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BEHAVIOR

The Effects of Environmental Education on Achievement
and Classroom Behavior

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Abstract

The current study explored the relationship between environmental education and achievement, attendance, and classroom behavior. The attendance rates and Commonwealth Accountability Testing System (CATS) test scores of elementary school children who had been exposed to environmental education were compared to those of children who were demographically comparable but had not been exposed to environmental education. No differences in attendance rates between the two schools were found. However, children in the non-experimental school had significantly higher achievement scores. Fifteen teachers from the experimental school completed questionnaires that revealed some change in behavior of their students during environmentally educational activities. The teachers reported significantly higher student interest when students were participating in environmental activities.

The Effects of Environmental Education on Achievement and Classroom Behavior

In 1983, the National Commission on Excellence published its findings on the state of education in America. The commission's report labeled America as a "nation at risk" citing thirteen dimensions in which American educational standards had significantly fallen since the mid 1960's (National Research Council). More recently, the National Center for Education Statistics (NCES, 2005) showed significant improvement in performance across several standardized measures. However, the data from the NCES also emphasizes an achievement gap that is still a concern among educators.

The achievement gap is defined as the difference in achievement between poor students and their peers, minority students and their peers, and between schools with high percentages of low-income families and their peers (McGee, 2004). In the NCES's report on the condition of education in America, fewer kindergarten children from homes with more risk factors, like poverty, mastered complex math and readings skills by third grade than did their peers. In regards to older children, there were significant differences in knowledge gains of Caucasian and Asian/Pacific Islander students compared with those of American Indian, Hispanic, and African-American students (NCES, 2005). Low-income children start life with disadvantages that are associated with the socioeconomic status, education, and primary language of their parents (Farkas, 2000). These children are often born into an environment with a weaker emotional, mental, and physical support system than are their middle and upper class peers (Athman & Monroe, 2004). By the time these low-income children begin the first-grade they are already approximately one instructional year behind their peers (Farkas, 2000). Without proper intervention, this cycle could become compounded throughout the child's education. Research suggests that by 12th grade the national norm for low-income students is eighth-grade level in

reading (NCES, 2005; Farkas, 2000). From the beginning of their lives, low-income children are inadequately prepared for the educational process mentally and, even more, so behaviorally (Farkas, 2000).

According to Farkas (2000), children an immaturity bring to school that is damaging to their academic success. These students cannot sit still or pay attention to the lesson they are being taught as well as their peers. In a classroom, where at least half the class is comprised of low-income students, the teacher has little control over this problem without proper intervention in instructional methods. Left untreated these problems could lead to low self-esteem and achievement motivation as well as drops in attendance and higher dropout rates (Farkas, 2000; Athman & Monroe, 2004; Lieberman & Hoody, 1998; NCES, 2005). It has become increasingly more evident that a change in instructional method for low-income children must take place. In order to provide low-income students with the same opportunities for success that middle and upper level children have, new teaching methods and curricula must be developed to convey material in a way that reaches every child in the classroom (McGee, 2004).

Lieberman and Hoody (1998), in a study of 40 schools in 12 states, have gathered strong evidence for a solution to this problem. Environmental education (EE) or environment-based education is gaining a lot of prestige as a means of raising achievement scores and bringing out desired classroom behavior in students. This type of educational model uses the environment and nature as an instructional medium. One specific type of EE has been recommended in which the environment is used as an integrating context for learning (EIC). EIC makes use of natural and socio-cultural environments while still relying on the practices of successful educators (Liebermann & Hoody, 1998; SEER, 2000). Each EIC program requires its own unique design because of the various natural and community settings in which these programs are located.

Unique design makes EIC programs ideal for schools and classrooms with high populations of low-income students. Successful programs exhibited increased performance on standardized achievement measures in reading, writing, math, science, and social studies (Lieberman & Hoody, 1998). These findings were replicated in a study of California schools in which 72% of students subjected to EIC performed better on academic assessments (SEER, 2000). These studies were also successful in showing increases in interest in learning and decreases in behavioral and classroom management problems (Lieberman & Hoody, 1998). In addition to the significant knowledge gains the SEER (2000) reported, 77% of EIC students scored higher on attendance assessments. Milton et al. (1995) reported other positive observations of classroom behavior. Teachers, principals, parents, and program coordinators noted differences in the students they had never before observed. Students who normally caused problems in other classes exhibited proper classroom behavior and enthusiasm during environmental activities. According to teacher interviews, the project seemed to reveal potential in the least promising students. Even learning-disabled students were performing above expectations. However, the study's results on actual measures of attitude were inconclusive.

