-02

<table>
<thead>
<tr>
<th>Statistic</th>
<th>2000-01 (N=308)</th>
<th>2001-02 (N=309)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean RET</td>
<td>69.07</td>
<td>80.81</td>
</tr>
<tr>
<td>Median RET</td>
<td>68.11</td>
<td>98.68</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>24.75</td>
<td>24.82</td>
</tr>
<tr>
<td>Number of 100% RET Schools</td>
<td>59</td>
<td>150</td>
</tr>
<tr>
<td>Percentage of 100% RET Schools</td>
<td>19.16</td>
<td>48.54</td>
</tr>
</tbody>
</table>

A comparison of both means and medians for the two years reveals a sizeable upward shift of both measures in 2001-02 accompanied by an increase in the number and percentage of schools with 100% RET that is consistent with the histograms just presented. Of note, the data file constructed for all years except 2001-02, including 2000-01, included only those schools that had AP course enrollments and exams listed on the sc_ap.csv files. By comparison, the 2001-02 data file involved a more exhaustive search of two additional data sources and includes four schools that were not listed on the sc_ap.csv file. Therefore, it is possible that a few schools that offered AP programs in 2000-01 are not included in the 2000-01 data file.

Rate of Exam Taking Among all AP courses, 2000-01 and 2001-02

The rate of exam taking among individual courses (with course defined as all students taking a particular AP subject in one high school) offered in New Jersey high
schools in both 2000-01 and 2001-02 was also examined. Of note, only one course in the 2001-02 data file and none in the 2000-01 data file had an RET of 0%, which is most likely due to the fact that only those AP subjects in which at least one student had taken an exam were included on the data collection software (SRC employee, personal communication, July 28, 2003). Thus, courses with a 0% RET were artificially eliminated from the database. Also, AP exams in excess of AP enrollments for any course were eliminated by this investigator, so no course had an RET greater than 100%. Figure 4 shows histograms of the rates of exam taking across all courses for the two years.

![Histograms of the rates of exam taking across all courses for 2000-01 and 2001-02.](image)

**Figure 4.** Rate of exam taking among AP courses in New Jersey, 2000-01 (left) and 2001-02 (right). Number of courses was 2838 in 2000-01 and 3101 in 2001-02.

These histograms demonstrate that for both years, the most noticeable pattern is the large number of courses with 90-100% RETS. At the other end of the spectrum, relatively few courses had RETs between 0 and 10%. Otherwise, apart from a small...
increase in numbers of courses as one moves from low to high RET bands (more perceptible in 2000-01 than in 2001-02), there is no appreciable pattern.

When comparing histograms of 2000-01 schools to 2001-02 schools, the main difference appears to be a decreased number of courses in all of the RET bands except for the 90-100% band. Descriptive statistics for the two years are provided in Table 7.

Table 7.

Descriptive Statistics of the Distributions of Rates of Exam Taking for AP Courses in 2000-01 and 2001-02

<table>
<thead>
<tr>
<th>Statistic</th>
<th>2000-01</th>
<th>2001-02</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean RET</td>
<td>71.39</td>
<td>81.75</td>
</tr>
<tr>
<td>Median RET</td>
<td>81.82</td>
<td>100.00</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>30.38</td>
<td>27.88</td>
</tr>
<tr>
<td>Number of 100% RET courses</td>
<td>1035</td>
<td>1840</td>
</tr>
<tr>
<td>Percent of 100% RET courses</td>
<td>36.47</td>
<td>59.34</td>
</tr>
</tbody>
</table>

A comparison of both means and medians reveals an increase in average rate of exam taking among New Jersey AP courses in 2001-02 compared to 2000-01 that is consistent with the increase in number and percentage of 100% RET courses.

Rate of Exam Taking for Subjects

The state-wide RETS for each of the 34 AP subjects offered in New Jersey were also calculated for 2000-01 and 2001-02 and are presented in Table 8 in order of ascending RET in 2001-02.
Table 8.

*Rate of Exam Taking for AP Subjects in 2000-01 and 2001-02*

<table>
<thead>
<tr>
<th>AP Subject</th>
<th>Rate of Exam taking 2000-01</th>
<th>Rate of Exam taking 2001-02</th>
<th>Difference (01-02) – (00-01)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human Geography</td>
<td>33</td>
<td>41</td>
<td>8</td>
</tr>
<tr>
<td>Latin-Literature</td>
<td>41</td>
<td>42</td>
<td>1</td>
</tr>
<tr>
<td>Studio Art - 3D</td>
<td>42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government &amp; Politics – Comparative</td>
<td>63</td>
<td>52</td>
<td>-11</td>
</tr>
<tr>
<td>Latin – Vergil</td>
<td>58</td>
<td>55</td>
<td>-3</td>
</tr>
<tr>
<td>Studio Art – Drawing</td>
<td>32</td>
<td>55</td>
<td>23</td>
</tr>
<tr>
<td>Studio Art – General</td>
<td>48</td>
<td>61</td>
<td>13</td>
</tr>
<tr>
<td>French Language</td>
<td>50</td>
<td>62</td>
<td>12</td>
</tr>
<tr>
<td>Computer Science AB</td>
<td>58</td>
<td>63</td>
<td>5</td>
</tr>
<tr>
<td>German Language</td>
<td>50</td>
<td>63</td>
<td>13</td>
</tr>
<tr>
<td>World History</td>
<td>64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statistics</td>
<td>58</td>
<td>66</td>
<td>8</td>
</tr>
<tr>
<td>History of Art</td>
<td>63</td>
<td>67</td>
<td>4</td>
</tr>
<tr>
<td>Music Theory</td>
<td>58</td>
<td>67</td>
<td>9</td>
</tr>
<tr>
<td>Physics B</td>
<td>54</td>
<td>67</td>
<td>13</td>
</tr>
<tr>
<td>Computer Science A</td>
<td>57</td>
<td>68</td>
<td>11</td>
</tr>
<tr>
<td>European History</td>
<td>59</td>
<td>68</td>
<td>9</td>
</tr>
<tr>
<td>Spanish Literature</td>
<td>65</td>
<td>68</td>
<td>3</td>
</tr>
<tr>
<td>Economics – Micro</td>
<td>57</td>
<td>69</td>
<td>12</td>
</tr>
<tr>
<td>Spanish Language</td>
<td>60</td>
<td>69</td>
<td>9</td>
</tr>
<tr>
<td>Economics – Macro</td>
<td>58</td>
<td>70</td>
<td>12</td>
</tr>
<tr>
<td>Psychology</td>
<td>64</td>
<td>70</td>
<td>6</td>
</tr>
<tr>
<td>French Literature</td>
<td>63</td>
<td>71</td>
<td>8</td>
</tr>
<tr>
<td>Environmental Science</td>
<td>58</td>
<td>74</td>
<td>16</td>
</tr>
<tr>
<td>Government &amp; Politics – U.S.</td>
<td>64</td>
<td>74</td>
<td>10</td>
</tr>
<tr>
<td>Physics C – Mechanics</td>
<td>61</td>
<td>74</td>
<td>13</td>
</tr>
<tr>
<td>US History</td>
<td>65</td>
<td>74</td>
<td>9</td>
</tr>
<tr>
<td>English Language &amp; Composition</td>
<td>71</td>
<td>77</td>
<td>6</td>
</tr>
<tr>
<td>English Literature &amp; Composition</td>
<td>70</td>
<td>77</td>
<td>7</td>
</tr>
<tr>
<td>Physics C – Electricity &amp; Magnetism</td>
<td>53</td>
<td>77</td>
<td>24</td>
</tr>
<tr>
<td>Biology</td>
<td>71</td>
<td>78</td>
<td>7</td>
</tr>
<tr>
<td>Chemistry</td>
<td>71</td>
<td>78</td>
<td>7</td>
</tr>
<tr>
<td>Mathematics – Calculus AB</td>
<td>68</td>
<td>78</td>
<td>10</td>
</tr>
<tr>
<td>Mathematics – Calculus BC</td>
<td>84</td>
<td>79</td>
<td>-5</td>
</tr>
</tbody>
</table>
Table 8 reveals a definite variation in the rate of exam taking across subjects for both years as well as a general tendency for the RET to be higher in 2001-02 in most subjects (28 of the 31 subjects offered both years). Figure 5 presents histograms of the rates of exam taking of the AP subjects that were offered in each year.

![Histograms of Rates of Exam Taking](image)

**Figure 5.** Rate of exam taking across AP subjects in New Jersey, 2000-01 (31 subjects) and 2001-02 (34 subjects).

In both years, the rate of exam taking for the majority of AP subjects fell within a fairly narrow band, but this band shifted from 50-70% in 2000-01 to 60-80% in 2001-02.

**Research Question 2**

*What was the statewide trend in rate of AP exam taking among AP-enrolled students in New Jersey public schools from 1997-98 through 2001-02?*

The sc_ap.csv data file was used as the data source for this question. This file lists all AP exams taken in each of the five years (identified by high school) along with the enrollment for the corresponding AP course. As was done in earlier analyses, AP exams without corresponding AP enrollments and AP exams in excess of enrollments for a particular course were eliminated from the database. Separate Microsoft Excel spreadsheets for each year were constructed to calculate statewide rates of exam taking.
Then, a portion of the Microsoft Excel spreadsheet for each year (the subtotal page listing the RETs for each high school) was imported into an SPSS 10.0 spreadsheet for the calculation of the percentage of schools with 100% RET. The Microsoft Excel and SPSS 10.0 spreadsheets for each year were constructed using a uniform set of steps, described in Appendix B (see Question 2: Steps in Trend Analysis). Of note, only the 305 schools that appeared on the sc_ap.csv file were included for the 2001-02 analysis in order to make the numbers for that year comparable to the numbers for the other years. For this reason, the RET for 2001-02 differs slightly from the figure reported in Question 1.

Table 9 shows yearly statewide rates of exam taking from 1997-98 through 2001-02 obtained by dividing the total number of AP exams by the number of AP enrollments for each year and then multiplying by 100 to obtain a percentage.

Table 9.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>61.39</td>
<td>63.04</td>
<td>64.99</td>
<td>64.81</td>
<td>72.95</td>
</tr>
</tbody>
</table>

The above table demonstrates that rate of exam taking increased gradually from 1997-98 to 1999-00, decreased slightly in 2000-01 and then increased substantially, from 64.81% to 72.95% in 2001-02. This increase in RET for 2001-02 was accompanied by a dramatic increase in the percentage of schools reporting 100% RET. Table 4, presented earlier, is repeated here.
Table 4.

Percentage of Schools with 100% Rate of Exam taking, 1997-98 to 2001-02

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(N=295)</td>
<td>(N=296)</td>
<td>(N=294)</td>
<td>(N=308)</td>
<td>(N=305)</td>
</tr>
<tr>
<td></td>
<td>15.93</td>
<td>17.57</td>
<td>15.99</td>
<td>19.16</td>
<td>48.85</td>
</tr>
</tbody>
</table>

Taken together, Tables 9 and 4 paint a picture of a gradual overall increase in both the statewide rate of exam taking and the percentage of schools with 100% RET between 1997-98 and 2000-01, with a more substantial increase in statewide RET and a dramatic increase in schools reporting 100% RET in 2001-02.

Research Question 3

What relationships exist between district- and school-level variables and the rate of AP exam taking among AP-enrolled students in New Jersey public schools?

In this section, the association between rate of exam taking and seven variables, one district-level and the other six school-level, will be discussed in turn. Separate SPSS 10.0 High School Master Files (described earlier) were created for 2000-01 and 2001-02 that included a list of AP high schools, their rate of exam-taking, and separate fields containing data on each of the study variables for each high school. The construction of these files is described in Appendix B. The first variable to be examined is the socioeconomic status of the district.
Socioeconomic Status of the District

As mentioned earlier, New Jersey places each school district into one of eight District Factor Groups (DFGs) based on seven socioeconomic indicators. DFGs are ranked from low (A) to high (J), but the intervals between DFGs are not necessarily equal (A. Dupree, personal communication, April 11, 2003). This research question examined whether the rate of exam taking of high schools varied from one DFG to another in 2000-01 and 2001-02. The first part of the analysis compared mean and median RETs for high schools in each District Factor Group. Table 10 lists this information. Of note, District Factor Groups I and J were combined for all DFG analyses because there were only three schools in the J group for both years. Also, 8 schools in 2000-01 and 9 schools in 2001-02 were vocational and were not assigned District Factor Groups, so these are excluded from the analysis.
Table 10.

Mean and Median Rates of Exam Taking for High Schools in Different District Factor Groups, 2000-01 and 2001-02.

<table>
<thead>
<tr>
<th>District Factor Group</th>
<th>N</th>
<th>Mean</th>
<th>Median</th>
<th>N</th>
<th>Mean</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>38</td>
<td>83.89</td>
<td>94.87</td>
<td>35</td>
<td>85.05</td>
<td>94.68</td>
</tr>
<tr>
<td>B</td>
<td>31</td>
<td>66.20</td>
<td>64.36</td>
<td>32</td>
<td>80.07</td>
<td>100.00</td>
</tr>
<tr>
<td>CD</td>
<td>35</td>
<td>65.61</td>
<td>63.83</td>
<td>34</td>
<td>80.24</td>
<td>100.00</td>
</tr>
<tr>
<td>DE</td>
<td>50</td>
<td>66.78</td>
<td>67.54</td>
<td>52</td>
<td>84.13</td>
<td>100.00</td>
</tr>
<tr>
<td>FG</td>
<td>40</td>
<td>72.53</td>
<td>67.24</td>
<td>41</td>
<td>84.35</td>
<td>100.00</td>
</tr>
<tr>
<td>GH</td>
<td>46</td>
<td>61.07</td>
<td>62.40</td>
<td>46</td>
<td>77.14</td>
<td>76.28</td>
</tr>
<tr>
<td>I + J</td>
<td>60</td>
<td>68.85</td>
<td>68.57</td>
<td>60</td>
<td>74.38</td>
<td>76.18</td>
</tr>
</tbody>
</table>

A comparison of means in 2000-01 and in 2001-02 reveals that District Factor Group A had the highest mean both years. In 2000-01 there does not appear to be much of a pattern aside from this, but in 2001-02, District Factor Groups GH and I + J had lower means than the others. The pattern of medians in 2000-01 is the same as that for the means, with A being higher than the others and no other discernable pattern apparent. Medians for 2001-02 show a curious pattern, however. The median of District Factor Group A was still higher than GH and I + J, but the medians of the intermediate four groups were all 100%.

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An examination of stem-and-leaf plots for each DFG in both years helps to explain this finding. (These are located in Appendix C.) While the shape of the data distributions for most of the groups in 2000-01 is fairly symmetrical (with Group A skewed somewhat more than the others), all the 2001-02 data distributions except GH and I + J are very negatively skewed, with large numbers of schools having 100% RET.

These findings are difficult to interpret, so a secondary analysis was performed. All high schools were placed into one of three groups based on their school-wide RET: a high RET group (schools with RETs of 90-100%), a medium RET group (schools with RETs of 60 to less than 90%), and a low RET group (schools with RETs less than 60%). Percentages of high schools in the high, medium, and low RET groups within each DFG were then determined. This method of data analysis allows one to see the relative makeup of the high schools in each DFG.

As mentioned earlier, the eight categories of DFG are ordered from lowest (A) to highest (J) socioeconomic status. Four of the DFGs are named by double letters (CD, DE, FG, and GH); these are the New Jersey designations and do not represent any combination of data by this investigator. However, District Factor Groups I and J were combined as I + J since there were only three schools in District Factor Group J. Figure 6 consists of two graphs, one for 2000-01 and the other for 2001-02, presented together to facilitate comparison. Each graph depicts the percentage of schools within each District Factor Group that belonged in each of the three RET categories (high, medium, or low).
Figure 6. Percentage of schools in high, medium, and low RET categories by District Factor Group, 2000-2001 (top) and 2001-2002 (bottom).
Looking first at the graph for 2000-01, it can be seen that the percentage of high RET schools is highest in A, lowest in GH and I + J, and of intermediate values in District Factor Groups B through FG. Most notably, within Factor Group A, high RET schools constitute a majority of schools (57.9%), whereas in GH and I + J, high RET schools comprise only 10.9 and 20% of schools, respectively.

In 2001-02, the most obvious difference from the previous year is the substantial increase in the percentage of high RET schools within all DFGs except A, which only increased from 57.9% to 60%. The reason for District Factor Group A showing a smaller increase in high RET schools is not clear. However, there were only 38 schools in this DFG in 2000-01, of which 57.9% (22 schools) were already in the high RET category. Consequently, only 16 schools could have changed from the low or medium category to the high. With this small number of schools, it is possible that random factors may have caused the shift from low and medium RET schools to high RET schools to have been smaller than expected. Also, if the increase in high RET schools in 2001-02 had been due to a random selection of schools reporting 100% RET by error, then the fact that DFG A had a higher percentage of schools in the high RET group to begin with would have meant that more of the schools making a random data reporting error would have already been in the high RET group and therefore fewer would have shifted to it.

These explanations are speculative, however, and we cannot really know why there was a smaller increase in the percentage of high RET schools for DFG A. Regardless of the reason for the smaller increase, the result of it was for District Factor Group A to be displaced by DE as the DFG with the highest percentage of high RET schools (69.2%). However, GH and I + J continued to have the lowest percentage of high
RET schools (43.5 and 36.7%, respectively). Furthermore, they were the only two groups in which high RET schools were not in the majority in 2001-02.

Relationship between Rate of Exam taking and Six School-Level Variables

In order to determine the strength of association between the rate of exam taking (RET) of a high school and other school-level variables, bivariate Pearson correlation coefficients were obtained using SPSS 10.0. The full table containing intercorrelations between all variables is reproduced in Appendix C. It is worth noting that of the seven variables, all but rate of exam taking and percentage of faculty with an M.A. or Ph.D. are strongly correlated with each other, with positive correlation coefficients in 2001-02 ranging from .70 to .89. The percentage of faculty with an M.A. or Ph.D. variable correlates moderately with the other variables except for rate of exam taking, with correlation coefficients in the range of .43 to .62. The correlations to be focused on herein, however, are those between rate of exam taking (RET) and the other six variables. These are listed in Table 11 for 2000-01 and 2001-02. The findings are reported in order of descending magnitude of the correlation coefficients in 2001-02.
Table 11.

