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ABSTRACT

The Advanced Placement (AP) Program allows high school students to learn subjects at a college level of difficulty. Students may receive college credit if they earn a high enough score on the AP examination typically taken at the end of an AP course. This report describes the participation and achievement of AP students in the Wake County Public School System (WCPSS), North Carolina. All WCPSS high schools offer AP courses, and overall, 17% of Wake County high school students took AP examinations in 1999. Thirty-one AP courses were offered, with five common courses offered in every school: U.S. History, Biology, English Language and Composition, English Literature and Composition, and Calculus AB. In comparison to other regions, Wake County excelled on the average score and the percent of scores of 3 or more (77.8%) for the examinations overall and most of the 31 examinations given. More female students took the AP examinations, but males (82%) were more likely to score a 3 or higher than females (75%). Black and Hispanic students were underrepresented among AP examination takers, but Hispanic students who did take the examination showed the highest percentage of scores of 3 or more. Examination score trends over 3 years are discussed, and some questions are raised about the consequences for the school district of encouraging more students to take AP courses and examinations. An attachment contains brief descriptions of the AP courses. (SLD)

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MEASURING UP

WAKE COUNTY PUBLIC SCHOOLS EVALUATION AND RESEARCH DEPARTMENT

1998-99 Advanced Placement Exam Results

June 28, 2000

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The Advanced Placement (AP) Program allows high school students to learn subjects at a college level of difficulty. Started as a national program, it has also become a major program in Canada and now includes schools in more than 50 countries other than the United States. Advanced Placement examinations were first administered in 1954. Students may receive college if they earn a high score on the AP exam, typically taken at the end of an AP course.

AP courses benefit both the high school and the students. It benefits the high school by enhancing the quality of the curriculum, allowing faculty to teach interesting advanced topics to motivated students, and demonstrating to the community the school's commitment to high academic standards. It benefits the students by allowing them to: 1) learn a subject of interest in greater depth, 2) develop skills critical to success in college, 3) demonstrate their willingness to undertake a challenging course, 4) obtain credit for a college course without paying tuition, and 5) expose them to the more challenging work they will have in college. Earned credit also increases the possibility of students graduating from college early.

According to the College Board, over 40 percent of the nation's high schools fail to offer any AP courses (Trotters, 2000), but in the WCPSS all the regular high schools offer AP courses. Overall, 17% of WCPSS junior and senior students took AP exams last year. There were 31 Advanced Placement courses offered in 1998-99 with only one course (meant only for English-speaking students in foreign countries) not available to WCPSS students. Attachment 1 provides a brief description of the AP courses offered in WCPSS. Five "common" AP courses were offered in every high school. These were U.S. History, Biology, English Language & Composition, English Literature and Composition, and Calculus AB. Availability of other courses varied by school.

Examinations are scored on a five-point scale based upon the student's perceived qualifications to receive college credit for a one-semester college course. The interpretation of the scores is as follows:

5: The student is extremely well qualified
4: The student is well qualified
3: The student is qualified
2: The student is possibly qualified
1: No recommendation

Currently, the exam score received does not influence the final grade in the high school class in WCPSS nor the chances of admission to a college. The scores are used only to place the student in a suitable class once the student is already accepted into college. Most colleges will grant credit for a course if students earn a score of 3 or more, although some require a score of 4 or 5.

Overall AP Results for 1998-99

Figure 1 shows the overall results for each exam in 1998-99 for WCPSS relative to North Carolina, the southern region, and globally. In comparison to other regions, WCPSS excelled in the average exam score (3.41) and percent of scores 3 or more (77.8%) for exams overall, as well as for most of the 31 exams given. Attachment 2 shows more complete results by course for WCPSS, North Carolina, the southern region, and globally for 1998-99.

Figure 1.
Overall AP Results for
WCPSS, NC, Southern Region, and Globally (1998-99)

	WCPSS	NC	South	Global
Average Exam Scores	3.41	2.81	2.87	3.02
Percent Scores 3 or More	77.8%	56.6%	58.5%	63.8%

Figure 2 shows the participation and performance in the five common AP courses offered at every high school in WCPSS in 1998-99. The highest percentage of students earned a score of 3 or higher in Calculus AB (84.5%) and the lowest percentage earned a score of 3 or more in U.S. History (66.5%).

Figure 2.
WCPSS Participation and Performance
in Common Courses (1998-99)

AP Course	Number of AP Exams	Average Exam Score	Percent Score ≥3
Biology	211	3.26	75.4%
Calculus AB	354	3.78	84.5%
English Lang. & Comp.	558	3.27	78.3%
English Lit. & Comp.	355	3.34	78.3%
U.S. History	523	3.18	66.5%

Figure 3 shows the percent of juniors and seniors at each WCPSS high school that took AP exams and the overall percent score of 3 or more for *all* exams combined.