As achievement scores for Kentucky students have failed to meet the standards that have been set by the Kentucky Department of Education, a great need arises to develop a curriculum that will help to alleviate these problems. The purpose of this study is to examine the effects of an environmental education program on achievement, and classroom behaviors including interest and attendance, in elementary school children. It is expected that children who participate in environmental education programs will have higher achievement scores, higher attendance rates, and exhibit fewer behavioral problems as a result of participating in environmentally educational activities. Previous research has shown that achievement scores in multiple disciplines are

positively affected by environmental education (Lieberman & Hoody, 1998; SEER, 2000). The hope is that review of achievement scores will yield similar results to previous findings in both science and other areas such as reading. Because teachers and parents of students who have participated in previous environmental education activities documented having noticed drastic behavioral changes in the students, it is expected that similar observation will be seen within the current study (Milton et al. 1995). Furthermore, previous evidence has suggested that attendance scores are positively affected by environmental education (Lieberman and Hoody, 1998; SEER, 2000). Upon review of the attendance data from the current study it is expected that similar differences in attendance will be observed. By completing the current study the hope is that the following three questions will be answered:

- 1) Do achievement scores in classrooms involved in an EE program differ from classrooms who are not involved in EE?
- 2) Does attendance in classrooms involved in an EE program differ from classrooms who are not involved in EE?
- 3) Do teachers who employ EE report increases in motivation and interest in school?

Method

Participants

Two elementary schools were chosen to complete this study. The schools were chosen based on their similarity in four factors: school size, racial make-up, school location, and percentage of risk factors. One of the schools has been gradually working an environmental curriculum into all subject areas of their existing curriculum and will serve as the experimental school. The two schools had populations ranging from 530 to 610 in a two year period. The experimental school has a 45.5% African -American student population while the non-

experimental school has a 42.6% African –American student population. In both schools, Hispanic students are represented within the Caucasian population. Within both schools significant numbers of students are “at- risk” based on family income levels and/or family structure. In the experimental school, approximately 62.99% of students are on free or reduced lunch status and approximately 51.78% live in single parent households or with neither parent (grandparent; foster parent). In the non-experimental school approximately 51.30% of students are on free or reduced lunch status, and approximately 60.91% live in single parent households or with neither parent. Both schools are located in urban areas. Fifteen out of 28 teachers of grades kindergarten through fifth at a Kentucky elementary school participated in the teacher questionnaire.

Design and Procedure

All the teachers at the experimental school were asked to participate in the study. After consenting to participate, participants were given as much time as was needed to complete the questionnaire and return it. This often took only about five to ten minutes. Attendance data were provided by the school board for all classrooms in both the experimental school and a non-experimental school. Achievement scores from the CATS assessment in science and reading were also provided by the school board for all fourth graders in both schools.

Materials

This study made use of the teacher questionnaire “Teacher Report of Environmental Activity and Student Interest”. It was designed by the author in the lab and based off of the Kentucky Progress Report (KPR) student questionnaire on the Commonwealth Accountability Testing System (CATS) assessment. The first six questions were designed to help gauge what environmental activities were occurring in the experimental school. Teachers were asked to check one of six responses (never, once a month, twice a month, once a week, more than once a

week, or everyday) to find out how often their students participated in the activities specified by the questions. Question seven was designed to gauge what behavioral changes teachers had noticed within the experimental group. They were asked to rate the behavioral change from 1-5 with 1 being many difference and 5 being no differences. The final question was used to help gauge teacher perception of student interest within the experimental group. Responses to this question were either “Yes” or “No”.

Results

Responses from the teacher questionnaire revealed that teachers most often did activities outside the classroom such as gardening and going for walks. These data can be found in Table 1. Six point seven percent of teachers reported that they had noticed many behavioral changes. The same percent of teachers noticed no behavioral differences. Most teachers observed moderate changes. Eleven out of 12 teachers that responded observed that their students seemed more interested during environmental activities. Because an 11-1 ratio is not what is expected, a Chi-Squares test was conducted that revealed that these data were significant, ($\chi^2= 8.333$, $df = 1$, $p = .004$).

Attendance rates for this experiment are represented by absences from school. The mean number of absences for the experimental and non-experimental schools was 3.91 days and 3.86 days respectively. This difference in attendance rates was not statistically significant, $t(1126) = -.269$, $p = .788$.