*Pearson Correlation Coefficients Between RET and Other School Level Variables, 2000-01 and 2001-02*

<table>
<thead>
<tr>
<th>School-Level Variable</th>
<th>2000-01</th>
<th>2001-02</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP Enrollment per 100 11th &amp; 12th graders</td>
<td>-.14 (N=308)</td>
<td>-.25 (N=309)</td>
</tr>
<tr>
<td>Percent of graduates to 4 year college</td>
<td>-.01 (N=305)</td>
<td>-.10 (N=308)</td>
</tr>
<tr>
<td>Sum of SAT Verbal + Math</td>
<td>-.13 (N=307)</td>
<td>-.08 (N=306)</td>
</tr>
<tr>
<td>Percent of 11th graders scoring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advanced on HSPA Math</td>
<td>-.07 (N=309)</td>
<td></td>
</tr>
<tr>
<td>Percent of 11th graders scoring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advanced on HSPA Language Arts</td>
<td>-.07 (N=309)</td>
<td></td>
</tr>
<tr>
<td>Percent of Faculty/Administrators</td>
<td></td>
<td></td>
</tr>
<tr>
<td>with M.A. or Ph.D.</td>
<td>.03 (N=305)</td>
<td>-.06 (N=309)</td>
</tr>
</tbody>
</table>

Note: The HSPA (High School Proficiency Assessment) was not given in 2000-01.

An examination of Table 11 reveals several things. First, the magnitude of all correlations except AP enrollment per 11th and 12th grader in 2001-02 with rate of exam taking is very low. Also, correlations between rate of exam taking and all variables except the percentage of faculty and administrators with an M.A. or Ph.D. (2000-01) are negative, indicating that as these variables increase, rate of exam taking tends to decrease. The variable that shows the highest correlation with RET in both years is AP enrollment per 11th and 12th grader, and this correlation is weak.
However, because the distribution of rate of exam taking among high schools in both years was skewed (i.e. a substantial number of schools had 100% RET), the correlation between rate of exam taking and any other variable would have tended to be dampened somewhat. For example, in 2001-02, almost half of the AP schools had an RET of 100%, which would make it difficult to demonstrate a correlation between RET and any other variable in that year. In 2000-01, the distribution was substantially less skewed, but there were still 59 schools out of 308 that had 100% RET.

Therefore, a second, different kind of analysis of the relationship between rate of exam taking and the school-level variables was undertaken to add to the understanding of this relationship. Specifically, the question was asked, “How do schools with high RETs (90 to 100%) differ from those with medium (60 to less than 90%) and low RETs (less than 60%) with respect to the school-level variables of interest?” Asked another way, this question examined the average value of the six different school-level variables across the three RET groups to see if they differed. Because the frequency distributions of the school-level variables within RET groups were skewed in a number of cases, medians were chosen as the measure of central tendency used to compare groups. The rationale for this decision is that medians and means serve as equally good measures of central tendency in completely symmetric distributions, but medians tend to be a better measure of central tendency in a distribution that is very skewed (Kiess, 1996). Means are also reported, however, along with skewness, for each RET group. The standard deviation of each variable for the entire population of schools (i.e. all three groups combined) is also reported for each year.
Further, in order to provide a standardized measure of the magnitude of the differences between groups, the differences between median scores are also expressed as standard deviations. For these calculations, the standard deviation of the total group of schools included in each analysis is used. However, it should be noted that since standard deviation is a measure of the average deviation of the scores of a distribution from the mean, this statistic, like the mean, is most meaningful with symmetrical distributions where the mean and median are equal.

The first school-level variable to be looked at is the AP enrollment per 100 11th and 12th graders. Specifically, the question asked was, “How does the median AP enrollment per 100 11th and 12th graders vary between schools with high, medium, and low rates of exam taking?”

**AP Enrollment per 100 11th and 12th Graders**

Table 12 lists the mean and median values of the AP enrollment per 100 11th and 12th graders for the groups of schools with high, medium, and low rates of exam taking. The skewness values for the frequency distributions of each RET group are also listed. These statistics are provided for both 2000-01 and 2001-02.
A few trends become apparent upon examination of the data. In 2000-01, the high group had a median AP enrollment per 100 11th and 12th graders that was 13.25 enrollments (.41 standard deviations) lower than the median for the medium RET group. Medians for medium and low RET groups, however, were essentially the same. In 2001-02, the median AP enrollment of the high RET group was also lower than the median of the medium RET group by 15.73 enrollments (.47 standard deviations), and the median AP enrollment of the medium group was 6.58 enrollments (.2 standard deviations) lower than the median of the low group. In other words, in both years, at schools in which there was a high rate of exam taking, students took fewer AP courses, on average, than at medium RET schools, and in 2001-02, students at medium RET schools took fewer AP courses, on average, than students at low RET schools.
Because the shapes of the frequency distributions of the high RET groups differed from the low and medium groups for both years, boxplots of them are shown below.

*Figure 7. AP enrollment per 100 11th & 12th graders for high, medium, and low RET groups, 2000-01 and 2001-2002.*

The difference in the shape of distributions of the high RET groups compared to medium and low groups make any effort to capture the “average” value for each group in a single statistic and to compare them difficult. Consequently, this comparison must be viewed with some caution for this particular variable.

*Percentage of Graduates to Four-year College*

The next school level variable to be examined is the percentage of graduates planning to attend a four-year college. Table 13 lists the means, medians, and standard deviations of this variable for high, medium, and low RET groups in 2000-01 and 2001-02.
Table 13.

**Percent Graduates to Four-year College Within RET Groups, 2000-01 and 2001-02**

<table>
<thead>
<tr>
<th>RET Group</th>
<th>N</th>
<th>Mean</th>
<th>Median</th>
<th>Skewness</th>
<th>N</th>
<th>Mean</th>
<th>Median</th>
<th>Skewness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SD</td>
<td></td>
<td></td>
<td></td>
<td>SD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>92</td>
<td>55.53</td>
<td>53.00</td>
<td>0.33</td>
<td>176</td>
<td>52.73</td>
<td>51.00</td>
<td>0.11</td>
</tr>
<tr>
<td>Medium</td>
<td>99</td>
<td>57.66</td>
<td>58.00</td>
<td>-0.01</td>
<td>55</td>
<td>57.44</td>
<td>56.00</td>
<td>-0.08</td>
</tr>
<tr>
<td>Low</td>
<td>114</td>
<td>56.68</td>
<td>54.00</td>
<td>0.28</td>
<td>77</td>
<td>59.81</td>
<td>59.00</td>
<td>-0.05</td>
</tr>
</tbody>
</table>

For 2000-01, the median percentage of graduates going on to four-year colleges was 5.00 percentage points (.26 standard deviations) lower for the high group than the medium group, but this trend was reversed between medium and low groups; the medium group had a median percentage of graduates going to four-year college that was 4.00 percentage points (.21 standard deviations) higher than the low group. There is, therefore, no consistent pattern of medians across the three groups in 2000-01. For 2001-02, however, the median of the high group was 5.00 percentage points (.26 standard deviations) lower than that of the medium group, which was in turn 3.00 percentage points (.16 standard deviations) lower than the median of the low group.

**Sum of SAT Verbal and Math**

Descriptive statistics for the next school-level variable, sum of SAT Verbal and Math scores, for each RET group are presented in Table 14.
Table 14.

*Sum of SAT Verbal and Math Within RET Groups, 2000-01 and 2001-02*

<table>
<thead>
<tr>
<th>RET Group</th>
<th>2000-01</th>
<th>2001-02</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
</tr>
<tr>
<td>High</td>
<td>93</td>
<td>972.15</td>
</tr>
<tr>
<td>Medium</td>
<td>99</td>
<td>1007.12</td>
</tr>
<tr>
<td>Low</td>
<td>115</td>
<td>1013.26</td>
</tr>
</tbody>
</table>

In both 2000-01 and 2001-02, an examination of the medians reveals that the high RET group had a lower median SAT score than the medium or low group. For 2000-01, this difference was 30.00 points, representing .27 standard deviations. In 2001-02, the difference was 42.5 points, representing .39 standard deviations. The difference between medium and low groups was nonexistent in 2000-01, however, and negligible in 2001-02 (5.00 points, or .05 standard deviations).

*Percentage of 11th Graders Scoring Advanced on the HSPA Math*

Descriptive statistics for this variable are presented in Table 15. Because this test was not given until 2001-02, there are no findings for 2000-01.
Table 15.

*Percentage of 11th Graders Scoring Advanced on the HSPA Math Test Within RET Groups, 2001-02*

<table>
<thead>
<tr>
<th>RET Group</th>
<th>N</th>
<th>Mean</th>
<th>Median</th>
<th>Skewness</th>
<th>N</th>
<th>Mean</th>
<th>Median</th>
<th>Skewness</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>177</td>
<td>20.57</td>
<td>17.40</td>
<td>1.34</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>55</td>
<td>26.15</td>
<td>23.80</td>
<td>0.20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>77</td>
<td>25.26</td>
<td>25.00</td>
<td>0.44</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SD = 15.47

The median percentage of 11th graders who scored Advanced on the math HSPA was 6.40 percentage points (.41 standard deviations) lower for the high RET group than the medium group and 1.20 percentage points (.08 standard deviations) lower for the medium than the low RET group.

*Percentage of 11th Graders Scoring Advanced on the HSPA Language Arts*

Descriptive statistics for this variable are presented in Table 16. Because this test was not given until 2001-02, there are no findings for 2000-01.
Table 16.

<table>
<thead>
<tr>
<th>RET Group</th>
<th>N</th>
<th>Mean</th>
<th>Median</th>
<th>Skewness</th>
<th>N</th>
<th>Mean</th>
<th>Median</th>
<th>Skewness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SD</td>
<td>11.78</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>177</td>
<td>16.74</td>
<td>14.60</td>
<td>1.26</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>55</td>
<td>20.46</td>
<td>18.50</td>
<td>0.17</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>77</td>
<td>20.19</td>
<td>18.40</td>
<td>0.48</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

It can be seen that the median percentage of 11th graders scoring advanced on the language arts HSPA for the high RET group was 3.90 percentage points (.33 standard deviations) lower than the median for the medium group, and that there was no appreciable difference between medium and low groups.

Percentage of Faculty/Administrators with an M.A. or Ph.D.

Descriptive statistics for this variable are presented in Table 17.
Table 17.

*Percentage of Faculty/Administrators with an M.A. or Ph.D. Within RET Groups, 2000-01 and 2001-02*

<table>
<thead>
<tr>
<th>RET Group</th>
<th>2000-01</th>
<th></th>
<th></th>
<th></th>
<th>2001-02</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>Median</td>
<td>Skewness</td>
<td>N</td>
<td>Mean</td>
<td>Median</td>
<td>Skewness</td>
</tr>
<tr>
<td>High</td>
<td>93</td>
<td>49.23</td>
<td>50.00</td>
<td>0.08</td>
<td>177</td>
<td>47.75</td>
<td>48.00</td>
<td>0.23</td>
</tr>
<tr>
<td>Medium</td>
<td>100</td>
<td>50.42</td>
<td>50.00</td>
<td>-0.08</td>
<td>55</td>
<td>49.75</td>
<td>50.00</td>
<td>0.14</td>
</tr>
<tr>
<td>Low</td>
<td>113</td>
<td>48.95</td>
<td>48.00</td>
<td>0.12</td>
<td>77</td>
<td>50.81</td>
<td>53.00</td>
<td>-0.10</td>
</tr>
</tbody>
</table>

In 2000-01, the median percentage of faculty and administrators with an M.A. or Ph.D. was the same for high and medium RET groups and was 2.00 percentage points (.15 standard deviations) higher for the medium group than the low group. In 2001-02 the trend was reversed; the median of the high RET group was 2.00 percentage points (.16 standard deviations) lower than that of the medium group, which was 3.00 percentage points (.23 standard deviations) lower than that of the low group.

*Summary of Findings on the Relationships Between RET and Six School-Level Variables*

Table 18 summarizes the findings from the correlational analyses and the comparison of medians for six school level variables when RET was used as a grouping variable (i.e. schools were placed into high, medium, or low RET groups).
Table 18.

Summary of Findings on the Relationships Between Rate of Exam Taking and Six School-Level Variables, 2000-01 and 2001-02

<table>
<thead>
<tr>
<th>Variable</th>
<th>2000-01 Pearson Correlation</th>
<th>2001-02 Pearson Correlation</th>
<th>Comparison of Medians Across RET Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP Enroll/100 11&lt;sup&gt;th&lt;/sup&gt; &amp; 12&lt;sup&gt;th&lt;/sup&gt; graders</td>
<td>-.14</td>
<td>-.25</td>
<td>H&lt;M (.41 SD) H&lt;M (.47 SD) M&lt;L (.20 SD)</td>
</tr>
<tr>
<td>% Graduates to 4 year college</td>
<td>-.01</td>
<td>-.10</td>
<td>H&lt;M (.26 SD) H&lt;M (.26 SD) M&gt;L (.21 SD) M&lt;L (.16 SD)</td>
</tr>
<tr>
<td>SAT V + M</td>
<td>-.13</td>
<td>-.08</td>
<td>H&lt;M (.27 SD) H&lt;M (.39 SD) M=L M~L</td>
</tr>
<tr>
<td>% 11&lt;sup&gt;th&lt;/sup&gt; graders scoring Advanced HSPA Math</td>
<td>-.07</td>
<td></td>
<td>H&lt;M (.41 SD) M~L</td>
</tr>
<tr>
<td>% 11&lt;sup&gt;th&lt;/sup&gt; graders scoring Advanced HSPA L.A.</td>
<td>-.07</td>
<td></td>
<td>H&lt;M (.33 SD) M~L</td>
</tr>
<tr>
<td>% Faculty/Admin. with M.A./Ph.D.</td>
<td>.03</td>
<td>-.06</td>
<td>H = M H&lt;M (.16 SD) M&gt;L (.15 SD) M&lt;L (.23 SD)</td>
</tr>
</tbody>
</table>

Note: The symbol ~ indicates that the values of the variable for the two groups were approximately the same, defined as less than .1 standard deviation apart.
Research Question 4A

What are the characteristics of New Jersey public schools that require students enrolled in all (or almost all) AP courses to take the AP exam?

This analysis used two data sources. The first was survey data on the current policy (2002-03) of New Jersey high schools in which at least one AP exam was taken in 2001-02, and the second was 2001-02 SRC data (the most recent available) on the characteristics of high schools. For the analyses involved in this question and question 4B, the responses to the survey data were added to the SPSS 10.0 High School Master Files for 2000-01 and 2001-02. Two further research notes regarding this analysis are worthy of mention at the outset. First, as noted previously, the SRC data on school level variables is from 2001-02 while the policy questions pertained to each school’s current policy (i.e. 2002-2003). If school characteristic data remain relatively stable from year to year, this should not pose a problem. However, the rate of exam taking (RET) has been documented to have changed substantially between 2000-01 and 2001-02, so linkage between 2001-02 RET data and 2002-03 policy data must be viewed with some caution.

The second point, which is worth stressing, is that most of the analysis for Research Question 4 does not involve RET data, so the potential problems with that data are not present to the extent that they were in previous analyses. For this research question, the only one of the school-level variables that would have potentially been impacted if the preloading of the AP enrollment field with AP exam data had occurred for the first time in 2001-02 is AP enrollment/100 11\textsuperscript{th} and 12\textsuperscript{th} grade students.

The survey data were obtained via two mailings to 307 of the 309 secondary schools that had at least one AP exam taken in 2001-02. (Two schools that had merged
into one were not surveyed.). Surveys were mailed to schools with 87.5 to 100% RET two weeks earlier than they were mailed to schools with RETs less than 87.5%. In order to ensure that this difference in mailing time did not result in a differential yield, an analysis of the yield was performed for each group. The yield for the 87.5 to 100% RET group (181 schools mailed surveys) was 81.8% while the yield for the group with RET less than 87.5% (126 schools mailed surveys) was 85.7%. This difference was considered small enough to justify an assumption that the different times of mailing did not substantially bias the response rates of the two groups. The yield for all schools was 83.4%, which constituted 256 of the 307 schools surveyed.

The exam requirement question of the survey asked principals (or their designated subordinate) to choose between three options to characterize their school policy regarding requiring AP-enrolled students to take the AP exam. These were, “For all (or almost all) AP courses, students who take an AP course are required to take the AP exam,” “For all (or almost all) AP courses, students who take an AP course are not required to take the AP exam,” or “Other,” with space provided for comment. As noted earlier, this question was modeled after a question on the College Board’s annual fall AP Participation Survey of high schools (R. Morgan, personal communication, June 26, 2003) so that New Jersey responses could be compared to national responses on this issue.

An overview of the responses of schools that returned the survey is presented in Table 19.
Table 19.

*Responses of Schools to Survey Question About AP Exam Requirement*

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency of Responses</th>
<th>Percent of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students required to take</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AP Exam</td>
<td>78</td>
<td>30.5</td>
</tr>
<tr>
<td>Students not required to take</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AP Exam</td>
<td>157</td>
<td>61.3</td>
</tr>
<tr>
<td>Other</td>
<td>18</td>
<td>7.0</td>
</tr>
<tr>
<td>No Response</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>School had no AP courses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In 2002-03</td>
<td>2</td>
<td>0.8</td>
</tr>
</tbody>
</table>

N = 256

Note: 51 schools did not return the survey and were not included in calculations.