- The percent of scores of 3 or more varied greatly from school to school, from 54% at Wake Forest/Rolesville to 94% at Leesville.
- There was a large variation in the percentage of juniors and seniors who took at least one AP exam each year, from 8.9% at Fuquay-Varina High School to 40.8% at Enloe High School. Enloe's overall participation rate (40.8%) was far greater than any other WCPSS high school, with Broughton (22%) being the next highest.

Figure 3.
Percent of Juniors and Seniors Taking AP Courses
and Percent of Scores 3 or More for Each WCPSS High School 1998-99

High School	% Jrs & Srs Taking AP Exams	% of Exams with Score of ≥3
Apex	14.34	90.0%
Athens Drive	12.55	80.9%
Broughton	22.14	75.9%
Cary	16.45	76.3%
East Wake	12.20	52.9%
Enloe	40.80	81.5%
Fuquay-Varina	8.91	57.6%
Garner	9.65	68.2%
Leesville	13.10	94.2%
Millbrook	19.92	80.4%
Sanderson	15.94	79.8%
Leesville	13.10	94.2%
Southeast Raleigh	14.59	67.3%

Results by Gender

Figure 4 shows the participation and performance by gender for the five AP courses offered in every WCPSS high school in 1998-99.

- 20% more females than males took AP exams. However, this percentage difference varied greatly according to the exam. For example, only males are reported to have taken Computer Science AP exams and more males took Chemistry, Physics and Calculus exams. More females took English Language and Composition, English Literature and Composition, and Biology exams.
- The average exam score across all tests for males (3.56) was slightly higher than the average exam score for females (3.28).
- 82% of males and 75% of females scored 3 or more. Males scored higher in U.S. History, Environmental Science, Physics C: Mechanics, and Statistics. Females scored higher in German Language, Government and Politics-U.S., Music Theory, and Spanish Literature.

Figure 4.
AP Results by Gender for the
Five AP Courses Offered in Every High School (1998-99)

AP Course	Males			Females		
	Number of AP Exams	Average Exam Score	Percent of Scores ≥3	Number of AP Exams	Average Exam Score	Percent of Scores ≥3
Biology	74	3.57	82.4%	137	3.09	71.5%
Calculus AB	187	3.94	86.6%	167	3.60	82.4%
English Lang. & Comp.	216	3.33	79.1%	342	3.23	77.8%
English Lit. & Comp.	119	3.27	78.9%	236	3.38	78.0%
U.S. History	243	3.28	73.2%	280	3.09	60.7%

Attachment 3 shows participation and performance by gender for each exam.

Results by Race

Figure 5 provides a breakdown of AP exam results as well as participation rates by race. To check whether racial groups were participating in AP testing in a representative way, the students' self-reported racial designation was compared to WCPSS data for high schools for fall 1998. As shown in the figure below, all racial groups were *over*-represented except Hispanic and Black students. Black students were *under*-represented the most, in that only 3.5% of the students taking AP exams were Black, while Black students represented 23.8% of the WCPSS students in 1998-99.

Figure 5.
WCPSS High School Enrollment
and AP Results by Race (1998-99)

Race	% of H.S. Population in WCPSS Fall 1998	% of Students Taking Exams	# of Students Taking Exams	# of AP Exams Given	% of Exams with Scores ≥3
Not Stated	N/A	4.1%	73	130	80.0%
Native American	0.2%	0.2%	3	6	83.3%
Black/African American	23.8%	3.5%	63	103	56.3%
Hispanic	2.3%	1.8%	33	63	87.3%
Asian	3.8%	9.7%	175	392	78.3%
White	69.4%	77.5%	1,394	2,656	77.8%
Other	0.6%	3.2%	57	121	86.7%
TOTAL	16,497		1,798	3,471	

In terms of performance in 1998-99:

- Hispanic students showed the highest percentage of exams with scores of 3 or more (87%). Over 80% of the exams taken by Native American and Other students also earned scores of 3 or more.
- About 78% of the exams taken by Asian and White students earned scores of 3 or more.
- Just over half (56%) of the exams taken by Black students earned a score of 3 or more. This percentage was considerably lower than other groups in WCPSS, but was in line with national passing rates for all students taking the exams.

WCPSS Three-Year Exam Score Trends

As illustrated in Figure 6, the number of exams given to WCPSS students during the three years increased significantly, 13% from 1996-97 to 1997-98 and 8% from 1997-98 to 1998-99. However, there was a slight decrease over the three years in the percent of students achieving a score of 3 or more for all exams combined. A decrease may occur due to more students taking the exams or for other reasons.