Figure 1 displays mean reading and math CATS scores for both experimental and non-experimental schools in the 2004-2005 and 2005-2006 school years. The non-experimental school outperformed the experimental school in reading and science both school years. However from the 2004-2005 school year to the 2005-2006 school year, the significance of the differences

in test scores decreased. A test of between subjects effects was conducted for both the science and reading tests in order to determine whether this difference was due to the type of test (reading or science), condition (EE, non-EE), or year. Both tests showed no main effect of test or year. With the science test there was a significant main effect of condition $F(1, 358) = 18.380, p > .01$. With the reading test there was also a significant main effect of condition $F(1, 358) = 5.769, p > .05$.

Discussion

The goals of this pilot study were to identify whether or not a program that has been utilized in one elementary school in Kentucky had an effect on achievement scores and classroom behavior. Unlike what was expected, when the experimental school was compared to the non-experimental school, no significant differences were observed in attendance rates. As displayed in Figure 1, a comparison of the mean CATS reading and science scores showed some indication of differences in achievement as was expected. Several different variables might explain these variables such as having different teachers, school setting, and other aspects of the student environment that researchers were not aware of. However, none of these causes can be pinpointed because the initial test scores for the experimental school were much lower making a comparison between the schools difficult. There is evidence that teachers in the experimental school have noticed some behavioral differences in their students during environmental activities as shown in Table 1. Teachers in the experimental school also reported a significant difference in student interest during environmental activities.

The current study's findings on interest in the experimental school are similar to the findings of Milton et al. (1995). Teacher reports on behavioral differences like previous studies also showed some behavioral differences (Milton et al.). It is important to note a problem with

the design of the questionnaire. For question number three, 40% of the teachers asked said they never went on environmental field trips. Teachers were in fact going on field trips. However, the number of field trips teachers took their classes on was not represented in the answer choices. This problem may also have affected how teachers answered other questions. For future research it would be beneficial to rewrite the questionnaire so that it is more representative of what is actually happening in classrooms. It might also be beneficial to compare teacher responses to the questionnaire with student responses on the KPR survey at the end of the school year to get a more accurate description of classroom activity.

The present study's findings on attendance rates are contradictory to the differences found by Lieberman and Hoody (1998) and SEER (2000). However, previous studies examined attendance across all grade levels whereas the current study examined attendance only in kindergarten through fifth grade. In regards to achievement scores, the results of the current study do not support previous research (Lieberman and Hoody, 1998; SEER, 2000). In the 2004-2005 school year, the significant difference between test scores was greater than the difference between the test scores for the 2005-2006 school year. It is worth mentioning that the achievement gap between the schools did seem to get smaller. However, nothing can be inferred from these results because the CATS test tested different students from one school year to the next. Also, it seems to be the case that the experimental school is in fact an outlier within the school system as far as test scores are concerned. This school should either be tested with another school that has comparable test scores or a new comparison should be made using two schools that do not fall outside the normal curve for test scores in the school system.

The findings of this study neither negate nor support whether or not environmental education has an effect on achievement. Because of flaws in the design of the experiment, there

is no way to draw any conclusions either for or against EE. Further study of this relationship should be considered with some modification of study design. First, as expressed before, the schools being compared should have comparable test scores before the experimental condition is administered. Secondly, the CATS test may not be the best way to examine the effects of EE or any other intervention. Only fourth graders are tested in science and reading. Once students are promoted to the next grade, they are tested on completely different subject matter. Using a year to year comparison does not yield a reliable account of how much the areas of reading and science have been affected. For research purposes, it would be beneficial to develop a test that would measure student achievement in the same subjects across any number of schools years. Furthermore observation of the effects of EE over a longer period of time might also yield significantly different results. Other variable that need to be considered with future research are the effects of different teachers and parent interaction as well as state mandated curriculum. Every teacher and every parent is not going to have the same attitude toward education. It goes without saying that some may be enthusiastic about EE while others are not. A better experimental design might involve collecting data from students of the same teacher over a period of two or more years to eliminate the teacher variable. This however may not be possible because teachers generally have the same students all day. Comparing different classrooms within the same school instead of comparing different schools might also yield more valid statistical information. It is also important to note the differences in state mandated curriculum for each grade. Because each grade is tested in different subject areas, some teachers may find it easier than others to integrate EE into their classrooms.