Next, the linkage between the 2002-03 AP exam-requirement policies of schools and their rate of exam taking in 2001-02 was examined for the 256 schools that answered the survey. It was found that among schools that had 100% RET in 2001-02, 42.62% required students to take the AP exam in 2002-03. The fact that such a low percentage of 100% schools reported an exam-requirement policy a year later could be explained by several possibilities; a change in exam-requirement policy between 2001-02 and 2002-03, the action of other factors beyond exam-requirement policies causing a 100% RET in
schools, or the inclusion in the 100% RET group of schools that did not actually have 100% RET because of the potential data artifact.

A different way of examining the linkage between exam requirement policies and rate of exam taking is to look at the 2001-02 RET of schools that required the AP exam in 2002-03. This analysis revealed that among schools that required students to take the AP exam in 2002-03, 66.67% had 100% RET in 2001-02 and 83.33% had between 90 and 100% RET. These findings suggest that exam requirement policies may have resulted in a high rate of exam taking in the schools employing them (assuming that the exam-requirement policy had been in effect in 2001-02).

*Relationship Between the AP Exam Requirement and District Factor Group (DFG)*

This aspect of the analysis focuses on the question of whether there was an association between the AP exam-requirement policy of schools and the District Factor Group they were assigned to. Of note, the DFG assignment of schools did not change from 2001-02 to 2002-03, so this analysis compares the AP exam-requirement policy of schools with their DFG category in the same year. Data on both of these variables was available for 249 schools. The AP requirement was treated as a dichotomous variable (schools were coded as either requiring the exam or not requiring it), and as in the previous DFG analysis, District Factor Groups I and J were combined. Figure 8 depicts the percentage of schools that required students to take the AP Exam within each District Factor Group.
Figure 8. Percentage of exam-requiring schools within District Factor Groups.

Figure 8 clearly indicates that the lowest socioeconomic District Factor Group, A, had the highest percentage of schools that required students to take the AP exam and that the three highest socioeconomic status District Factor Groups, GH and I + J, had the lowest percentage of such schools. District Factor Groups B, CD, DE, and FG had intermediate percentages of schools requiring the AP exam.

Relationship between the AP Exam Requirement and Six Other School-Level Variables

The analysis of the relationships between the school-level variables and the AP exam requirement will be presented in the same order as the analyses were presented in Research Question 3. A series of tables lists the means, medians, and skewness of the frequency distributions of each variable within each group of schools (i.e. schools that required the AP exam versus those that did not). The standard deviation for the entire group of schools is also reported. As was done for the analysis of these variables in Research Question 3, medians will be compared across groups to assess differences. Of note, the total number of schools in each analysis (the sum of the Ns for both groups) represents all schools that responded to the survey and had a score on the variable of
interest. The total number of schools surveyed was 307, so the number of missing cases due to missing variable data for each analysis equals 307 minus the sum of the number of schools in the two groups.

Table 20.

AP Enrollment per 100 11th and 12th Graders

<table>
<thead>
<tr>
<th>Exam Requirement Group</th>
<th>N</th>
<th>Mean</th>
<th>Median</th>
<th>Skewness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requires AP exam</td>
<td>78</td>
<td>36.99</td>
<td>21.39</td>
<td>1.86</td>
</tr>
<tr>
<td>Does not require exam</td>
<td>178</td>
<td>43.10</td>
<td>34.02</td>
<td>1.15</td>
</tr>
</tbody>
</table>

SD = 34.59

It can be seen that the median AP enrollment per 100 11th and 12th graders was 12.63 enrollments (.37 standard deviations) lower for the group that required students to take the exam.

Table 21.

Percentage of Graduates to Four-year College

<table>
<thead>
<tr>
<th>Exam Requirement Group</th>
<th>N</th>
<th>Mean</th>
<th>Median</th>
<th>Skewness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requires AP exam</td>
<td>78</td>
<td>53.94</td>
<td>51.50</td>
<td>0.22</td>
</tr>
<tr>
<td>Does not require exam</td>
<td>177</td>
<td>58.63</td>
<td>57.00</td>
<td>-0.24</td>
</tr>
</tbody>
</table>

SD = 19.41

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The percentage of students going to four-year colleges was 5.50 percentage points (.28 standard deviations) lower for schools that required the AP exam than for schools that did not.

Table 22.

*Sum of SAT Verbal and Math*

<table>
<thead>
<tr>
<th>Exam Requirement Group</th>
<th>N</th>
<th>Mean</th>
<th>Median</th>
<th>Skewness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requires AP exam</td>
<td>77</td>
<td>978.05</td>
<td>980.00</td>
<td>0.11</td>
</tr>
<tr>
<td>Does not require exam</td>
<td>176</td>
<td>1024.60</td>
<td>1022.50</td>
<td>-0.24</td>
</tr>
</tbody>
</table>

SD = 103.99

Similarly, schools that required the AP exam had median SAT scores that were 42.50 points lower (.41 standard deviations) than the schools that did not require exam taking.

Table 23.

*Percentage of 11th Graders Scoring Advanced on HSPA Math*

<table>
<thead>
<tr>
<th>Exam Requirement Group</th>
<th>N</th>
<th>Mean</th>
<th>Median</th>
<th>Skewness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requires AP exam</td>
<td>78</td>
<td>20.31</td>
<td>15.10</td>
<td>1.24</td>
</tr>
<tr>
<td>Does not require exam</td>
<td>178</td>
<td>25.75</td>
<td>23.05</td>
<td>0.73</td>
</tr>
</tbody>
</table>

SD = 15.63

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A similar difference is apparent for the percentage of 11th graders scoring Advanced on the HSPA Math section; exam-requiring schools had 7.95 percent (.51 standard deviations) fewer 11th graders scoring Advanced than non-requiring schools.

Table 24.

Percentage of 11th Graders Scoring Advanced on HSPA Language Arts

<table>
<thead>
<tr>
<th>Exam Requirement Group</th>
<th>N</th>
<th>Mean</th>
<th>Median</th>
<th>Skewness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requires AP exam</td>
<td>78</td>
<td>16.88</td>
<td>13.85</td>
<td>1.33</td>
</tr>
<tr>
<td>Does not require exam</td>
<td>178</td>
<td>20.51</td>
<td>18.95</td>
<td>0.58</td>
</tr>
</tbody>
</table>

A comparison of medians for the percentage of students scoring Advanced on the Language Arts section also reveals that the exam-requiring schools had a lower median value, 5.10 percent fewer students scoring Advanced (.43 standard deviations), than schools that did not require students to take the exam.

Table 25.

Percentage of Faculty & Administrators with an M.A. or Ph.D.

<table>
<thead>
<tr>
<th>Exam Requirement Group</th>
<th>N</th>
<th>Mean</th>
<th>Median</th>
<th>Skewness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requires AP exam</td>
<td>78</td>
<td>48.67</td>
<td>49.00</td>
<td>0.23</td>
</tr>
<tr>
<td>Does not require exam</td>
<td>178</td>
<td>49.78</td>
<td>50.50</td>
<td>0.07</td>
</tr>
</tbody>
</table>
Finally, the median percentage of faculty and administrators with an M.A. or Ph.D. was also found to be lower for the exam-requiring than non-requiring schools by 1.50 percentage points, or .11 standard deviations.

Table 26 summarizes the findings for the six school-level variables.

Table 26.

Summary of Relationships Between Schools’ Exam-Requirement Policy and Six School-Level Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Comparison of Medians Across Exam Requirement Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP Enroll/100 11th &amp; 12th graders</td>
<td>NR &gt; R (.37 SD)</td>
</tr>
<tr>
<td>Graduates to 4 year college</td>
<td>NR &gt; R (.28 SD)</td>
</tr>
<tr>
<td>SAT V + M</td>
<td>NR &gt; R (.41 SD)</td>
</tr>
<tr>
<td>% 11th graders scoring Advanced HSPA Math</td>
<td>NR &gt; R (.51 SD)</td>
</tr>
<tr>
<td>% 11th graders scoring Advanced HSPA L.A.</td>
<td>NR &gt; R (.43 SD)</td>
</tr>
<tr>
<td>% Faculty/Admin. with M.A. or Ph.D.</td>
<td>NR &gt; R (.11 SD)</td>
</tr>
</tbody>
</table>

Note: NR = non-requirement group, R = requirement group.

Table 26 shows a very clear pattern. In the case of all variables, the median of the exam-requirement group is lower than that of the non-requirement group, and the differences are fairly sizeable (.37 to .51 standard deviations) for four variables; AP
enrollment per 100 11th and 12th grader, SAT Verbal plus Math score, and the two HSPA variables.

**Review of Comments on the AP Requirement Question of the Survey**

The question that asked principals about their school’s AP exam requirement policy provided an “other” option, which was selected by 18 respondents. In addition, some principals (or their designated subordinates) chose one of the first two options but provided a comment as well. Thirty-eight schools wrote comments, which are categorized in Table 27. Some comments fit into more than one category, so the responses total more than 38.

**Table 27.**

**Comments on the AP Exam-Requirement Question**

<table>
<thead>
<tr>
<th>Category of Comments</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students are “expected,” “encouraged,” or “highly encouraged” to take the AP exam.</td>
<td>10</td>
</tr>
<tr>
<td>Students who take the AP exam are exempted from the course final.</td>
<td>9</td>
</tr>
<tr>
<td>(In 3 schools, students had to meet some other requirement to be exempted, such as being a senior or having a certain course grade.)</td>
<td></td>
</tr>
<tr>
<td>Students in certain courses must take the AP exam.</td>
<td>5</td>
</tr>
<tr>
<td>The school hesitates to require exam taking without paying the fee.</td>
<td>2</td>
</tr>
<tr>
<td>Dual enrollment or college credit is an option for students who do not take the AP exam.</td>
<td>2</td>
</tr>
<tr>
<td>The instructor can require the exam.</td>
<td>1</td>
</tr>
</tbody>
</table>
Students are required to take all (or almost all) AP exams “with the recommendation of the teacher.”

Miscellaneous comments (including those below)

Interesting miscellaneous comments:
The school considered requiring the exam but the move was

“strongly opposed by parents.”

“The value of the course(s) rest on content and exposure to higher level/critical thinking skills. The exams often fall short.”

Research Question 4B

What percentage of New Jersey public schools that require students to take the AP exam pay the exam fee?

The SPSS 10.0 High School Master Files for 2000-01 and 2001-02 were also used for this analysis. Before answering the specific research question, an overview of the percentage of schools that reported paying the AP exam fee is presented. Respondents to the survey were asked to choose one of three possible responses to the question of whether their school pays the AP exam fee for students enrolled in AP courses, apart from the NJDOE and College Board program for low-income students. The choices were, “The school (or district) pays the exam fee for all students who take AP exams,” “The school (or district) does not pay the exam fee,” and “other (please specify your policy).” The responses of the 256 schools that answered the survey are presented in Table 28.
Table 28.

Responses of Schools to AP Exam-Fee Question

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency of Responses</th>
<th>Percent of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>N = 256</td>
<td></td>
<td></td>
</tr>
<tr>
<td>School pays the exam fee</td>
<td>60</td>
<td>23.4</td>
</tr>
<tr>
<td>School does not pay the fee</td>
<td>153</td>
<td>59.8</td>
</tr>
<tr>
<td>Other</td>
<td>41</td>
<td>16.0</td>
</tr>
<tr>
<td>School had no AP courses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In 2002-03</td>
<td>2</td>
<td>0.8</td>
</tr>
</tbody>
</table>

"Other" responses will be categorized and reported on later. The next step in the AP fee analysis involves addressing the research question. Among the 256 responding schools, it was found that 49 of the 78 schools (62.8%) that required students to take the AP exam paid the exam fee for all students. Another 13 schools (or their districts), while not paying the entire fee for all students, had policies to pay some portion of the fee for some or all students. These policies included paying a portion of the exam fee, reimbursing students who attained a certain AP exam grade, or paying the fee for needy students. Thus, 62 of 78 schools (79.5%) that required students to take the AP exam had some fee payment policy that either paid the fee for all students, paid a portion of the fee, or paid the fee under certain circumstances.

Another means of examining the linkage between exam requirement and fee-payment policies is to look at what percentage of schools that paid the exam fee also
required students to take the exam. This percentage was found to be even higher, at 81.67%. Thus, there appeared to be a strong linkage between schools' exam-requirement and fee-payment policies.

Because of the linkage found between the exam requirement and District Factor Group, and because paying the exam fee could very conceivably be linked to the socioeconomic status of students, it was also decided to investigate the association between a school’s fee-payment policy and its DFG. Figure 9 shows the percentage of schools within each DFG that paid the exam fee.

![Bar chart showing percentage of exam fee-paying schools within District Factor Groups](image)

**Figure 9.** Percentage of exam fee-paying schools within District Factor Groups.

Figure 9 clearly demonstrates that the percentage of schools that paid the exam fee decreases steadily as one moves from the lowest (A) to highest socioeconomic status group (I + J).
Review of Comments on the Exam Fee-Payment Question of the Survey

Finally, Table 29 presents the categories into which the comments of 57 schools on this question were placed. Some schools provided comments that encompassed more than one category, so the responses total more than 57.

Table 29.
Comments on the AP Exam-Fee Question

<table>
<thead>
<tr>
<th>Category of Comments</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>The school or district pays a portion of the AP exam fee.</td>
<td>22</td>
</tr>
<tr>
<td>The school or district pays the exam fee for needy students.</td>
<td>17</td>
</tr>
<tr>
<td>Students are reimbursed if they attain a certain AP exam grade.</td>
<td>8</td>
</tr>
<tr>
<td>The exam fee is paid for students attaining a certain course grade.</td>
<td>3</td>
</tr>
<tr>
<td>The school pays the exam fee only for students enrolled in AP courses (i.e. not for independent study).</td>
<td>3</td>
</tr>
<tr>
<td>Miscellaneous comments (including those below)</td>
<td>9</td>
</tr>
</tbody>
</table>

Interesting miscellaneous comments:

The school pays the exam fee “as long as students attend required tutoring sessions.” | 1         |
A civic organization provides funds for the exam fees of needy students.           | 1         |
Research Question 5

How does the assessment of an AP course based on the percentage of AP test takers who achieve an exam grade of 3 or better compare to the assessment of the same course based on the percentage of AP-enrolled students who achieve an exam grade of 3 or better?

This question addressed the issue of how AP exam grades can be fairly used to evaluate the strength of AP courses. A common statistic calculated by the ETS for states is the percentage of passing exam grades (3 or better) among students who took the AP exam (CEEB, n.d.b). This statistic, however, does not take into account those students who completed the course but did not take the exam, and therefore provides an incomplete assessment of the success of AP Programs. Research Question 5 examines the difference between two indexes that could be used to evaluate an AP course: the percentage of test-takers who earned exam grades of 3 or better and the percentage of AP-enrolled students who earned exam grades of 3 or better.

The data analysis addresses this issue by comparing the two indexes for all courses offered in New Jersey in 2001-02 in a single AP subject. (As defined previously, the word course is used here to describe all students taking a particular subject in a particular high school and may include more than one class.) English Literature and Composition was chosen because it was the second most commonly offered course that year. The first, Calculus AB, was not chosen because students sometimes take the test even though they have been enrolled in a Calculus BC course (R. Morgan, personal communication, July 31, 2003). The sc_ap.csv file was used to identify all 285 AP English Literature and Composition courses offered in New Jersey in 2001-02. For each
course, the total number of exam scores between 3 and 5 was calculated along with the total number of exam scores of 1 to 5. For 17 courses, the total number of exam scores of 1 to 5 was 0 (i.e. no grades were recorded). In two cases this appears to represent missing data, but in the other 15 cases it was probably due to the New Jersey DOE policy not to report exam scores when three or fewer students took an exam. These 17 courses were deleted from the file.

For the remaining 268 courses, two indexes were calculated. The first was the percentage of scores of 3 through 5 among all test-takers in the course (number of exam grades of 3 through 5 divided by the number of exam grades of 1 through 5 times 100). The second index was the percentage of scores of 3 through 5 among all students enrolled in the course (number of exam grades of 3 through 5 divided by the course enrollment times 100).

Once these two indexes had been calculated for each course, two analyses were performed. First, the Pearson correlation coefficient between the two indexes was calculated and found to be .76 for the 268 courses. Second, the difference between these indexes was examined in another fashion. All courses in which 100% of test-takers earned exam grades of 3 through 5 were identified. This group consisted of 43 courses. The range of values for the second index, percentage of enrolled students who earned exam grades of 3 through 5, for this same group of courses is presented in Table 30.
Table 30.

*Percentage of Passing Exam Grades per Enrolled Students Among AP English Literature & Composition Courses in Which the Percentage of Passing Exam Grades per Test Takers was 100%*

<table>
<thead>
<tr>
<th>Percent Grades 3-5/Test-Takers</th>
<th>Percent Grades 3-5 /Enrolled Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>100 (18 courses)</td>
</tr>
<tr>
<td>100</td>
<td>96</td>
</tr>
<tr>
<td>100</td>
<td>94</td>
</tr>
<tr>
<td>100</td>
<td>85</td>
</tr>
<tr>
<td>100</td>
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<td>100</td>
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<td>100</td>
<td>65</td>
</tr>
<tr>
<td>100</td>
<td>60</td>
</tr>
<tr>
<td>100</td>
<td>56</td>
</tr>
<tr>
<td>100</td>
<td>55 (2 courses)</td>
</tr>
<tr>
<td>100</td>
<td>50 (2 courses)</td>
</tr>
<tr>
<td>100</td>
<td>47</td>
</tr>
<tr>
<td>100</td>
<td>44</td>
</tr>
<tr>
<td>100</td>
<td>38</td>
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<tr>
<td>100</td>
<td>35</td>
</tr>
<tr>
<td>100</td>
<td>31</td>
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<tr>
<td>100</td>
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<tr>
<td>100</td>
<td>27</td>
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<tr>
<td>100</td>
<td>25</td>
</tr>
<tr>
<td>100</td>
<td>18</td>
</tr>
</tbody>
</table>

This table illustrates that among a group of courses in which 100% of test takers earned exam grades of 3 through 5, the percentages of enrolled students who earned exam grades of 3 through 5 ranged from 18 to 100%. Further, the preloading of the AP enrollment field with AP exam data that is assumed to have occurred in 2001-02 (and...
may or may not have occurred earlier) might have artificially increased the number of courses in which the rate of exam taking was recorded as 100%, in which case the true relationship between the two indexes for this group of courses might actually be even more distant. (This is because any course in which the number of enrolled students equaled the number of test takers would necessarily have had the same percentage of enrolled students who earned exam grades of 3 or better as the percentage of test takers who earned exam grades of 3 or better.)