Figure 6.
WCPSS Participation and Performance on AP Exams over a Three-Year Time Period

Overall for WCPSS	1996-97	1997-98	1998-99
Number of Exams Given	2785	3197	3471
Average Exam Score	3.42	3.44	3.4
Percent Score 3 or More	80.4%	79.9%	77.8%

This pattern was generally, although not consistently, true at the school level. Seven of the eight schools with increased participation showed a decrease in the percentage of students earning a score of 3; three of five with decreased participation showed increased high scores.

Figure 7 shows the percent of students taking exams and the percent of tests with a score of 3 or more for all 13 high schools for the three-year period 1996-97, 1997-98 and 1998-99.

Figure 7.
Advanced Placement Overall Results for WCPSS High Schools for 1996-97, 1997-98, and 1998-99

High School	Percent of Juniors and Seniors Taking AP Exams			Percent of Exams Tests with a Score of 3 or More		
	96-97	97-98	98-99	96-97	97-98	98-99
Apex	11.81	14.06	14.34	90.1	86.2	90.0
Athens Drive	15.03	14.51	12.55	76.0	74.9	80.9
Broughton	23.01	25.19	22.14	82.7	83.5	75.9
Cary	10.69	15.39	16.45	81.5	80.8	76.3
East Wake	10.11	9.20	12.20	56.8	62.4	52.9
Enloe	35.04	40.25	40.80	83.1	81.1	81.5
Fuquay-Varina	11.03	10.10	8.91	77.5	60.0	57.6
Garner	11.63	9.82	9.65	62.2	63.6	68.2
Leesville	17.96	15.03	13.10	88.7	95.7	94.2
Millbrook	12.84	15.28	19.92	83.2	77.9	80.4
Sanderson	13.98	13.89	15.94	83.0	79.6	79.8
Southeast Raleigh	N/A	4.22	14.59	N/A	71.4	67.3
Wake Forest/ Rolesville	13.34	14.70	19.25	76.3	80.3	53.9

N/A: Not applicable – school did not exist

For individual exams, the combination of a decrease in performance and an increase in participation rates was found to be statistically significant for U.S. History, English Language and Composition, Environmental Science, and Calculus BC (based on regression analyses). The percentage of exams with a score of 3 or more significantly increased for Calculus AB. Attachment 4 shows more complete results by exam over the last three years.

Attachment 5 illustrates AP participation and performance by race over the last three years. Hispanics showed the greatest increase in average scores and percent of scores of 3 or more over a three-year period.

Attachment 6 provides an overall detailed summary of the participation and performance by WCPSS high school for the three-year period.

Questions Raised

These results raise some interesting questions for consideration.

- Given that the percentage of our students earning a score of 3 or more on the AP exams is 21% higher than the national average, should WCPSS encourage more students to take AP courses and exams? WCPSS has increased the number of students taking AP exams 21% since 1996-97 with only a small (1.6%) decrease in the percentage of our students earning high scores. This is a positive trend, and it appears there is room for continued improvement in participation rates.

- Does the percentage of students taking AP exams vary more than necessary across WCPSS campuses? Are students of similar ability equally challenged across our high school campuses?

- Can WCPSS accept the likely results of encouraging more students to take these courses and tests? The direct results would likely be a slightly lower *percentage* of students earning high scores, however a larger *number* of students overall earning high scores and therefore college credit. The indirect result might be that more of our high schools earn top rankings nationally when AP scores are used as a sign of excellence.

- How can we predict which students who are currently not taking AP courses could be successful? Can we use PSAT scores or earlier information to predict which students can handle AP courses successfully?

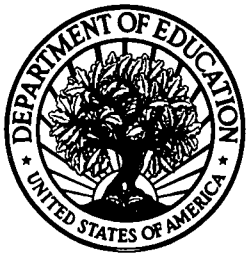
Reference:
Trotter, Andrew (2000, February 16). New Company Hopes To Score Big with Online Advanced Placement Courses. Education Week, 13.