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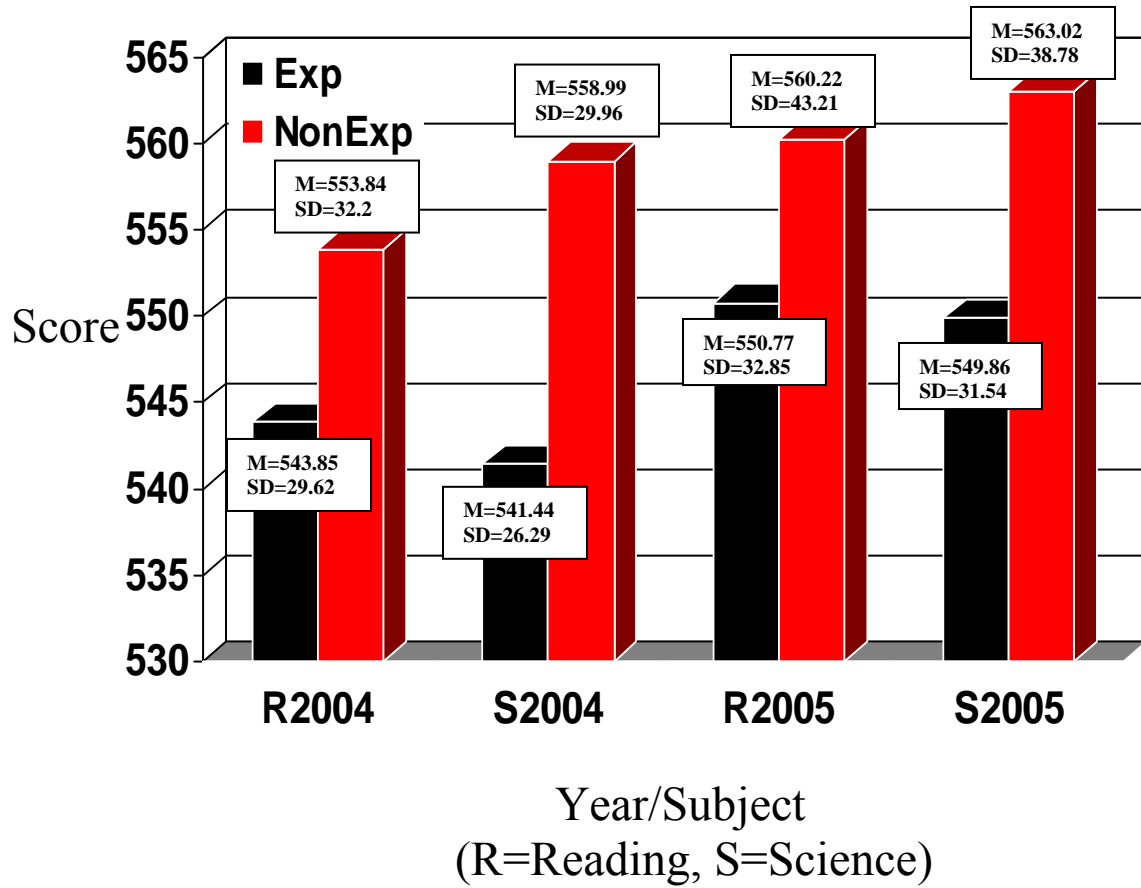
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Table 1. Teacher Questionnaire

	<u>Never</u>	<u>Once a Month</u>	<u>Twice a Month</u>	<u>Once a week</u>	<u>More than once a week</u>	<u>Everyday</u>
1. Environmentally educational experiments/ demonstrations for students	13.3%	53.3%	13.3%	13.3%	6.7%	0%
2. Have students perform environmentally educational experiments	13.3%	53.3%	13.3%	13.3%	6.7%	0%
3. Go on environmentally educational field trips (ex. Blackacre). If so, please list some examples.	40%	13.3%	6.7%	0%	6.7%	0%
4. Do activities outside the classroom such as gardening or walking?	6.7%	6.7%	20%	0%	13.3%	53.3%
5. Have your students write in Journals about these experiences	6.7%	46.7%	6.7%	13.3%	20%	0%
6. About how often do students free-write about the environment (including activities they have participated in such as environmental field trips?)	6.7%	46.7%	13.3%	6.7%	13.3%	0%

Figure 1. Comparison of mean CATS Score for 2004-2005 and 2005-2006

Comparison of Mean CATS Scores for Two School Years



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