Conclusion

In this chapter, the findings for each of the research questions were presented. Second, the possibility that the preloading of the AP enrollment field of the data collection software with AP exam data occurred for the first time in 2001-02 was assessed from several different vantage points. It was concluded that there is no way to know for certain whether or not the preloading occurred only in 2001-02 or in all the years of the study, as asserted by the SRC employee (SRC employee, personal communication, July 14, 2003). Because of the importance of this question to the study, Chapter Five reviews the findings and interprets them in the light of the possible data collection artifact.
CHAPTER FIVE
DISCUSSION OF FINDINGS, CONCLUSIONS, AND IMPLICATIONS

In this chapter, the findings from the analyses of the research questions will be discussed in order. For each research question, the results will first be summarized. This will be followed by a commentary section, which will include the interpretation of the results in the light of previous literature. Conclusions and implications for research and practice will then be discussed.

Research Question 1

What were the patterns of AP exam taking among students enrolled in AP courses in New Jersey public schools in 2001-2002?

Rate of Exam taking for the State, 2001-02

Result.

The statewide rate of exam taking was found to be 73.19% in 2001-02.

Commentary.

The rate of exam taking calculated from the New Jersey SRC data by the method described in Chapters Three and Four is close to the 69.9% rate of exam taking estimated for New Jersey in 2001-02 by the ETS (R. Morgan, personal communication, July 10, 2003). ETS estimates of rates of exam taking were arrived at through a comparison of the numbers of students enrolled in AP courses in the fall of 2001 to numbers of students who took exams in the spring of 2002 (R. Morgan, personal communication, October 4,
2002). SRC data used ETS figures for number of AP exams taken in each school, so the contribution of that data to the exam-taking estimate is shared by both SRC and ETS. However, the SRC collection methodology for the AP enrollment portion of the RET calculation comes from district personnel in the fall after the year the course was offered. Each methodology has potential pitfalls; ETS data came from only 71.8% of schools (R. Morgan, personal communication, August 8, 2003), while SRC data had the problem of the preloaded AP enrollment field. However, the fact that these two substantially different methodologies resulted in statewide rates of exam taking that differed by only 3.3 percentage points suggests that despite a less than ideal data collection methodology, the SRC data for 2001-02 may not be extremely inflated. (Of note, the statewide RET derived from SRC data referred to here differs from that in the previous analysis comparing SRC to ETS estimates for statewide RET because this analysis includes all 309 AP schools rather than just the 305 found on the sc_ap.csv file.)

The 73.19% statewide RET calculated from the SRC data also corresponds fairly closely to the 70% national rate of exam taking estimated by ETS for 2001-02 (R. Morgan, personal communication, December 20, 2002). This suggests that at a state level, the rate of exam taking in New Jersey is fairly characteristic of the nation as a whole.

Rate of Exam taking for High Schools, 2001-02

Results.

The analysis of the histogram depicting the distribution of rates of exam taking (RET) for all 309 New Jersey AP schools in 2001-02 revealed very few schools with RETs below 30%, but a fairly wide distribution of schools spread across the other bands.
By far the largest group, 177 schools, had an RET of from 90 to 100%, and 150 of these schools had an RET of 100%. These 150 schools with a 100% RET comprised 48.5% of AP schools in 2001-02. A finding that almost half of all AP high schools reported that virtually every student in every AP class took the AP exam is one that must inevitably be viewed with some incredulity. Accordingly, the investigator determined the number and percentage of schools reporting 100% exam taking in the previous four years as a basis for comparison.

It was found that in the four years preceding 2001-02, the RET was between about 16 and 19 percent, and then jumped to almost 49% in 2001-02. Again, these findings require some explanation. As discussed in Chapters Three and Four, the data pattern suggested the possibility that the preloading of the AP enrollment field of the data collection software had occurred for the first time in 2001-02, notwithstanding the recollections of the SRC employee and colleague. Consequently, three analyses were conducted to look for further evidence that the data collection methodology had changed, or that it had not changed. These were described in detail in Chapter Four and will be briefly summarized here.

**Analyses of change in percentage of 100% RET schools from 2000-01 to 2001-02.**

The first analysis used survey data on the 2002-03 exam-requirement policies of schools to determine what percentage of schools that had a 100% RET in 2001-02 required students to take the exams in 2002-03. It was found that of the 121 schools that had a 100% RET in 2001-02 and responded to the survey, 52 schools (43%) required AP students to take the exam in 2002-03. If the 2002-03 exam requirement policy of most of
these schools had been in effect a year earlier, this would make a reporting of 100% exam taking credible for approximately 40% of schools.

The second analysis looked at the reporting of RETs by districts that had more than one high school and where at least one high school had an RET of 100%. Eleven such districts were found, six of which had reported 100% RET for all schools, suggesting the possibility of the data artifact. However, there were only two high schools each in four of these districts and three high schools in each of the other two districts. Furthermore, in one of the districts that had three 100% RET high schools, all three schools reported requiring the AP exam in 2002-03. Finally, five districts reported 100% RET for one high school and reported an RET other than 100% for at least one other high school, suggesting that the 100% RET was not due to data artifact (assuming that the same district employee filled out the Report Card data for all high schools in the district). Again, this provides some reassurance that at least five out of eleven districts (and potentially more) did not report 100% exam taking as the result of the preloading of the AP enrollment field.

The third analysis consisted of comparing the differences between the ETS and SRC estimates for 2000-01 and 2001-02. The findings revealed that the difference between these two estimates did change, with the ETS estimate being 3.5 percentage points higher than the SRC-derived figure in 2000-01 and 3.5 percentage points lower than the SRC figure in 2001-02. As discussed in Chapter Three, however, it is not clear whether these differences represent a significant change.

In summary, the statistical analyses are inconclusive. A second avenue of investigation was undertaken to shed light on this issue, and is described herein.
Specifically, the question was asked as to whether some dramatic change in the New Jersey AP Program in 2001-02 could have caused a large number of schools to shift to the 100% RET category. The first question that was asked was whether any legislation had been enacted with respect to AP. New Jersey has a Legislature web site with a search engine allowing the user to search for legislation by keyword. A search of the 1996-98, 1998-2000, and 2000-02 sessions by keyword phrase Advanced Placement revealed no records (New Jersey Legislature, n.d.). The absence of AP legislation was also confirmed by representatives of the Public Information Office (R. Vespucci, personal communication, July 22, 2003) and the Legislative Information and Bill room (D. Black, personal communication, August 8, 2003).

Apart from legislation, it is possible that some strong encouragement from the NJDOE could have caused widespread change in New Jersey high schools. Dr. Robert Higgins, the Advanced Placement Incentive Program (APIP) Coordinator for New Jersey, was asked whether he could provide any explanation for the increase in percentages of schools with 100% RET in 2001-02. He noted that the number of AP exams paid for by the APIP had increased between 2000-01 and 2001-02, but apart from that he could not explain the findings (R. Higgins, personal communication, August 4, 2003). The number of exams paid for by the APIP did increase from 1300 in 2000-01 to 1800 in 2001-02, and this could have contributed to an increased RET across the state (NJDOE, n.d.a, 2002), but it is not clear to what extent that might account for the observed RET changes.

Finally, Shelley Fox, the State Representative for Gifted and Talented and the Gifted and Talented Coordinator for the northern region of New Jersey, was asked if she
had any thoughts as to what might have caused a large increase in the number of schools with 100% RET in 2001-02. She was also unable to proffer an explanation.

Putting this all together, there is really no way to be sure whether the increase in 100% RET schools in 2001-02 was due to a genuine increase or to data artifact. Therefore, two possibilities exist. The first is that the change, though inexplicable by this investigator, was genuine and that there was no alteration of data collection methodology in 2001-02.

The second possibility to explain the increase in number of 100% RET schools is that it was caused by artifact, namely that the preloading of the enrollment field occurred in 2001-02 for the first time. Because it is not possible to determine which of these is the true explanation, two interpretations will be posed for each of the analyses in Research Questions 1 through 3. The first alternative will hereafter be referred to as “Accurate RET change,” and the second as “Artifact RET change.” Of note, these alternatives differ in their interpretations of the change from 2000-01 to 2001-02. In either scenario, it is assumed that the AP enrollment field was preloaded with exam data in 2001-02. The question is whether it was also preloaded in 2000-01, in which case the change between 2000-01 and 2001-02 would have had to be due to another factor. In addition to offering two explanations for each of the findings involving 2001-02 RETs, it was decided to run parallel analyses of 2000-01 for comparison, as discussed earlier.

Returning to the analysis of the number and percentage of 100% RET schools in 2001-02, the Accurate RET change interpretation (i.e. the appropriate interpretation if the RET change were accurate) is that 2001-02 saw a very impressive increase in the number of schools with 100% RET. The actual number of schools with 100% RET in 2001-02
and in the other four years might have been inflated due to the preloading of the AP enrollment field, but the change from 2000-01 and 2001-02 would have been genuine rather than being due to data artifact.

The Artifact RET change interpretation would be that the 2001-02 increase in number and percentage of schools with 100% RET was most likely due, at least in part, to the preloading of the AP enrollment field occurring in that year for the first time. If this were true, we would have no way of knowing what the real number of 100% RET schools were.

Comparison of RETs for High Schools in 2000-01 and 2001-02

Results.

Histograms of the distribution of high school RETs in 2000-01 and 2001-02 were produced for comparison. In examining these two histograms side by side, a substantial increase in the 90-100% band in 2001-02 was noted, accompanied by a concomitant decrease across the board in the other RET bands. Descriptive statistics of the RET distributions of high schools in 2000-01 and 2001-02 also reveal a sizeable upward shift in the mean and median RET in 2001-02 that goes along with an increase in the number (from 59 to 150) and percentage (from 19.16 to 48.54) of 100% RET schools.

Commentary.

The Accurate RET change interpretation would suggest that a large number of schools in all bands of RET in 2000-01 achieved a 100% RET in 2001-02. If this were true, such a change would most likely have been due to adoption by high schools of either an exam requirement or a highly persuasive incentive, as it is hard to imagine
schools moving from a 40 or 50% RET to a 100% RET in one year absent the adoption of a fairly compelling policy.

The Artifact RET change interpretation would suggest that many, if not most, of the schools that moved from lower RET bands to the 100% bands did so because of a change in data collection methodology and consequent data artifact.

*Rate of Exam Taking Among all AP Courses, 2000-01 and 2001-02*

*Results.*

For both years, histograms of the distributions of course RETs show a pattern similar to that seen for the high school RETs. The largest number of courses in both years are found in the 90-100% band, with a wide distribution of courses spread across all other bands. Comparisons of descriptive statistics for the distributions of course RETs in 2000-01 and 2001-02 show an upward shift of the mean and median RET in 2001-02 with an increase in number and percentage of courses with 100% RET (from 36.47 to 59.34%).

*Commentary.*

Interestingly, this is one of the few analyses where data is available from the literature to compare to the SRC-derived findings. Herr’s 1990 dissertation study included a survey item that asked 176 AP science teachers from AP schools in California, New York, and New Jersey what percentage of students in their classes took the AP exam. He then plotted histograms of the percentages of enrolled students who took the AP exam (comparable to the RET in this study) for biology, chemistry, and physics classes. All three histograms resemble the histograms for RETs of AP courses in New Jersey, with the largest numbers of classes in the 90-100% RET band. Likewise, Herr
reported that the mode of rate of exam taking for all three subjects was 100% and the mean was 70%.

The close concordance of rates of exam taking for science courses studied by Herr in 1990 with all courses in New Jersey in 2000-01 and 2001-02 suggests that the SRC data, on the whole, are fairly credible. Thus, if the AP enrollment field had been preloaded with the numbers of students who had taken AP exams in the same subject for all five years studied, this would appear not to have resulted in a major distortion in the pattern of rates of exam taking. The difference between the pattern in 2001-02 and the other years, however, would still remain to be explained.

The main area where the shape of Herr’s histograms for AP science courses differs from the histograms for all AP courses in New Jersey in both 2000-01 and 2001-02 is that the 0 to 9% band in each of the three Herr histograms contained an equal or greater number of schools than most of the other, non-100% bands. Herr noted that in 10% of courses, no student took the exam (Herr, 1990). SRC data collection methodology had the effect of virtually eliminating the 0% schools, however, by only including on the data collection software the AP subjects in which at least one student in a school had taken an exam. Therefore SRC data cannot be compared to Herr’s data in this respect.

The Accurate RET change interpretation of the 2000-01 and 2001-02 course RET histograms would be that the shift of courses from all RET bands into the 90-100% RET band, accompanied by the substantial increase in number and percentage of 100% RET courses, was due to a genuine increase in exam taking by AP students. If there were a genuine increase in 2001-02, one plausible explanation would be that large numbers of
high schools adopted exam-requiring and exam-promoting policies in that year. This explanation is purely speculative, however.

The Artifact RET change interpretation of these results would be that many of the courses moved from lower RET bands in 2000-01 to 100% RET in 2001-02 as a result of a change in data collection methodology and subsequent data artifact.

Rate of Exam Taking for AP Subjects, 2000-01 and 2001-02

Results.

Calculations of the RETs for all AP subjects were obtained for 2000-01 and 2001-02. Within each year there was a substantial variation in RET across subjects, with rates ranging from 32 to 84% in 2000-01 and from 33 to 79% in 2001-02. Consistent with all the other data presented so far, there was also a greater tendency for the 2001-02 RET in a given subject to be higher than the RET for the same subject in 2000-01, with 28 of the 31 subjects that were offered both years showing increased RET in 2001-02. Finally, histograms of the subject RETs show that in both years, the RET for most subjects fell within a fairly narrow band, but this band shifted from 50-70% in 2000-01 to 60-80% in 2001-02.

Commentary.

The variation in RET between different subjects suggests that there are characteristics of the AP subjects themselves, independent of where they are taught or by whom, that result in differing RETs. What these factors might be, however, is not clear.

The Accurate RET change interpretation would be that there were increases in RET in almost all subjects in 2001-02, which, like the preceding results, could be explained by a significant number of schools adopting policies to promote exam taking.
The Artifact RET change interpretation would be that the 2001-02 increases were due, at least in part, to a change in data collection methodology and subsequent data artifact.

Research Question 2

What was the statewide trend in rate of AP exam taking among AP-enrolled students in New Jersey public schools from 1997-1998 through 2001-2002?

Results.

The state-wide RET increased gradually from 1997-98 to 1999-00 (from 61.39% to 64.99%), decreased slightly in 2000-01 (to 64.81%), and then increased substantially, to 72.95% in 2001-02. As previously reported, this overall increase in RET was accompanied by a dramatic increase in the percentage of 100% RET schools.

Commentary.

The alternative interpretations for the change between 2000-01 and 2001-02 have already been discussed. Additionally, the fact that both the overall RET and percentage of schools with 100% RET showed only a very gradual increase in the four years preceding 2001-02 lends support to the premise that something unusual, either a change in the AP Program in New Jersey or in data collection methodology, happened that year.

Research Question 3

What relationships exist between district- and school-level variables and the rate of AP exam taking among AP-enrolled students in New Jersey public schools?

District Factor Group

The first variable to be examined was the socioeconomic status of schools, operationalized in this study as the DFG of the district the school was located in.
Results.

A comparison of mean rates of exam taking of schools in each District Factor Group indicated that District Factor Group A had the highest mean RET in both years. For 2000-01, this was the only discernable pattern, whereas for 2001-02, District Factor Groups GH and I + J had lower means than the other groups. The pattern for medians was similar to that for means, but in 2001-02, the pattern differed from the pattern for means in that the four intermediate groups, B, CD, DE, and FG, all had medians of 100%, even higher than the median for Group A (94.68%). An examination of stem-and-leaf plots showing the frequency distribution of RETs for schools within each DFG demonstrated that there was a substantial change in the shapes of these four distributions (B, CD, DE, and FG) in 2001-02, with all becoming very negatively skewed as a result of the large number of 100% RET schools in each group.

When the percentages of high, medium, and low RET schools within each DFG were plotted on bar graphs, however, the picture became a little clearer. For convenience, Figure 6, illustrating the percentage of schools in high, medium, and low RET groups by District Factor Group in 2000-01 and 2001-02 is reproduced here.
Figure 6. Percentage of schools in high, medium, and low RET categories by District Factor Group, 2000-2001 (top) and 2001-2002 (bottom).
In 2000-01, the percentage of high RET schools was highest in Group A, lowest in GH and I + J, and of intermediate values in Groups B through FG. Most notably, within Factor Group A, high RET schools constituted a majority of schools (57.9%), whereas in GH and I + J, high RET schools comprised only 10.9 and 20% of schools, respectively. In 2001-02, there was an increase in the percentage of high RET schools within all DFGs. The increase was small for District Factor Group A (from 57.9% to 60%), but for all other groups the increase in percentage of high RET schools was substantially greater. Group A was displaced by DE as the DFG with the highest percentage of high RET schools (69.2%), but GH and I + J continued to have the lowest percentage of high RET schools (43.5 and 36.7%, respectively). Further, they were the only two groups in which high RET schools were not in the majority in 2001-02.

Commentary

Schools in the lowest socioeconomic District Factor Group, Group A, had the highest mean RET in both years and the highest percentage of schools in the high RET group in 2000-01. In 2001-02, the intermediate DFGs had higher percentages of schools in the high RET group than DFG A, but the two most affluent DFGs, GH and I + J, continued to have the lowest percentages of schools in the high RET group.

