An Evaluation of the Advanced Placement Program in Environmental Science

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- Stakeholders’ perceptions of the Advanced Placement Program in Environmental Science (APES) were evaluated. Research focused on teacher and student profiles, attitudes, self-report data, strengths and weaknesses, and a match between implementation and guidelines.

Introduction
As national interest in environmental issues increased in the 1990's, the Advanced Placement Environmental Science (APES) Program was created. It is the most recent of the Advanced Placement (AP) Science Programs and was adopted in May of 1998. In 1993, the Geraldine R. Dodge Foundation for the College Board recognized the need for an AP ecology course and funded research to determine its feasibility. The resulting study suggested that a course in AP environmental science be offered instead of AP ecology because the goal of environmental science courses is to create citizens who can make intelligent, informed decisions concerning environmental issues (College Board, 1997).

In a follow-up study, faculty in more than 300 college biology, environmental science, and interdepartmental programs were surveyed to determine their attitudes concerning the offering of an AP Environmental Science Program (College Board, 1997). The results indicated that most colleges and universities already offered an introductory-level environmental science course and could support an AP Environmental Science Program. High schools that already had AP Programs in place were also surveyed to determine their attitudes regarding an AP Environmental Science Program. The respondents stated that their schools already had some type of environmental science course in place or would be interested in offering a course in environmental science, indicating that secondary schools were also willing to support the offering of an AP environmental science class. Additionally, the survey revealed that high school students were interested in participating in an AP environmental science course (College Board, 1997).

The goals of APES focus on processes and systems and include student experiences such as (a) evaluating information, (b) applying concepts to new information, (c) understanding natural systems, (d) asking questions, (e) recognizing how humans have impacted the environment, (f) understanding the limits of science, and (g) devising solutions to environmental problems (College Board, 1997).

Importance of the Study
This study is based on a modification of a previous study evaluating the Advanced Placement Biology Program (APBP) (Lucky, 1972). Lucky (1972) investigated the attitudes of students, teachers, and principals involved in the APBP in high schools in Memphis, Tennessee, during the 1970-71 academic year. The current study evaluated the Advanced Placement Environmental Science Program (APESP) in four high schools in California, Florida, and New York. It investigated the types of students and teachers involved in the APESP and their attitudes towards the program. It is important to determine students' attitudes toward APES because students' attitudes toward science affect their science achievement and knowledge (Cannon & Simpson, 1985; Schibeci & Riley, 1986; & Weinburgh, 1995). The current study also highlighted the program's strengths and weaknesses and provided recommendations for program improvement.

The current study was needed because the Advanced Placement Environmental Science Program has not been evaluated since its 1998 inception. Education programs should be evaluated using quantitative and
One previous study was conducted to determine the demographics of students who take AP exams (College Entrance Examination Board, 2000), but there have been no studies specifically investigating the demographics of students and teachers of APES classes. The current study provides a baseline for studies of other AP programs. It is important to determine the types of students and teachers involved in the Advanced Placement Environmental Science Program especially because the College Examination Board is seeking new ways to increase the enrollment of poor (low-income) and minority (Hispanic and African American) students in AP classes (College Entrance Examination Board, 2000).

The data from the current study provided information regarding strengths and weaknesses of the program as perceived by teachers and students. These findings were used to develop recommendations for program improvement, and to highlight areas of the program that teachers and students viewed differently. The data were also used to provide explanations of why teachers do or do not follow the guidelines for APES set forth by the College Examination Board.

**Theoretical Framework**

**Attitude Model**

The theoretical framework used to measure the construct of students’ and teachers’ attitudes toward Advanced Placement Environmental Science is based on the model developed by Haladyna, Olsen, and Shaughnessy (1982, 1983). This model suggests that student, teacher, and learning environment variables affect students’ attitudes toward science and arise from factors that cannot be controlled (age of the teacher, gender of the student, or condition of the classroom) and from factors that can be controlled (teacher praise and student reinforcement, the relationship students have with each other, and the tone of the classroom). Haladyna et al. (1983) identified three variables that affect students’ attitudes toward science: (a) self-confidence, (b) fatalism, and (c) feelings of the importance of science. They suggested that either students enjoy science because they feel that it is important, or they feel that science is important because they enjoy it. Students with high academic self-confidence, who believe they control their academic fate, have more positive attitudes toward science. Most importantly, Haladyna et al. (1982, 1983) posited that the following four factors are the most significant factors predicting students’ attitudes toward science: (a) teacher enthusiasm, (b) respect for teacher knowledge, (c) teacher support for students, and (d) praise and commitment to learning fairness. The learning environment variables shown to affect students' positive attitudes toward science were (a) overall satisfaction, (b) enjoyment of classmates, (c) positive class environment, (d) organized instruction and (e) attentiveness (Haladyna et al, 1982).