Attachment 1. Brief AP Course Descriptions

U.S. History. Students learn facts of U.S. history, along with methods of critical analysis. They assess the relevance, reliability, and importance of historical materials, and critique scholarly interpretations of U.S. history.
Art: History. Students gain an understanding and enjoyment of architecture, sculpture, painting, and other art forms within historical and cultural contexts.
Studio Art: Drawing and General (2 courses). Students learn techniques and critical analysis with much work expected. College, university, and high-school art instructors using rigorous standards evaluate a three-part portfolio of the student's artwork.
Biology. The equivalent of a first-year biology course in college for biology majors, including college-level laboratory work. Students should have already successfully completed high-school biology and chemistry courses.
Chemistry. The equivalent of a first-year college general chemistry course, with laboratory work. Students should have already successfully completed high-school chemistry and second-year algebra courses.
Computer Science A and AB (2 courses). Computer Science A is the equivalent of a first-semester college computer science. It emphasizes problem solving and algorithmic development, with an overview of data structures and other abstractions. Computer Science AB covers the same topics as Computer Science A, but also contains a more in-depth study of a wider range of data structures. It may cover topics included in a second-semester introductory course in college.
Economics: Micro. The students gain an understanding of economic principles as applied to consumers and producers within the larger economic system. It includes the nature and functions of markets and the role of government in promoting efficiency and equity.
Economics: Macro. Students study the principles of economic systems, particularly national income and price determination, economic performance measures and growth, and international economics.
English: Language and Composition. This course enables students to understand complex texts of various forms and to write clear, rich prose that effectively communicates to mature readers.
English: Literature and Composition. Students read, experience, interpret, and evaluate a variety of classic literature of different genres and time periods, closely analyzing the themes, structure, style, use of language and imagery, and tone.
Environmental Science. This course teaches students to analyze environmental problems, evaluate the relative risks, and propose possible solutions or preventative measures. It stresses scientific understanding of the interrelationships in the natural world.
European History. Students learn the chronology of major events and trends from about 1450 AD to the present. History is examined in various contexts: cultural, diplomatic, economic, intellectual, political, and social.
French: Language. This course is equivalent to a third-year college course in French Composition and Conversation. A student should already have a good command of French grammar and vocabulary.
French: Literature. Students study a representative body of literary texts in French. The student reads, analyzes, and critiques (in French) various works of French literature.
German Language. This course is at the approximate level of an advanced college-level German class. A student should have excelled at the equivalent of four years of high-school German.
Government and Politics: US. Students gain an analytical perspective on government and politics in the US. The course covers general concepts as well as analyses of specific examples. Students become familiar with institutions, beliefs, and ideologies that govern US politics.
Government and Politics: Comparative. The students gain an understanding of the world's diverse political structures and practices. General concepts are taught, and five countries are closely examined. These countries are Great Britain, France, China, Russia, and either India, Mexico, or Nigeria.

Attachment 1. Brief AP Course Descriptions

Latin: Vergil. Students read, translate, understand, analyze, and interpret the Aeneid.
Latin: Literature. Students read, translate, understand, analyze and interpret the poetry of Catullus as well as selections from a second author, either Cicero or Horace or Ovid.
Calculus AB and BC (2 courses). Calculus AB covers topics in differential and integral calculus, and is the equivalent of a first college course in calculus. Calculus BC goes beyond the topics covered in AB, studying functions of a single variable in dept. It is the equivalent of a college course 1 level beyond AB. However, both courses are considered equally challenging. Students should have mastered high-school algebra, trigonometry, geometry, and coordinate geometry before taking an AP Calculus course.
Music Theory. The students gain the ability to recognize, understand, and describe the basic materials and processes of music that are heard or presented in a score. This course develops the student's aural, sight-singing, written, compositional, and analytical skills. The students also gain basic performance skills in voice or on an instrument.
Physics: B and C (2 courses). In many colleges, there are three types of physics courses. Type A is usually for non-science majors and provides a historical and cultural view of the field. Type B is usually for science, but non-physics majors, and covers both classical and modern topics in physics with some mathematical sophistication. Type C is intended for physics majors and covers mechanics, electricity and magnetism in analytical and mathematical detail. While Physics B does not require calculus, it may refer to concepts developed in calculus, and does require algebra and trigonometry. Physics C's first half of the year is devoted to mechanics and the second half explores electricity and magnetism. As the year progresses, more and more calculus is used to explain phenomena. Therefore, calculus should be either taken previous to or concurrently with Physics C.
Psychology. Students are introduced to the systematic and scientific study of the behavior and mental processes of humans and other animals. The topics covered are: methods, approaches, and history; biological bases of behavior; sensation and perception; states of consciousness; learning; cognition; motivation and emotion; developmental psychology; personality; testing and individual differences; abnormal psychology; treatment of disorders; and social psychology.
Spanish: Language. This course is equivalent to a third-year college course in Spanish Composition and Conversation. A student should already have a good command of Spanish grammar and vocabulary.
Spanish: Literature. Students are prepared to understand lectures in Spanish and participate actively in discussions on literary topics and to read and analyze literary texts of all genres in Spanish. Students will read works by Jorge Luis Borges, Frederico Garcia Lorca, Gabriel Garcial Marquez, Ana Maria Matute, and Miguel de Unamuno.
Statistics. The equivalent of a one-semester introductory non-calculus based college course in statistics. This course introduces students to the major concepts and tools for collecting, analyzing, and drawing conclusions from data. Four themes covered are exploring data, planning a study, anticipating patterns, and statistical inference.
World History. (New course 1998-99) This course explores global trends from 1000 AD to the present, covering peoples from Asia (including the Middle East), Europe, America, and Africa, and their interactions in different periods or eras.
Human Geography. (New course 1998-99) This course introduces students to the patterns and processes that have shaped human understanding, use, and alteration of Earth's surface.



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