The impact of the possible data artifact on the change between 2000-01 and 2001-02 must also be considered. The Accurate RET change interpretation would be that a substantial percentage of schools in each District Factor Group moved from low and medium RET groups to the high RET group between 2000-01 and 2001-02 as the result of a real change in rates of exam taking. The Artifact RET change interpretation would be
that the percentage of schools moving from low and medium RET groups to the high RET group was due to data artifact. From either vantage point, it is not clear why Group A had a smaller number of schools shifting from lower RET groups to the high RET group.

When the trend in mean RETs of schools across the different DFGs in New Jersey in 2000-01 is compared to the bar graph showing the mean RETs of schools within Connecticut’s Education Reference Groups in the same year (see Figure 1), some interesting differences emerge. In Connecticut, schools in the highest socioeconomic status Education Reference Groups had the highest RETs, whereas in New Jersey in 2000-01, the three highest socioeconomic status DFGs (GH and I+J) had mean RETs that were lower than the RET of the lowest socioeconomic status DFG and about the same as the RETs of the other DFGs. This difference is somewhat surprising since Connecticut and New Jersey appear similar to each other in some important respects. For example, College Board data indicate that in 2001, 98% of Connecticut public schools had AP Programs, compared to 98.1% of New Jersey public schools (CEEB, n.d.a). Similarly, the report of the Commissioner of Education to the State Board of Education, referring to Connecticut’s AP performance figures, noted that, “Connecticut ranked third in the nation, behind Illinois and New Jersey, in the average performance of public high school students” (Sergi, 2002, p.2).

What this suggests is that despite the apparent similarity between Connecticut and New Jersey as two states with high AP performance and participation, there may be a systematic difference between them that results in different patterns of exam taking across schools of differing socioeconomic status. One possible explanation for the
difference in patterns may be that schools in the lowest socioeconomic status district in New Jersey have a higher average RET than schools in low socioeconomic status ERGs in Connecticut due to a difference between the AP Incentive Program in New Jersey and Connecticut’s fee subsidy program. The Connecticut report states that, “With the Advanced Placement Federal Fee-Reduction Grant, coupled with the College Board’s fee waiver, needy students will be able to take the AP exams at minimal cost” (Sergi, 2002, p.2). While this statement does not provide a lot of detail about Connecticut’s fee reduction program, it implies that needy students still need to pay part of the exam fee, whereas in New Jersey the fee is paid for completely through the APIP (NJDOE, n.d.a).

While the lowest-income Education Reference Groups in Connecticut had lower average RETs than did the highest-income ones, the fact that the low-income ERGs had higher RETs than the middle ERGs does suggest that the fee subsidy program in Connecticut may be promoting exam taking among low-income students in that state as well, though perhaps not to the extent that it does so in New Jersey. An alternative hypothesis that could explain the difference in patterns of exam taking across schools in districts of varying socioeconomic status in New Jersey versus Connecticut is the possibility that the schools in high-income DFGs in New Jersey had a lower rate of exam taking than schools in high-income ERGs in Connecticut for reasons that are not yet understood. There is far too little information about factors affecting rates of exam taking to draw conclusions of any kind. Rather, the findings presented herein point to the need for future investigations to examine the relationship between the socioeconomic status of schools and rates of exam taking.
The Relationship Between RET and Six School-Level Variables

Before turning to the interpretation of these results, a brief analysis of the impact of the potential data artifact problem on the findings from this research question is in order. In Research Question 1, the possible data artifact (preloading of the AP enrollment field for the first time in 2001-02), if present, would be predicted to have the effect of magnifying the true findings. In other words, if in reality there had only been 20% of schools with 100% RET, the data artifact had the potential to increase that to a number that was artificially higher. What would the effect of the data artifact, if present, be on the parts of Research Question 3 that compared the differences between high, medium, and low RET groups on the six school-level variables? The most likely impact, in the view of this investigator, would be that the data artifact would tend to decrease differences across groups, thereby artificially dampening rather than inflating any findings.

Consider the situation that would occur if a true difference existed across the three groups such that the high group had a higher average value for a particular variable than the medium group, which in turn had a higher average value than the low group. If a number of schools were randomly chosen from the low and medium groups and moved to the high group, then the average value for those two groups would not change, but the average value of the high group would move closer to the average values of the other two groups due to the addition of the new schools.

This hypothetical scenario essentially describes the situation that would most probably have occurred had the AP enrollment field been preloaded with exam data for the first time in 2001-02 and had subsequent misunderstanding of the data collection software caused some schools to be mistakenly reported as 100% RET. Therefore,
differences between the high group and the other two groups that are observed in 2001-02, the year in which the RET change might have occurred, are not likely to have been caused by data artifact, but are more likely to have been dampened by it. However, this makes the important assumption that schools that mistakenly moved from medium and low RET groups to the high group were randomly distributed with respect to the other school-level variables, a situation that might not be true in all cases.

Because it is difficult to be certain what the impact of possible data artifact would be on the 2001-02 findings, only those findings that appear in both 2000-01 and 2001-02 will be considered credible. Lastly, it is possible that the preloading of the AP enrollment field occurred in 2000-01 as well as 2001-02, as asserted by the SRC employee, in which case the findings from that year might have been distorted in some way as well. It is now time to turn to the interpretation of the findings, and Table 18 from Chapter Four is reprinted here for the reader's convenience.
Table 18.

Summary of Findings on the Relationships Between Rate of Exam taking and Six School-Level Variables, 2000-01 and 2001-02

<table>
<thead>
<tr>
<th>Variable</th>
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<th>2001-02</th>
<th>2000-01</th>
<th>2001-02</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP Enroll/100 11th &amp; 12th graders</td>
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<td>-.25</td>
<td>H&lt;M (.41 SD)</td>
<td>H&lt;M (.47 SD)</td>
</tr>
<tr>
<td>% Graduates to 4 year college</td>
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<td>-.10</td>
<td>H&lt;M (.26 SD)</td>
<td>H&lt;M (.26 SD)</td>
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<tr>
<td>SAT V + M</td>
<td>-.13</td>
<td>-.08</td>
<td>H&lt;M (.27 SD)</td>
<td>H&lt;M (.39 SD)</td>
</tr>
<tr>
<td>% 11th graders scoring Advanced HSPA Math</td>
<td>-.07</td>
<td></td>
<td>H&lt;M (.41 SD)</td>
<td>M~L</td>
</tr>
<tr>
<td>% 11th graders scoring Advanced HSPA L.A.</td>
<td>-.07</td>
<td></td>
<td>H&lt;M (.33 SD)</td>
<td>M~L</td>
</tr>
<tr>
<td>% Faculty/Admin. with M.A./Ph.D.</td>
<td>.03</td>
<td>-.06</td>
<td>H = M</td>
<td>H&lt;M (.16 SD)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>M&gt;L (.15 SD)</td>
<td>M&lt;L (.23 SD)</td>
</tr>
</tbody>
</table>

Before discussing the findings for each variable, however, a general comment is warranted. As was mentioned in Chapter Four, intercorrelations between all these
variables with each other were high, in the range of .70 to .89 in 2001-02, with the exception of the percentage of faculty and administrators with an M.A. or Ph.D., which had correlations with the other variables between .43 and .62. Accordingly, the correlations between each of these variables and RET cannot be viewed as independent relationships.

Also, because of the ambiguity surrounding the cause of the change in 2001-02 RET data compared to other years, findings that occurred in both 2000-01 and 2001-02 will be the major focus of the analysis. Where intriguing trends occur in 2001-02, however, these will be commented on but will not be considered as credible as trends that showed up in both years. AP enrollment per 100 11th and 12th graders is the variable that will be discussed first because it has the strongest relationship with RET.

**AP Enrollment per 100 11th and 12th Graders**

This is the one variable that had a correlation with rate of exam taking in both years that was not negligible. The correlation was low and the direction negative, indicating that as the number of AP enrollments per 100 11th and 12th grade student increased, rate of exam taking decreased. This finding is consistent with the findings that in both 2000-01 and 2001-02, the median AP enrollment per 100 11th and 12th graders (subsequently referred to as AP enrollment) was substantially lower (.41 and .47 SD, respectively) for the high RET group than for the medium and low groups. In 2001-02, the median AP enrollment of the medium RET group was also lower, by .20 standard deviations, than the median AP enrollment of the low RET group.

What might explain this result? One possibility was suggested by a New Jersey principal interviewed in Kladko's 2002 news article who suggested that if students were
taking a large number of AP courses, they might not choose to take the exam in all of them. This hypothesis would fit the data patterns described, and is deserving of further investigation.

**Percentage of Graduates Going to Four-Year College**

There is no clear cut relationship between this variable and RET in 2000-01. In 2001-02, there was a very low negative correlation along with a small trend for schools in higher RET groups to have lower median percentages of graduates going to four-year colleges. The magnitude of this finding was small and it was not corroborated by 2000-01 data, but the fact that there is any trend at all in this direction, rather than in the opposite direction, is interesting, as one might expect students who are going on to four-year colleges to be higher-achieving students than those not going on to four-year colleges, and that they would therefore be more confident of their AP exam performance.

A possible explanation for the observed, somewhat counterintuitive, trend could be that students who are aspiring to attend four-year colleges perceive that they do not need to take the AP exam to gain an admissions advantage. This perception would be supported by the policy of the University of California, which awards an extra point for AP courses regardless of whether students take the AP exam (Hebel, 1999) and by the surveys of admissions officials conducted by Dillon (1986), Hershey (1990), and the National Research Council (2002). Indeed, Hershey (1990), the college counselor at a private preparatory school, went so far as to suggest that low AP exam scores might hurt a student.

In discussing whether schools should record all AP exam grades on students’ transcripts, she noted that “From a college counseling point of view, it is clearly to
students’ advantage to indicate the scores when they are 4s or 5s and probably not a
detriment when they are 3s. Failure to show 1s and 2s may help a given student” (Hershey, 1990, p.10). If other college counselors and students share the perception that
exam grades lower than 3 may hurt a student’s admissions prospects, it would be to the
advantage of students aspiring to competitive colleges not to take the AP exam unless
they anticipated a grade of 4 or 5. This is one possible explanation of the finding reported
herein that schools with lower rates of exam taking tended to have somewhat higher
percentages of students going on to four-year colleges.

*Sum of SAT Verbal and Math.*

There was a very weak negative correlation between SAT Verbal plus Math
scores and rate of exam taking in both 2000-01 and 2001-02. When comparisons between
the median scores of the high, medium, and low RET groups were made, however, a
moderately large difference in median scores of the high group compared to the medium
and low groups was present in both 2000-01 and 2001-02 (.27 standard deviations and
.39 standard deviations, respectively), with little to no difference seen between medium
and low RET groups. In both years, the schools in the high RET group had lower median
SAT scores than schools in the medium and low RET groups.

Like the percentage of graduates going to four-year colleges, this inverse
relationship between SAT scores and rate of exam taking is somewhat counterintuitive.
Research reported earlier on AP performance data has generally revealed high AP
performance (as measured by AP exam grades) to be associated with high achievement
on the SAT or PSAT. In a report on AP in Texas, the percentage of students scoring at or
above 1110 on the SAT or 24 on the ACT was positively associated with AP
performance (TEA, 2002), and for a national sample of students, correlations between some PSAT measure (Verbal, Math, or a combination) and AP exam score was .50 or higher for 17 of 29 exams looked at (Camara & Millsap, 1998). These measures provide research evidence supporting the intuitive supposition that students with high academic ability/achievement tend to do better on AP exams.

Therefore, if students tend to avoid taking the AP exam because they feel they are not likely to do well, a reason proffered by some students interviewed by Casserly (1986), then one might hypothesize that schools in which students have higher SAT scores would be those schools in which more students would feel confident enough to take the AP exam. However, the findings from this study reveal an opposite trend. A possible explanation might be found in a connection to the trends for AP enrollment per 11th and 12th graders and the percentages of graduates going on to four-year colleges discussed above. Specifically, if students with high SAT scores tend to be those taking many AP courses and tending to go on to four-year colleges (a supposition supported by the high intercorrelations between these three variables), then the factors discussed that would tend to discourage such students from taking AP exams could account for the finding that schools with medium and low RETs had higher average SAT scores than schools with high RETs.

Percentage of 11th Graders Scoring Advanced on the HSPA Math and Language Arts Tests

The HSPA was not given in 2000-01, so the 2001-02 results must stand on their own. The findings for the HSPA Math and Language Arts Sections are quite similar; there were low negative correlations between each and rate of exam taking and lower
average scores for schools with high RETs than for schools with low and medium RETs. This pattern, like the others so far discussed, is somewhat surprising. Taken together, the finding that schools with low and medium rates of exam taking had higher SAT scores and percentages of 11th graders scoring Advanced on both sections of the HSPA suggest that academic ability of students may not be the most significant factor determining whether or not students elect to take the AP exam. Rather, the data so far presented suggest that other factors, possibly including such things as the number of AP courses a student is taking and the perceived college admissions benefits of taking AP exams, may play at least as important a role in students’ exam decisions.

*Percentage of Faculty and Administrators with an M.A. or Ph.D.*

In 2000-01, the correlation between RET and this variable was very low and was positive. Similarly, the only difference between the mediants of high, medium, and low RET groups was a difference of .15 standard deviations between medium and low groups (medium greater than low). By contrast, in 2001-02, the correlation was also low, but was negative, and was accompanied by a small but consistent trend for the average percentage of faculty with an M.A. or Ph.D. to decrease as one moved from high to low RET groups. Because the patterns in the two years were inconsistent and the trends small in both cases, no real conclusion can be drawn about the relationship between this variable and RET.

*Summary of findings on the six school-level variables.*

The correlational analyses reveal that the most convincing relationship was a small inverse one between AP enrollment per 100 11th and 12th graders and rate of exam taking. There was also a very small inverse relationship between all three measures of academic achievement/ability (the SAT Verbal + Math and both sections of the HSPA)
Rate of Exam Taking - 252

and RET. For all four of these variables, when median values of the variable for the high, medium, and low RET groups were compared, the main difference found was between the high and medium group, and was fairly substantial, ranging from .33 to 47 standard deviations. While the relationship between the percentage of graduates going on to four-year college and RET grouping was not clear in 2000-01, in 2001-02 the trend was in the direction of schools with higher rates of exam taking having lower percentages of students going on to four-year colleges. While not corroborated by 2000-01 findings, this trend was compatible with the other findings, suggesting that schools with high rates of exam taking tended to be those that had students who were taking fewer AP courses on average, had lower academic ability/achievement, and lower academic aspirations.

These are very preliminary findings, and caution must be exercised not to infer too much from them before they have been duplicated by other researchers, preferably using data that is free from potential artifact problems. However, the findings do provide food for thought. Miller’s qualitative case study of an affluent high school and a low-income high school in the same city pointed to low academic achievement/ability of the students in the low-income school as contributing to low teacher expectations and decreased rigor of course work (Miller, 1994). Similarly, a news article from the Los Angeles Times described AP courses at one inner city high school in which students had poor academic skills and were unprepared for the rigor of the course (Banks, 2002).

Anecdotal reports such as these regarding lower AP course rigor and student performance in disadvantaged schools are discouraging, but unhappily, they are not surprising. What is surprising is when schools with high-achieving students have low rates of exam taking. The most likely explanation for that scenario is that such students

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are not taking the AP exam either because they do not believe the exam will help them or because they believe it might actually hurt them. In fact, as noted above, information from three surveys of college admissions officers indicated that in general, students who opted not to take an AP exam were not disadvantaged in the admissions process (Dillon, 1986; Hershey, 1990; NRC, 2002) and it has been hypothesized that they might even be advantaged by skipping the exam instead of taking it and earning a low score. If students who are aspiring to attend competitive colleges believe this, then it would stand to reason that such students would take only those exams in which they expected to do well. On the other hand, if college admissions pressure were the main cause of the findings, then one might expect to see a stronger relationship between rate of exam taking and the percentage of students going to four-year college than was found in this study.

An alternative, though not mutually exclusive, hypothesis is that by providing the opportunity for low-income students to take the AP exam for free, New Jersey has eliminated the potential negative link between socioeconomic status of students and exam taking. Another factor that this study suggests may contribute to the observed trend for New Jersey schools with higher rates of exam taking to be those with relatively lower income and lower-performing students is the exam-requirement policies of those schools. This is examined in the next Research Question.

Research Questions 4A and 4B

A. What are the characteristics of New Jersey public schools that require students enrolled in all (or almost all) AP courses to take the AP exam?

B. What percentage of New Jersey public schools that require students to take the AP exam pays the exam fee?
These questions made primary use of survey data and secondary use of school-level variables from the SRC data. Therefore the only variables that would have been affected by the possible data artifact problem in this question are AP enrollment per 100 11th and 12th graders, as that variable utilized AP enrollment data as the denominator of the ratio, and the variable of RET itself. If the data artifact problem had been present, this might have led to a decrease in recorded AP enrollment for some schools and, as noted earlier, an artificially high percentage of 100% RET schools. Apart from those variables, this research question should not have been affected by the possibility that the AP enrollment field was preloaded with AP exam data for the first time in 2001-02.

Because the results to Questions 4A and 4B suggest that exam requirement and exam fee policies are closely linked, these two questions are considered together. The first part of this analysis revealed that 30.5% of the 256 schools that responded to the survey required students to take the exam in all (or almost all) courses. Because the survey question was structured to parallel somewhat the question asked by the College Board on its annual fall Participation Survey, a comparison between the national responses to the College Board question and the New Jersey responses to the question in this study can be made. When asked by the College Board, “Are students enrolled in an AP course (or its equivalent, e.g. honors) required to take the AP exam?” 27.2% of responding schools answered “Yes, for all courses (or their equivalent)” in 2001-02, and 9.1% answered “Yes, for most AP courses (or their equivalent),” bringing the total percentage of schools that required students to take the exam in all or most courses to 36.3% (2001-02 AP Participation Survey Data, R. Morgan, personal communication, June 26, 2003).
According to the survey data from this study, New Jersey had a slightly lower percentage of schools requiring AP-enrolled students to take the AP exam in all (or almost all) courses (30.5%), but the percentages are fairly close, indicating that New Jersey, in this respect, is not very different from the nation. (Of note, the College Board survey was sent in the fall of 2001, whereas this survey was sent in May of 2003, so some difference could be due to difference in the timing of the surveys.)