This current study was designed to determine stakeholders’ perceptions of the APES Program by focusing on the three facets of student variables, teacher variables, and learning environment variables that function together to explain the construct of student attitude toward science. A construct is a complex, inferred concept (Dooley, 2001), which can be made up of parts or facets. Student and teacher attitude surveys were developed specifically for this study and included items pertaining to students' and teachers' attitudes toward student variables, teacher variables, and learning environment variables in an attempt to determine students' and teachers' attitudes toward Advanced Placement Environmental Science.

**Methods**

**Survey Study Sample**

California, Florida, and New York were selected for this study because they are the three states with the highest numbers of schools having at least 10 students who took the Advanced Placement Environmental Science exam in 2000. A letter explaining the study and asking for participation was sent to 50 APES teachers from 50 randomly selected schools in each of the three states. Follow-up postcards were sent one month later to those teachers who had not responded to encourage more participation. The 15 teachers from five schools in each state who agreed to participate were then sent teacher and student surveys. The final sample consisted of four schools in each state: California, Florida and New York and included a total of 12 teachers and 355 students who filled out and returned the surveys. The student sample was 61% female, and 56% White, 17% Hispanic, 16% Asian, 8% Black, and 3% other ethnic groups. The majority of the students were in 12th grade (52%), followed by 46% in 11th grade, 1% in 10th grade, and 1% in 9th grade. The teachers were 100% White and 60% female.
**Observation/Interview Study Sample**
The case study sample was included to collect qualitative data and to add to the richness of the survey data, to provide insights into the interpretation of the survey data, and for triangulation. The case study site was chosen because it was one of two high school AP Environmental Science class sites in Gainesville, Florida, that had a teacher willing to participate and was the most convenient location for the researcher to visit.
The class was taught by a White male teacher and contained 30 students in the class (19 females and 11 males). All of the students were White except for one Asian female and two Black females. The majority of the students were 9th graders (12) with ten 10th, four 11th, and four 12th graders. Ten of these students were chosen to be interviewed based on gender, ethnicity, grade level, APES class grade, and overall grade point average to make the sample as heterogeneous as possible.

**Data Collection and Analysis**
Surveys were completed by teachers of four Advanced Placement Environmental Science courses in each state. The teachers filled out a teacher survey and a data sheet providing information specific to their Advanced Placement Environmental Science classes. The teachers then administered a student survey to all students in each section of their Advanced Placement Environmental Science classes. Additional data were collected through 10 class observations and teacher and student interviews at the case study APES class site. Questions 1-5 utilized quantitative data from the survey study sample while questions 6-10 were investigated using a combination of quantitative survey data and qualitative survey and case study data.

Research questions 1 and 2 were analyzed by calculating the frequency of responses for each survey item. Research question 3 was analyzed by computing an average attitude scale score for each student and by computing descriptive statistics (means, standard deviations) and a 95% confidence interval for individual attitude items. Descriptive statistics, such as means and standard deviations, for the overall attitude scale as well as individual attitude items were also computed to answer research question 4. A two-way ANOVA was conducted to investigate research question 5. The remaining five research questions were investigated using both quantitative and qualitative data sources. The quantitative data were analyzed by calculating the frequency of responses for relevant survey or interview items and the case study observation field notes were analyzed using the constant comparison method.

The two assumptions used to interpret the results of this study were: (a) teachers and students have particular attitudes toward APES, and teachers and students properly followed the directions on the surveys.

**Conclusions**
Recently, the AP Program has received criticism for encouraging too much coverage at the expense of depth. Further recent criticisms include: concerns about preparation of AP teachers and restricted access to AP classes especially for minority students and those living in urban areas. The College Board reports that few teachers are qualified to teach AP classes and thus their students have poor AP backgrounds (Trounson & Colvin, 2002). Some schools have even dropped their AP Programs, stating that they focus too much on memorization and not on real learning. The College Board has responded by offering more AP teacher training sessions, creating more clear AP guidelines, and developing programs to better prepare middle and high school students for AP classes. Students have responded by explaining that they feel they are just memorizing a huge amount of information that they forget after they take the test. Colleges and universities are also frustrated because the students who perform well on AP exams do not always do well in their college classes (Trounson & Colvin, 2002).

These criticisms and concerns are validated by the data collected in this study. It appears as though the once highly valued, prestigious Advanced Placement Program is now facing the challenge of preparing students for college classes in the face of an ever-increasing information explosion. It is becoming more apparent that students need to learn, not simply memorize, the information in these classes to be successful in college and in their careers. A new era is emerging in which it must be decided what information is most important for our students to know to be able to adequately function in our changing society. With the Internet at our fingertips, we are entering deeper into the information age, and are facing more information on a daily basis than ever before. Educators, scientists, and members of the College Board need to work together to address these concerns.

**References**