Next, the relationship of a school's exam requirement policy to its District Factor Group was investigated by determining the percentage of schools in each DFG that required students to take the AP exam. The graph of this relationship (Figure 8) shows an overall trend of decreasing percentages of exam-requiring schools as the socioeconomic status of schools increases. At the extremes of the District Factor Grouping categories, 59.1% of schools in the lowest DFG (A) required AP students to take the exam in 2002-03 compared to 12.5% and 17.5% in the three highest DFGs (GH and I + J).

What are the possible explanations for this phenomenon? One factor that needs to be considered is that beginning in 2002-03, the year in which schools were asked to identify their exam requirement policy, New Jersey began an Advanced Placement Expansion Program, which allocated Advanced Placement planning and teacher training funds to 44 high need districts. These districts “included all districts with Abbott or special needs designations, and districts in which 40 percent or more of the students have family incomes that meet income criteria for free or reduced price meals” (NJDOE, 2002, p.2). (Abbott districts are those districts, generally in the A and B District Factor Groups, that were plaintiffs in a court case involving inequities in school funding [R. Higgins, personal communication, February 10, 2003]).
While this program does not directly impact the exam-requirement or exam fee-payment policies of schools in participating districts, each participating district was required to develop a "state-approved advanced placement plan" (NJDOE, 2002, p.1) to receive teacher training funds. Therefore, it is possible that by virtue of developing such a plan, schools turned their attention to exam-requirement or fee-payment policies, which might have contributed to the findings of higher percentages of such policies among schools in District Factor Group A. However, the AP Expansion Plan could not explain the parallel findings in the earlier part of this study of a large percentage of high RET schools in DFG A in both 2000-01 and 2001-02, since the program did not go into effect until 2002-03.

A second factor that may help to explain the pattern of larger percentages of exam-requiring schools in lower socioeconomic status districts compared to higher socioeconomic status is the linkage found between the exam-requirement policies of schools to exam fee-payment policies. It was found that overall, 23.4% of the 256 schools that responded to the survey paid the exam fee for all students. Among this group of 60 schools that paid the fee, 49 schools (81.67%) also required students to take the exam. Looked at the other way, it was found that of the 78 schools that required the exam, 49 schools (62.82%) paid the exam fee for all students. Another 13 schools (or their districts) in the exam-requirement group paid some portion of the fee for some or all students, bringing the total percentage of exam-requiring schools that had some fee-payment policy to 79.5%. This linkage between exam-requirement and fee-payment policies may be due to concerns about the fairness or even legality of requiring students to take the exam without paying the fee. Such concerns were noted to have been voiced
by school officials in the news article about low rates of AP exam taking in Northern New Jersey (Kladko, 2000) as well as by two respondents to the survey in the current study, who commented that they hesitated to require the AP exam without paying the fee.

Further evidence of a linkage between the exam requirement and exam fee policies is found in the graph showing the percentages of schools that paid the exam fee by DFG. This graph (Figure 9) shows an even stronger relationship between DFG and exam-fee policies than was seen for the exam requirement; a clear-cut decrease in percentages of schools paying the fee as socioeconomic status of the schools increases. At the extremes, 68.2% of Group A schools paid the fee, compared to 10% and 3.5% of schools in Groups GH and I+J.

In conclusion, there appears to be a strong linkage between schools’ fee-payment and exam-requirement policies. One possible explanation of such a relationship is that schools in low-income districts may be more likely to pay the exam fees than schools in more affluent districts for the obvious reason that there is a greater need to pay the fee for students. Then, once schools have decided to pay the fee, they may feel entitled to require students to take the exam. The fact that 81.7% of schools that paid the exam fee required students in all (or almost all) AP courses to take the AP exam lends credence to this possibility.

Returning to the remainder of the analysis on the exam requirement, an investigation of the relationship between schools’ exam requirement policy and the six other school-level variables was undertaken. The summary of findings presented in Chapter Four as Table 26 is reprinted here.
Table 26.

Summary of Relationship Between Schools' Exam-Requirement Policy and Six School-Level Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Comparison of Medians Across Exam Requirement Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP Enroll/100 11th &amp; 12th graders</td>
<td>NR &gt; R (.37 SD)</td>
</tr>
<tr>
<td>% Graduates to 4 year college</td>
<td>NR &gt; R (.28 SD)</td>
</tr>
<tr>
<td>SAT V + M</td>
<td>NR &gt; R (.41 SD)</td>
</tr>
<tr>
<td>% 11th graders scoring Advanced HSPA Math</td>
<td>NR &gt; R (.51 SD)</td>
</tr>
<tr>
<td>% 11th graders scoring Advanced HSPA L.A.</td>
<td>NR &gt; R (.43 SD)</td>
</tr>
<tr>
<td>% Faculty/Admin. with M.A./Ph.D.</td>
<td>NR &gt; R (.11 SD)</td>
</tr>
</tbody>
</table>

Note: NR = non-requirement group, R = requirement group.

Table 26 shows a very clear pattern. In the case of all variables, the median of the non-requirement group was higher than that of the requirement group, although this difference was very small for the percentage of faculty and administrators with an M.A. or Ph.D. These results indicate that schools that did not require students to take the AP exam tended to have higher median AP enrollments per 100 11th and 12th grade students, higher SAT scores, higher percentages of students scoring Advanced on the HSPA Math and Language Arts sections, and higher percentages of students going to four-year colleges than schools that did require students to take the AP exam.
The extent to which these findings are due to the tendency for exam-requirement schools to be those in lower socioeconomic status districts cannot be assessed by the data that has been presented, but must be considered a likely contributory factor. Previous discussions raised possible reasons why the group of high RET schools had lower median AP enrollments per 11th and 12th grader, SAT scores, and percentages of 11th graders scoring Advanced on the Math and Language Arts HSPA than medium and low RET schools. These reasons were based on speculations regarding students’ choices about whether to take the exam. However, the corollary findings that the same pattern appeared for exam-requiring schools compared to non-requiring schools suggest that high rates of exam taking in lower-achieving schools may also be due, in substantial part, to exam requirements.

Comments on Exam Requirement and Exam Fee Questions

The last portions of both the exam requirement and exam fee questions were a compilation of comments offered by respondents either as alternative policies to the choices provided or as extra comments. For the exam requirement question, 38 schools provided comments, of which the three most common ones involved school incentives or attitudes that would tend to foster exam taking without requiring it in all cases. These responses were that students are encouraged or “highly encouraged” to take the AP exam (10 schools), that students who take the AP exam are (or may be in certain circumstances) exempted from the course final (9 schools), and that students in certain courses must take the AP exam (5 schools). Two respondents noted a disincentive for students to take the exam, namely that they could get dual enrollment credit without taking the AP exam. These comments suggest that apart from requiring all students in AP
courses to take the AP exam, a number of schools have policies that promote exam taking.

Comments on the exam fee were more numerous, with a total of 57 schools providing comment. The most frequent responses were that the school or district paid a portion of the exam fee (22 schools) or paid the exam fee for needy students (17 schools). Some schools paid the exam fee if students met certain requirements, which included attaining a certain AP exam grade (8 schools), being enrolled in an AP course (3 schools), attaining a certain grade in the course (3 schools), or “attending required tutoring sessions” (1).

These comments reflect many approaches to the exam fee as well as evidence that many schools pay at least a portion of the fee or pay the fee for needy students. Thus, in addition to having an AP Incentive Plan, New Jersey appears to have many high school and district officials committed to at least defraying exam costs for students.

Research Question 5

How does the assessment of an AP course based on the percentage of AP test-takers who achieve an exam grade of 3 or better compare to the assessment of the same course based on the percentage of AP-enrolled students who achieve an exam grade of 3 or better?

The two indexes described in Research Question 5 were calculated for all the AP English Literature and Composition courses in 268 schools in which the number of recorded exam scores was greater than 0. The Pearson correlation coefficient between these two indexes for the same courses was found to be .76.
A second analysis was performed to illustrate how much these two indexes can differ from each other within the same course. All 43 courses in which 100% of test-takers had earned exam grades of 3 through 5 were identified. Then, the range of values for the second index, percentage of AP-enrolled students who earned exam grades of 3 through 5, was examined for this group of courses. For 18 courses, the percentage of enrollees earning exam grades of 3 through 5 was 100%, but for the other 25 courses, the percentage ranged from 18% to 96%. These analyses reveal that among a group of AP courses that appeared equivalent in terms of course quality using the metric of the percentage of AP test-takers who earned exam grades of 3 or better, there was wide variation with respect to the percentage of AP enrollees who earned exam grades of 3 or better.

Conclusions

Thus far, a great deal of descriptive data has been provided and commented upon. The following section will attempt to tie together some of these findings and to address four major themes that emerge from the data. Before doing so, however, the impact of the problem of the preloading of the AP enrollment field with AP exam data on the credibility of the findings must be addressed for the last time. As noted earlier, this study assumes that the AP enrollment field was preloaded with AP enrollment data in 2001-02, based on information provided by an SRC employee (SRC employee, personal communication, June 18, 2003). The question is whether this happened for the first time that year.
Implications of the Possible Data Artifact on Study Findings

If the AP enrollment field had been preloaded with exam data for the past several years, then it seems likely that the percentage of 100% RET schools, as well as the overall statewide RET, would be somewhat inflated in all affected years. Further, differences between high, medium, and low RET groups on the school-level variables might have been blunted if schools that were mistakenly recorded as 100% RET schools were a random group of schools with respect to the school-level variables studied, a situation that seems likely to this investigator. If schools mistakenly recorded as 100% RET were not randomly selected with respect to a particular school-level variable, however, it is possible that differences between groups could have been increased rather than blunted.

On the other hand, if the AP enrollment field was preloaded with exam data for the first time in 2001-02, a situation that would be compatible with the findings of this study, then the number of 100% RET schools and the overall RET for the state might have been artificially increased in 2001-02, but data for previous years would not have been affected. In this case, trend data comparing 2001-02 to previous years would be inaccurate to the extent that 2001-02 schools were mistakenly recorded as 100% RET schools, and 2001-02 differences between high, medium, and low RET groups of schools on the school level variables might have been affected as described in the preceding paragraph.

In summary, the potential data artifact problem renders any conclusion derived from the analysis of Research Questions 1 through 3 tentative and in need of corroboration by independent data. However, it is important to note that the findings from
Research Question 4 are largely unaffected by the potential data artifact problem because the data are comprised of survey data and school level variables that would not have been affected by preloading of the AP enrollment field with exam data (with the exception of AP enrollment data per 100 11th and 12th graders and the RET data used to assess the linkage between exam requirement and RET of schools). Research Question 4 findings are therefore the most credible of the study. With respect to Research Question 5, it seems likely to this investigator that the preloading of the enrollment field with exam data in 2001-02, whether or not it occurred in previous years, would tend to make the difference between the two indexes for the group of courses examined appear smaller than it actually was since courses recorded as having 100% RET would necessarily have had the same value for both indexes.

Bearing the limitations of the data in mind, it is time to proceed to a discussion of the four major themes that emerged from the analysis of it. The first concerns the characteristics of schools with high rates of exam taking.

Characteristics of Schools with High Rates of Exam Taking

The first finding regarding schools with high rates of exam taking is that in both 2000-01 and 2001-02, the lowest socioeconomic status DFG had a substantially higher percentage of schools in the high RET group than did the three highest DFGs. Second, schools in the high RET group tended to have students who were taking fewer AP courses per 11th and 12th grader and had lower SAT scores than students in middle and low RET schools in both years. High RET schools also had a lower percentage of students scoring Advanced in the 11th grade HSPA Math and Language Arts sections in 2001-02 (the only year it was given).
Taken together, these findings are somewhat surprising. If the exam fee did not present a barrier to low-income students (seemingly true to a large extent in New Jersey because of the AP Incentive Program) and if an AP exam score of 3, for example, had had the same significance to all students, then one would have expected higher-achieving students to be more likely to take AP exams, as they would have been more likely to expect high exam grades. However, a few factors that might have moderated this simplistic assumption have been suggested by this study.

First, students who are taking a large number of AP courses may be less likely to take the exam in *every* course, which would be consistent with the finding that schools in the high RET group had fewer AP enrollments per 11th and 12th grader than medium and high RET schools. Second, high-achieving students aspiring to be admitted to competitive colleges might be less inclined to take the AP exam in every course because a grade below 4 might actually decrease their admissions prospects more than skipping the exam (Hershey, 1990), and because the most competitive schools often require an exam grade of 4 or 5 to award course credit (Lichten, 2000).

The supposition that college admissions considerations might have contributed to lower rates of exam taking among higher-achieving students, however, was not corroborated very strongly by the analysis of the percentage of graduates to four-year colleges within high, medium, and low RET groups. In 2000-01 the high RET group had a lower median percentage than the medium RET group, but the medium group percentage was higher than that of the low RET group. In 2001-02, there was a consistent trend for schools in the high RET group to have a lower median percentage than the medium RET group, which in turn had a lower percentage than the low RET
group, but differences between groups were relatively small (.26 standard deviations between high and medium groups and .16 between medium and low groups).

This data is compatible with (though falls far short of proving) a hypothesis that students applying to more competitive colleges (i.e. four-year colleges) are less likely to take every AP exam than students applying to less competitive colleges. However, if students in high-performing schools were choosing not to take AP exams primarily because of a perception that such a decision would net them a college admissions advantage, one might have expected to see a stronger relationship between this variable and rate of exam taking than was actually found. Alternatively, it may be that the percentage of students going to four-year college is not a sufficiently sensitive measure to gauge the extent to which students are applying to competitive colleges, which is the true construct intended to be measured.

The above rationales focus on how students' exam choices might explain the RET findings, but a second major theme that emerged from this study suggests that higher rates of exam taking in the lowest socioeconomic districts, along with the lower academic ability/achievement observed among schools in the high RET group compared to the medium and low groups, may have been due in substantial measure to school policies that require AP-enrolled students to take the AP exam. The following section examines this supposition.

Linkage Between Exam Requirement and Rate of Exam Taking

Findings from survey data revealed that a substantially higher percentage of schools in the lowest socioeconomic status District Factor Group required AP-enrolled students to take the AP exam in 2002-03 (59.1%) than schools in the three highest
District Factor Groups, GH and I + J (12.5 and 17.5%, respectively), while intermediate
DFGs had percentages of exam-requiring schools between these two extremes. A
possible linkage between these exam-requirement findings from 2002-03 and the patterns
of rate of exam taking in 2000-01 and 2001-02 is suggested by a comparison of the
percentages of schools within each DFG that required exam taking with the percentages
of schools in each DFG that were in the high RET group. Figures 6 and 8 are herein
reproduced side by side for comparison (see Figure 9 below).
Figure 9. Comparison of percentages of schools that required the AP exam in 2002-03 within DFGs (top) to percentages of schools in three RET groups within DFGs in 2000-01 (middle) and 2001-02 (bottom).
A comparison of the top two graphs shows a close concordance between the percentages of schools in each DFG that required the AP exam in 2002-03 to the percentages of schools in each DFG that were in the high rate of exam-taking group (90-100% RET) in 2000-01. The parallelism of these graphs suggests the possibility that the exam-requirement policy of schools in 2002-03 was in effect in 2000-01 and that the policy may have been responsible, at least in part, for the high percentage of schools in the high RET group in each DFG that year. In order to examine the likelihood of this hypothesis, an analysis was performed to determine what percentage of 2000-01 schools in the high RET group had an exam requirement policy in 2002-03. This percentage was found to be 73%, suggesting that exam-requirement policies (if consistent over the two years) made a fair sizeable contribution to high rates of exam taking. Looked at another way, among schools that required students to take the exam in 2002-03, 69% were found to be in the high RET category in 2001-02, again suggesting that exam requirement policies (if consistent across the years) may have contributed to causing high rates of exam taking.

The graph of the percentages of schools in the high RET group within each DFG in 2001-02, however, does not match up as well with the percentages of schools requiring students to take the exam in 2002-03. One possible explanation for this would be that exam requirement policies were the same for the majority of schools in 2000-01 and 2002-03 but different between 2001-02 and 2002-03. While possible, this seems somewhat unlikely. A more plausible explanation would be that preloading of the AP enrollment field with AP exam data for the first time in 2001-02 caused a random group of schools to mistakenly report 100% RET in that year, thereby altering the graph of the
The rate of exam taking in 2001-02 appears somewhat stronger when one examines a different linkage that would not have been biased by the potential preloading of the AP enrollment field with AP exam data. Specifically, the percentage of exam-requiring schools in 2002-03 that were in the high RET group in 2001-02 was an impressive 83%.

The unresolved question of whether preloading of the AP enrollment field with AP exam data occurred for the first time in 2001-02 makes a definitive interpretation of the foregoing findings impossible. However, the similarity between the graphs of the percentages of schools in the high RET group within each DFG in 2000-01 and the percentages of schools that required students to take the AP exam in 2002-03 suggest a potentially strong relationship between these findings that is deserving of further investigation. A third major theme to emerge from the study involved the characteristics of schools that required AP-enrolled students to take the AP exam.

Characteristics of Schools that Required AP-Enrolled Students to take the AP exam

Schools that required students to take the AP exam in all (or almost all) courses had lower median AP enrollments per 100 11th and 12th grade students, SAT scores, percentages of students scoring Advanced on the HSPA Math and Language Arts sections, and percentages of students going to four-year colleges (with differences between the groups ranging from .28 to .51 standard deviations). A smaller difference
(.11 standard deviations) in the same direction was also noted between groups with respect to the percentage of faculty and administrators with an M.A. or Ph.D., with schools that required the AP exam having lower median percentages. A possible explanation for this constellation of findings resides in the strong linkage found between exam-requirement and exam fee payment policies of schools, which is the fourth major theme to emerge from the data.

**Linkage Between Exam-Requirement and Exam Fee-Payment Policies of Schools**

The first piece of evidence suggesting such a linkage is the parallelism between the graph showing the percentages of schools within each DFG that required students to take the AP exam (Figure 8) and the graph showing the percentages of schools that paid the exam fee (Figure 9). Examining this relationship more directly, it was found that among schools that paid the exam fee, 81.67% also required students to take the exam, a finding that suggests that a school's decision to pay the exam fee may drive its exam-requirement policy.

The linkage between exam fee-payment and exam-requirement policies was also demonstrated in a different way. It was found that among schools that required students in all (or almost all) AP courses to take the exam, 62.82% paid the fee for all students. Another 13 schools that required the exam paid some portion of the fee for some or all students, bringing the total percentage of exam-requiring schools that had a fee payment policy of some sort to 79.5%. This suggests that when schools decide to require students to take the AP exam, most also pay some or all of the exam fee.
Implications for Research

The first and most important conclusion stemming from this study is that there is a distinct need for more and better data on exam taking. As noted earlier, despite the problems noted with the New Jersey SRC data collection methodology, it is an exceptionally comprehensive data source, providing AP enrollment and exam data for every AP subject taken in every high school. The potential pitfalls of preloading the AP enrollment field with exam data for the same subject have been exhaustively discussed previously, but if this shortcoming were corrected, the New Jersey SRC could serve as a model for statewide AP exam collection data that other states would be wise to emulate. Simply recording the participation and performance rates of high schools, or of states, provides no accounting of the number of students who took AP courses and did not attempt the exam. As Research Question 5 demonstrates, leaving out such information results in a situation where courses (and by extension high schools and states) with very different exam-taking situations may have identical participation (number of students taking AP exams) and performance (percentage of test-takers earning qualifying scores) profiles.

Further research studies suggested by the current investigation include the following. The finding that schools in the lowest socioeconomic DFG had the highest mean RET in both 2000-01 and 2001-02 was contrary to 2000-01 Connecticut data in which the schools in the highest Education Reference Groups had the highest rates of exam taking (Sergi, 2002). It was suggested previously that New Jersey’s policy of paying the entire exam fee for low-income students compared to the fee subsidy program alluded to in the Connecticut report could contribute to this difference, but such a
suggestion is highly speculative. Further research to examine how the relationship of schools' rate of exam taking to their socioeconomic status varies as a result of state-level fee payment and other policies would be most interesting. A study by Felker, subsidized by the College Board, has been undertaken to assess the impact of state and federal exam fee subsidies and other AP programs on AP participation and performance, particularly for low-income and minority students (Felker, not yet published), and such studies should be extended to examine rates of exam taking as well.

Other quantitative studies that could lend corroboration to the findings and tentative hypotheses suggested herein would consist of comparing rates of exam taking across groups of students matched for all relevant variables except the variable of interest (with no students being required to take the exam). For example, to assess whether applying to a competitive college tends to decrease rates of exam taking, a group of students applying to the most competitive colleges could be compared to a group applying to somewhat less competitive colleges, with student ability, socioeconomic status and quality of school, course, and teacher held constant.

Similarly, to determine whether requiring all students to take the AP exam leads to lowered performance data for schools by virtue of forced inclusion of students who might not have chosen to take the exam, the following study could be performed. Two groups of courses, one in which students are required to take the AP exam and one in which they are not, could be matched for variables relevant to exam performance (e.g. socioeconomic status of school and students, teacher experience and education, student ability/achievement). A comparison of the average exam grade or percentage of test-takers achieving qualifying grades would then allow for a conclusion as to whether
requiring all students in an AP course to take the exam results in lower average class
performance on the exam, all other factors being equal.

In addition to quantitative studies, qualitative studies could substantially augment
our understanding of the exam-taking phenomenon. Specifically, the following case
studies would be illustrative. One study could look at schools with high rates of exam
taking in the absence of an exam requirement to determine what incentives are
particularly powerful in inducing exam taking. Another might examine schools that
require students to take the AP exam but do not pay the exam fee, and a third could study
high achieving schools with particularly low rates of exam taking. Interviews with school
administrators, teachers, students, and parents could provide a wealth of data on the
questions surrounding what motivates students to take exams and what motivates school
administrators to adopt the AP policies that they do.

The foregoing represents just a small smattering of the potential research studies
that could be performed surrounding the issue of exam taking. Returning to an earlier
metaphor, the topic remains a vast unexplored territory in which almost any exploration
would produce useful information.

Implications for Practice

This study has implications for practice for several groups. For policy-makers at
the New Jersey Department of Education, the following suggestions are offered. First, the
data collection software should be corrected so that the AP enrollment field is not
preloaded with AP exam data. Next, the fact that schools in low socioeconomic DFGs
were substantially more likely to require students to take the AP exam than schools in
high socioeconomic DFGs should be considered carefully. If, as suggested by the data,
exam requirement by low-income schools is at least in part a consequence of schools in low-income districts being more likely to pay the exam fee for all students, then the question must be raised as to whether exam requirement is a desirable consequence for students.

While it would be advantageous to the AP Program if all students took the AP exam, the information presented herein regarding the attitudes of college admissions officers at selective colleges (Dillon, 1986; Hershey, 1990; NRC, 2002) suggest that it is not necessarily advantageous to an individual student to take every exam. From a completely selfish point of view, a student who is applying to competitive colleges is probably best served by taking only those AP exams in which he expects to do well enough to earn a high grade. Thus, ironically, schools in low-income districts that require students to take the AP exam may be disadvantaging those students with respect to selective college admissions. Policy-makers at the state level should seriously contemplate this issue, and consider issuing recommendations to low-income schools that exam requirement should not be the inevitable result of the school paying the exam fee. The fact that students cannot afford to pay the exam fee themselves should not necessarily restrict their ability to act in their own academic best interest.

If the state policy-makers decide that high rates of AP exam taking are desirable, a position espoused by this author, then state policy should encourage schools at all income levels to attempt to achieve high rates of exam taking. New Jersey has already taken one important step in this direction simply by making rates of exam taking public for individual high schools, but it could go even further by providing recognition or other
rewards to schools with high rates of exam taking. State policy-makers are not the only stakeholders for whom this study has implications, however.

High school administrators also wield a great deal of influence on exam taking. Whether by crafting exam-requirement or fee-payment policies, by providing incentives or disincentives for exam taking, or by creating a culture in which exam taking is expected, it seems likely that high school principals and guidance counselors can have a significant impact on students' exam decisions. This study suggests the possibility that many schools adopt exam-requirement policies in conjunction with exam fee-payment policies, and as discussed above, the potential negative consequences of this policy for students must be assessed by high school administrators. The challenge at this level is to balance the positive aspects of required exam taking for the school, in the form of increased accountability and possibly higher course standards, with its negative aspects, in the form of potentially lowered performance data and restriction of students' freedom to act in their own best interest. There are no clear-cut answers to this conflict, but each high school should carefully evaluate its dimensions.

Finally, at the college level, the implications of this study seem clear. College admissions offices should not regard AP courses as standardized courses unless the majority of enrolled students have taken, and earned qualifying grades, on the AP exam. Similarly, admissions offices should not assume that every student who has taken an AP course has mastered the curriculum. In the interest of fairness, admissions offices should adopt and publicize a policy wherein formal admissions benefits are only awarded to students who have proven their mastery of the curriculum by having taken the AP exam and having earned a qualifying exam grade.
The conceptual framework of this dissertation was Gardner’s characterization of the conflict between equity and excellence (Gardner, 1984). With respect to the AP Program, ensuring equity and excellence has taken on many meanings. The Commission for the Future of the AP Program identified the central challenge of the AP Program as attempting to satisfy twin goals; increasing access to AP course work to groups of students who are currently underserved and maintaining the integrity of the Program. Further, a statement from the report of the Commission that “there is no true AP equity without AP quality” (CFAPP, 2001, p.5) highlights the idea that these two concepts are inextricably linked. If AP courses are not excellent, then making them available to more students only improves access to an illusion of excellence rather than to excellence itself.

The results of this study clearly demonstrate that in 2002-03, New Jersey public schools in low socioeconomic status districts were far more likely to pay the AP exam fee than were schools in more affluent districts. This fosters AP equity. On the other hand, schools in low socioeconomic status districts were also substantially more likely to require students to take the AP exam, and this may foster inequity. The potential threat to equity in New Jersey is exacerbated by the fact that the New Jersey schools that do require students to take the exam are schools with lower performing student bodies than the schools that do not require it. This situation adds a previously unexplored dimension to the tension inherent in striving to serve both equity and excellence in the AP Program and illustrates anew the tremendous challenge that AP policymakers at all levels face. Beyond that, it illustrates one of the most serious dangers facing the AP Program; that without compiling and analyzing data on rates of exam taking, issues such as this one may never even come to light.
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APPENDIX A

Communication with Survey Participants
May 14, 2003

Name of Principal
Principal Title
Name of High School
Address of High School

Dear Name of Principal,

I am writing to ask for a minute of your time to answer two questions about your school policies regarding Advanced Placement exam taking by students enrolled in AP courses.

I am a doctoral student in education at the College of William and Mary investigating which school factors influence the extent to which AP students take the AP exam. I have chosen New Jersey as my case study because of the extensive AP data available in your statewide School Report Card database, but two pieces of information that are critical to my research are not available through this source. As a result, I am surveying principals from a sample of New Jersey high schools.

In consideration of your busy schedule, I have limited the survey to two simple questions that you may answer yourself or ask your AP Coordinator or other staff member to answer. Please note that you are asked to identify the name of your high school on the survey so that the AP policies of your school can be linked to other school characteristics. However, I assure you that the information obtained from this survey will only be used to characterize groups of high schools with similar policies. The policies of individual high schools will not be revealed in my report.

Your cooperation would contribute valuable information relevant to high schools in New Jersey and nationally and would be greatly appreciated by me personally. A self-addressed, stamped envelope is included for your convenience. Moreover, if you are interested in learning the results of the survey, simply write your e-mail address in the space provided and I will send you a brief summary. This project was approved by the College of William and Mary Protection of Human Subjects Committee (Phone: 757-221-3901) on May 14, 2003 and expires on May 14, 2004. If you have any questions, please do not hesitate to contact me by phone or e-mail. Thank you in advance for your cooperation.

Sincerely,

Ellen Fithian
6 Island Court
Poquoson, Virginia 23662
(757)-868-4645
ecfith@widomaker.com
Advanced Placement High School Questionnaire

Name of High School _________________________________________________________

Position of Person Completing Survey:
    Principal
    ______AP Coordinator
    ______Guidance Counselor
    ______Other (please specify) _____________________________________________

1. The New Jersey Department of Education (in conjunction with the College Board and New Jersey high schools) pays the Advanced Placement exam fees of low-income students. Apart from this program, some high schools (or districts) pay the AP exam fees for all students. What is the policy of your high school with respect to payment of the AP exam fee for students enrolled in AP courses?

    ______The school (or district) pays the exam fee for all students who take AP exams.
    ______The school (or district) does not pay the exam fee.
    ______Other (please specify your policy) ______________________________________

2. Some high schools have policies that require students enrolled in AP courses to take the AP examination. What is the policy at your high school?

    ______For all (or almost all) AP courses, students who take an AP course are required to take the AP exam
    ______For all (or almost all) AP courses, students who take an AP course are not required to take the AP exam
    ______Other _______________________________________________________________

If you would like to receive a brief synopsis of the survey results, please print your e-mail address here ________________________________________________________________

Thank you.
June 9, 2003

Principal Name  
Principal  
School Name  
School Address

Dear Principal Name,

On May 14th I sent a two-question survey about policies regarding Advanced Placement exam taking to you and other New Jersey high school principals. Many have already completed the survey and returned it to me. However, because a high response rate is very important to my research, I am sending this follow-up letter and copy of the survey to those I have not yet heard from.

As I mentioned in my first letter, I am a doctoral student at the College of William and Mary investigating which school factors influence the extent to which AP students take the AP exam. I know this is a busy time of year, but the survey consists of just two questions that should take no more than a minute or two for you or another staff member to answer. Please identify the name of your high school on the survey so that the AP policies of your school can be linked to other school characteristics, but rest assured that the information you provide will only be used to characterize groups of high schools with similar policies. The policies of individual schools will not be revealed.

Your participation would contribute valuable information relevant to high schools in New Jersey and nationally and would be very much appreciated. A self-addressed, stamped envelope is included for your convenience. Moreover, if you are interested in learning the results of the survey, simply write your e-mail address in the space provided and I will send you a brief summary. This project was approved by the College of William and Mary Protection of Human Subjects Committee (Phone: 757-221-3901) on May 14, 2003 and expires on May 14, 2004. If you have any questions, please do not hesitate to contact me by phone or e-mail. Thank you for your consideration of this matter.

Sincerely,

Ellen Fithian  
6 Island Court  
Poquoson, Virginia 23662  
(757)-868-4645  
ecfith@widomaker.com
Dear Principals, AP Coordinators, and other responders to my AP survey,

I would like to sincerely thank all of you who took the time to answer the questions on my dissertation survey about AP policies of New Jersey high schools. As promised, I am sending you a brief summary of the responses, which I hope will be of interest.

Summary of Survey Responses

Surveys were mailed to the 307 New Jersey public schools that had at least one AP enrollment in 2001-02. Of these schools, 256 responded, making the yield of the survey 83.4%. To refresh your memory, the survey consisted of two questions about school policies regarding paying the AP exam fee and requiring students to take the AP exam. Question 1 asked schools whether they pay the exam fee for all students who take AP exams (apart from the AP Incentive Program administered through the New Jersey Department of Education). The responses were:

**Responses of Schools to Question About AP Fee**

<table>
<thead>
<tr>
<th>Response</th>
<th>Number of Schools</th>
<th>Percent of Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>School pays the exam fee</td>
<td>60</td>
<td>23.4%</td>
</tr>
<tr>
<td>School does not pay the fee</td>
<td>153</td>
<td>59.8%</td>
</tr>
<tr>
<td>Other</td>
<td>41</td>
<td>16.0%</td>
</tr>
<tr>
<td>School had no AP courses in 2002-03</td>
<td>2</td>
<td>0.8%</td>
</tr>
</tbody>
</table>

Further information came from the comments of 57 schools. These were categorized as follows. (Of note, some schools provided comments that encompassed more than one category, so the responses total more than 58.)

**Comments on the AP Exam Fee Question**

<table>
<thead>
<tr>
<th>Category of Comments</th>
<th>Number of Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>The school or district pays a portion of the AP exam fee.</td>
<td>22</td>
</tr>
<tr>
<td>The school or district pays the exam fee for needy students.</td>
<td>17</td>
</tr>
<tr>
<td>Students are reimbursed if they attain a certain AP exam grade.</td>
<td>8</td>
</tr>
<tr>
<td>The exam fee is paid for students attaining a certain course grade or overall GPA.</td>
<td>3</td>
</tr>
<tr>
<td>The school pays the exam fee only for students enrolled in AP courses (i.e. not for independent study).</td>
<td>3</td>
</tr>
<tr>
<td>Miscellaneous comments</td>
<td>9</td>
</tr>
</tbody>
</table>

Question 2 was patterned after a question from the AP Participation Survey sent to AP coordinators each fall by the College Board. It asked whether for all (or almost all) AP courses, students in AP courses are required to take the exam. The responses follow.
### Responses of Schools to Survey Question About AP Requirement

<table>
<thead>
<tr>
<th>Response</th>
<th>Number of Schools</th>
<th>Percent of Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students required to take AP Exam</td>
<td>78</td>
<td>30.5%</td>
</tr>
<tr>
<td>Students not required to take AP Exam</td>
<td>157</td>
<td>61.3%</td>
</tr>
<tr>
<td>Other</td>
<td>18</td>
<td>7.0%</td>
</tr>
<tr>
<td>No Response</td>
<td>1</td>
<td>0.4%</td>
</tr>
<tr>
<td>School had no AP courses in 2002-03</td>
<td>2</td>
<td>0.8%</td>
</tr>
</tbody>
</table>

A total of 38 schools provided comments for this question, and they are categorized below.

### Comments on the AP Exam Requirement Question

<table>
<thead>
<tr>
<th>Category of Comments</th>
<th>Number of Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students are “expected,” “encouraged,” or “highly encouraged” to take the AP exam.</td>
<td>10</td>
</tr>
<tr>
<td>Students who take the AP exam are exempted from the course final. (In 3 schools, students had to meet some other requirement to be exempted, such as being a senior or having a certain course grade.)</td>
<td>9</td>
</tr>
<tr>
<td>Students in certain courses must take the AP exam.</td>
<td>5</td>
</tr>
<tr>
<td>The school hesitates to require exam taking without paying the fee.</td>
<td>2</td>
</tr>
<tr>
<td>Dual enrollment or college credit is an option for students who do not take the AP exam.</td>
<td>2</td>
</tr>
<tr>
<td>The instructor can require the exam.</td>
<td>1</td>
</tr>
<tr>
<td>Students are required to take all (or almost all) AP exams “with the recommendation of the teacher.”</td>
<td>1</td>
</tr>
<tr>
<td>Miscellaneous comments</td>
<td>11</td>
</tr>
</tbody>
</table>

Thank you again for your participation. It was most appreciated!

Sincerely,

Ellen Fithian
College of William and Mary
Williamsburg, Virginia
Construction of Spreadsheets for Data Analyses

Research Question 1

The complete New Jersey database for School Report Card Data (NJ-CSV-Files) used for this analysis consisted of a compressed .zip file in a comma separated variable format that was located on the New Jersey Department of Education Web site at http://nj.evalsoft.com/njDOE/data_maps4632.asp. Once downloaded, this database consisted of 57 separate spreadsheets, referred to as “data tables” or “data files” which contained different categories of information. For this study, data files were saved as Microsoft Excel spreadsheets, and preliminary data analysis, including the calculation of rates of exam taking for courses, high schools, and AP subjects, was performed by Excel functions. Some of the Excel spreadsheets (or specific subtotal pages of the spreadsheets) were also imported into SPSS 10.0 spreadsheets for other types of data analysis, such as generating frequency distributions, histograms, descriptive statistics, and crosstabulations.

All analyses in this question used the sc_ap.csv data table as the source table. This table contained a listing, by year, of the AP exams given in each New Jersey high school (with school identification consisting of a unique combination of three fields; county number, district number, and school number). The following information was provided for each exam subject in each high school; the name of the AP subject, the test year, the number of AP students enrolled in the corresponding course, the number of students who took the exam, and the frequency distribution of exam grades. Of note, however, when three or fewer students took the AP exam in a particular high school, exam scores were withheld to protect student confidentiality (NJDOE, 2003c).
This sc_ap.csv file was used to identify the AP high schools for each of the years examined in the study. For all years except 2001-02, it was the sole source of identifying AP high schools. For the 2001-02 year, which was intended to be the primary year of analysis, two additional searches for AP high schools were performed to ensure that all AP high schools had been found, and these searches located an additional four schools that had not been included in the sc_ap.csv file (see Methodology Chapter for more complete description of additional searches). These were added to the 2001-02 data files for all analyses involving Question 1 except where noted otherwise.

Calculation of RET of High Schools, 2000-01 and 2001-02

The sc_ap.csv file was saved as a Microsoft Excel spreadsheet and courses were sorted by test year. For the preliminary analysis of Question 1, all courses except those offered in 2001-02 were deleted. The courses in the four high schools identified by the extra searches for 2001-02 AP high schools were added manually to the spreadsheet. This resulted in the creation of a Microsoft Excel spreadsheet containing all AP courses offered in 2001-02 in all New Jersey schools (referred to herein as the All Courses 01-02 file). High schools are identified in all the School Report Card data files by a unique combination of three numbers; the county, district, and school number. These three numbers were located in three separate fields, so for the purpose of being able to sort schools for certain kinds of later data manipulation, a separate field was created which contained the concatenated county, district, and school numbers. Thus, for example, a school with the county, district, and school numbers of 2 - 35 - 50 would have a concatenated number of 23550. After concatenating the numbers, a check was made to ensure that every school had a unique concatenated number. (This was true for all years...
Schools were then sorted in ascending concatenated numbers. RET was calculated for all individual AP courses and for each high school (obtained by dividing the total AP exams taken in the school by AP enrollments times 100).

Since this study is concerned with the percentage of enrolled students who took AP exams, and not in the taking of AP exams in the absence of AP course-taking, AP exams in which there were no corresponding AP enrollment were deleted from the data file. In 2001-02, this resulted in the elimination of 182 exams in 43 courses. Similarly, when the number of AP exams exceeded the enrollment for a particular course, resulting in an exam-taking rate of greater than 100%, the number of AP exams was reduced to the number of enrollments so that no course had an exam-taking rate of more than 100%. This step involved the elimination of 259 exams in 12 courses. Thus, taken together, a total of 441 exams were eliminated in 2001-02, which represented just 1% of the 40,042 exams taken that year.

The same process was used to create a Microsoft Excel spreadsheet for 2000-01; this was titled All Courses 00-01. Finally, in order to generate frequency distributions and histograms of rates of exam taking, as well as other selected statistical tests, the subtotal page of the Microsoft Excel spreadsheet that listed RET for each high school was imported into an SPSS 10.0 spreadsheet for each year.

**Calculation of the RET for all AP Courses**

For this analysis, copies of the Microsoft Excel spreadsheets All Courses 00-01 and All Courses 01-02 were imported into SPSS 10.0 spreadsheets so that histograms and descriptive statistics of the distribution of rates of exam taking across all courses could be analyzed.
\textit{Calculation of the RET for AP Subjects}

Copies of the All Courses 00-01 and All Courses 01-02 were again used. These were sorted by AP subject, and rates of exam taking by subject were calculated. The subtotal page containing the rates of exam taking for each AP subject was then imported into an SPSS 10.0 spreadsheet for histogram analysis.

Research Question 2

\textit{Steps in Trend Analysis}

In order to ensure that the data analysis for each of the five years would be comparable, a series of steps was followed to construct the spreadsheets of AP schools and courses for each year. These steps are as follows. (Of note, for this analysis, only the AP schools found on the sc_ap.csv file for 2001-02 were used in order to make the data from that year comparable to the data from the other years, which also identified AP schools only from the sc_ap.csv file.)

Make a Microsoft Excel copy of the sc_ap.csv data file
Sort by test year
Delete courses not in test year, leaving header column intact
Record number of courses for the year on paper
Get sum of AP enrollments (Class) and AP exams (Take)
  \hspace{1em} Record these sums on paper
Create a column that calculates RET (rate of exam taking) for all courses (=Take/Class)
Record RET overall
Delete sum of AP enrollments, sum of exams, and overall RET
Sort by RET-descending
  \hspace{1em} For courses in which there were AP exams but no AP enrollment (#DIV/0):
  \hspace{2em} Record on paper the number of courses affected
  \hspace{2em} Sum the enrollments by inserting an extra row below the last such course and using sum function; record on paper and then delete sum
  \hspace{2em} Delete the courses
  \hspace{1em} For courses in which there were more AP exams than AP enrollments (RET>1.0):
  \hspace{2em} Record on paper the number of courses affected
  \hspace{2em} Insert extra row below last course
  \hspace{2em} Sum enrollments and exams
  \hspace{2em} Calculate exams - enrollments on spreadsheet: this is the number of excess AP exams
• Delete sums and number of excess AP exams from spreadsheet
• For each course, change the number of exams to = number enrollments
Determine and record the total number of AP exams deleted in above 2 steps
Calculate the total sum of enrollments and exams after above, calculate and record RET total (i.e. sum of AP exams/sum of AP enrollments)
Record the number of courses left after above.
Check to be sure that the number of AP exams left is less than the original number of exams by the total number of AP courses deleted
Delete the sum of enrollments and exams and total RET
Delete RET column
Resort by CO, then DIST, then SCH, all ascending
Insert column and header label for Concat column
Concatenate CODISTSCH
Subtotal (at each change in CONCAT, sum class and take)
Insert a new column and re-calculate RET
Save this as: All courses (year) for Quest 2

Making the SPSS File listing Schools and RET for each year:
Transfer the list of subtotals to a new SPSS spreadsheet in the following manner:
First, change the concat column in the excel file (All courses (year) for Quest 2) to text by highlighting column, clicking on Format, then cells, then changing to text
Copy the columns with Concat, class, take, and RET
Close out this file
Then open a new SPSS file. Click on Enter new data
In the new spreadsheet, go to Variable View. Then make the first column (the one that will contain the concat column to be pasted in) a string variable
Paste the columns from the subtotal page of the All courses (year) for Quest 2 file into the new SPSS spreadsheet
Delete all but Concat and RET
Go to Variable View: label variable RET and set for 4 decimal places
Multiply RET by 100 to make it a percentage
Sort by RET descending
Record the number of high schools and the number with 100% RET
Save this as: (Year) schools for Quest 2 file

Then, check to be sure there are no duplications in the Concat column by sorting for concat ascending, looking over the numbers, and then closing out the file without saving the change, so it will revert to a list sorted in order of descending RET.
Analysis of the Number of AP Exams in Excess of Enrollments Deleted Each Year

Because this study was concerned with the percentage of AP-enrolled students who took AP exams, any AP exams in which there were no corresponding AP enrollments were deleted. Thus, if there were AP exams listed with no enrollments for a particular course, those exams were deleted. Similarly, when the number of exams exceeded the enrollment, the number of exams was reduced to the same number as AP enrollments for the course. The number and percentage of AP exams that were deleted each year because they were in excess of AP enrollments in specific courses is listed in Table 31.

Table 31.
Number and Percentage of AP Exams Deleted in Each Year

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<tr>
<th>Year</th>
<th>Number of Exams</th>
<th>% of Exams</th>
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<td>1745</td>
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<tr>
<td>2001-02</td>
<td>235</td>
<td>0.60</td>
</tr>
</tbody>
</table>

It can be seen that at most, AP examinations without corresponding course enrollments constituted a small percentage of overall AP exams in every year. Of note, 2001-02 data again departs from other years. According to a SRC employee, the inability of schools to enter a number in the AP enrollment field that was smaller than the number of exams in the same subject without contacting the SRC Office was not a new feature in 2001-02 (SRC employee, personal communication, July 14, 2003). Apart from this explanation, however, it is not clear what would explain the difference between 2001-02 and the other years.
Research Questions 3 and 4

Construction of the High School Master Files Used for Questions 3 and 4

The High School Master File for 2001-02 that was used for the analysis of Research Question 3 was constructed by beginning with the SPSS 10.0 spreadsheet containing the 2001-02 high schools, with their RETs, derived from the sc_ap.csv file as described above for Research Question 1. This list of high schools, identified by the concatenated school number, contained the numbers of total AP enrollments, total AP exams taken, and overall RET for each school. The individual county, district, and school number fields were added to this file for later use in file merging. This beginning file then served as the index file to which other fields were added in the following manner.

The District Factor Group for each school was identified from the list of District Factor Groups available on the NJDOE web site (NJDOE, n.d.d). A field was created for this information, and data for each school was added manually to the index file. The 50th percentile SAT Math and Verbal scores for each school were obtained from the sc_sat.csv file (part of the NJ.CSV-Files.zip) and were also added manually to an SAT field. A separate field was then created, consisting of the calculated sum of the Math and Verbal scores. This was the variable used for data analysis.

Two sources of data came from the survey of all AP high schools. These consisted of the responses to the question of whether the school paid the exam fee and whether it required students in all (or most) AP courses to take the AP exam in 2002-03. Two fields were created to contain this information, and data was entered manually.

Information on the percentage of faculty and administrators with a B.A., M.A., or Ph.D. was available on the sc_fact.csv data file. This file was sorted by the field...
Rate of Exam Taking - 311

designating the percentage of 11th and 12th graders in each school who had taken an AP test (unduplicated count) in 2001-02. After all schools with a value of 0 were deleted, the file contained the AP schools for 2001-02. (Note: this file actually contained one school that did not have any AP courses listed in the sc_ap.csv file and was subsequently deleted. It was also missing three AP schools that should have been included. Data for these schools was added manually, using the individual School Report Card for each school as the data source.) All fields except those containing the information on percentage of faculty and administrators with an M.A. or Ph.D. were then deleted from this file and it was merged with the index file. Finally, a new field was created consisting of the calculated sum of the percentages of faculty and administrators who had an M.A. or a Ph.D. This sum was the variable used in the study.

Data on the percentage of students who attained an advanced score on the 11th grade High School Proficiency Assessment (HSPA) tests in Mathematics and Language Arts were obtained from the sc_tst11.csv file (part of the NJ.CSV-Files.zip). After deleting superfluous fields, this file was merged with the index file. (Of note, the sc_test11.csv file used for this study was downloaded on June 26, 2003 as the test information was not available when the School Report Card Data was first released.)

Data on the percentage of graduates going on to four-year colleges was obtained from the sc_pstg.csv file (part of the NJ.CSV-Files.zip). As in previous steps, superfluous fields of this data file were deleted and it was merged with the index file. Finally, 11th and 12th grade enrollment data was added to the index file by merging the pertinent fields of the sc_ensec.csv file (also part of the NJ.CSV-Files.zip) with it. In all cases, the county, district and school numbers were used as the common fields for file merges.

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For the vocational schools, data on 11th and 12th grade enrollment was obtained from the individual School Report Cards and added manually to the index file. Based on a discussion with the School Report Card Office employee, who indicated that shared-time enrollment had already been halved by the School Report Card Office, full-time and shared-time enrollment was summed to generate a number comparable to enrollment listed for the non-vocational high schools (School Report Card office employee, personal communication, July 10, 2003). However, this affected small numbers of students (fewer than 30 in either 11th or 12th grade) in only three schools.

The percentage of vocational school graduates planning to attend four-year colleges was also obtained from the individual School Report Cards and was added manually. In the case of one school, separate percentages were provided for full-time and shared-time students. Rather than attempting to approximate a percentage for all students that would be comparable to that of schools with only full-time enrollment, it was decided not to include the percentage of graduates attending four-year colleges for this school.

After the High School Master File for 2001-02 had been completely assembled as an SPSS 10.0 spreadsheet, its accuracy was verified by checking all fields for 32 schools against either the relevant source file or the individual School Report Card. The 32 schools were selected somewhat randomly by the investigator; at least one school in each county was checked, and the others were selected such that they represented approximately one in ten schools, but not exactly one in ten. The data fields for all schools were found to be correct, indicating that the file merges had not created data errors.
The High School Master for 2000-01 was assembled in a similar fashion with the exception that the SAT scores were added by merging the sc_sat.csv file with the file rather than by recording them manually. Also, for 2000-01 there was less concordance between the list of schools identified from the sc_ap.csv file (a total of 308 schools) and the list identified from the sc_fact.csv file (297 schools). Not only did the sc_fact.csv file not contain all the AP schools, but also it appeared to contain three schools that were not included on the sc_ap.csv file. The sc_ap.csv file was considered to be the more correct list, since the AP percentage figure on the sc_fact.csv file represented a calculation taken from other fields.

The completed High School Master File for 2000-01 (in the form of an SPSS 10.0 spreadsheet) was also verified by checking data fields against the individual School Report Cards for 34 schools selected randomly by the investigator (schools included at least one from each county, and were approximately, but not exactly, one in ten schools). All fields were correct except for one District Factor Group, which had been entered manually and copied erroneously by the investigator.
APPENDIX C

Additional Statistical Tests
Stem-and-leaf Plots for Rate of Exam taking of Schools in Different District Factor Groups, 2000-01

Rate of Exam taking Stem-and-Leaf Plot for
DFG= A

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<td>9 . 0036789</td>
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Each leaf: 1 case(s)

Rate of Exam taking Stem-and-Leaf Plot for
DFG= B

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Rate of Exam taking Stem-and-Leaf Plot for 
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Rate of Exam taking Stem-and-Leaf Plot for 
DGF= FG

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Each leaf: 1 case(s)
Rate of Exam Taking Stem-and-Leaf Plot for
DFG= GH

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Stem width: 10.00
Each leaf: 1 case(s)

Rate of Exam taking Stem-and-Leaf Plot for
DFG= I + J

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*Figure 10.* Stem-and-leaf plots for rate of exam taking of schools in different District Factor Groups, 2000-01. (Plots generated by SPSS 10.0 statistical software package.)
### Rate of Exam Taking Stem-and-Leaf Plot for DFG= A

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| Each leaf:  | 1 case(s) |

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Rate of Exam Taking Stem-and-Leaf Plot for DFG= DE

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Each leaf: 1 case(s)

Rate of Exam Taking Stem-and-Leaf Plot for DFG= FG

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Each leaf: 1 case(s)
Rate of Exam Taking Stem-and-Leaf Plot for
DFG= GH

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Each leaf: 1 case(s)

Rate of Exam taking Stem-and-Leaf Plot for
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</table>

Stem width: 10.00
Each leaf: 1 case(s)

Figure 12. Stem-and-leaf plots for rate of exam taking of schools in different District Factor Groups, 2001-02. (Plots generated by SPSS 10.0 statistical software package.)
### Research Question 3

Table 32.

*Intercorrelations Between School-Level Variables and Rate of Exam Taking, 2000-01 and 2001-02. (Correlations calculated by SPSS 10.0 software package.)*

<table>
<thead>
<tr>
<th>Pearson Correlations for Rate of Exam-Taking and Six Other Variables, 00-01</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Rate of exam-taking</td>
<td>1.000</td>
<td>-.144</td>
<td>-.007</td>
<td>-.132</td>
<td>.033</td>
</tr>
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<td>308</td>
<td>305</td>
<td>307</td>
<td>305</td>
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<tr>
<td>2. AP enrollments per 100 11th &amp; 12th graders</td>
<td>-.144</td>
<td>1.000</td>
<td>.709</td>
<td>.685</td>
<td>.482</td>
</tr>
<tr>
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<td>308</td>
<td>308</td>
<td>305</td>
<td>307</td>
<td>305</td>
</tr>
<tr>
<td>3. % Graduates to 4 year college</td>
<td>-.007</td>
<td>.709</td>
<td>1.000</td>
<td>.756</td>
<td>.605</td>
</tr>
<tr>
<td>N</td>
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<td>305</td>
<td>305</td>
<td>305</td>
<td>305</td>
</tr>
<tr>
<td>4. Sum of Math and Verbal SAT</td>
<td>-.132</td>
<td>.685</td>
<td>.756</td>
<td>1.000</td>
<td>.381</td>
</tr>
<tr>
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<td>307</td>
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<tr>
<td>5. % Faculty/Admin with M.A. or Ph.D.</td>
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<table>
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</thead>
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<tr>
<td>2. AP enrollments per 100 11th &amp; 12th graders</td>
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<td>.696</td>
<td>.760</td>
<td>.709</td>
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<td>308</td>
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<tr>
<td>3. % Graduates to 4 year College</td>
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<td>1.000</td>
<td>.777</td>
<td>.806</td>
<td>.778</td>
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<td>305</td>
<td>308</td>
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<td>308</td>
</tr>
<tr>
<td>4. Sum of Math and Verbal SAT</td>
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<td>.777</td>
<td>1.000</td>
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<td>.810</td>
<td>.425</td>
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<tr>
<td>5. % 11th Graders Scoring Advanced on 11th Grade HSPA Math</td>
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<td>.806</td>
<td>.864</td>
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<td>6. % 11th Graders Scoring Advanced on 11th Grade HSPA LA</td>
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<tr>
<td>7. % Faculty/Admin. with MA or PH.D.</td>
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<td>.616</td>
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<td>.514</td>
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</tbody>
</table>

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