FOR MORE INFORMATION ABOUT GREEN SCHOOLS VISIT: WWW.MAEOE.ORG

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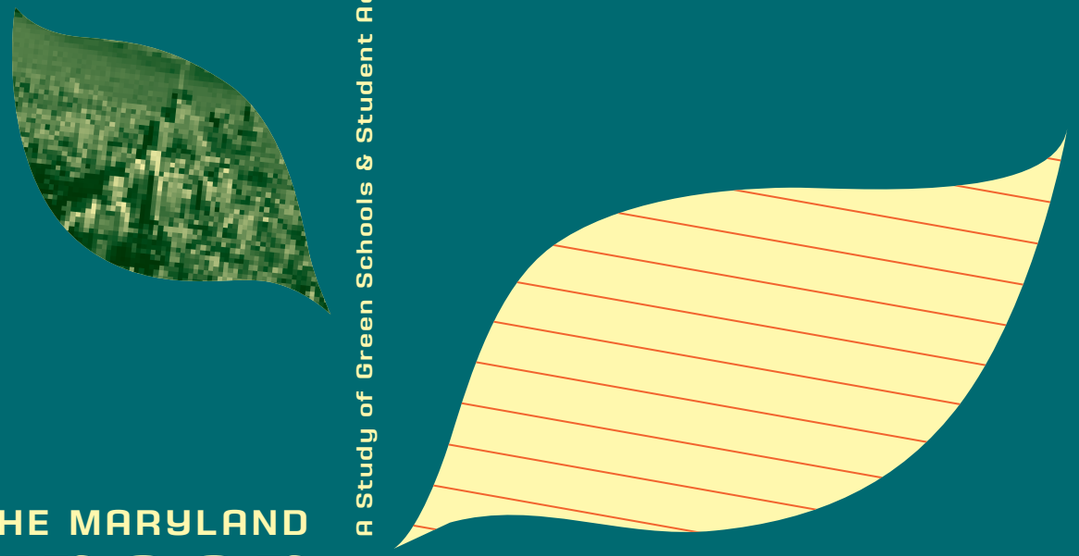
A Study of Green Schools & Student Academic Achievement



THE MARYLAND green SCHOOL AWARD PROGRAM

Celebrating Excellence in Environmental Education

Prepared by
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The Maryland Association for Environmental & Outdoor Education

about MAEOE

FOUNDED IN 1984 AND INCORPORATED AS A NONPROFIT ORGANIZATION IN 1993, THE MARYLAND ASSOCIATION FOR ENVIRONMENTAL AND OUTDOOR EDUCATION (MAEOE) MISSION IS TO ENCOURAGE, TRAIN, AND SUPPORT MARYLAND EDUCATORS TO BUILD A CITIZENRY THAT UNDERSTANDS & IS RESPONSIBLY ENGAGED IN PROMOTING SUSTAINABILITY, ADDRESSING HUMAN NEEDS AND CONSERVING THE EARTH'S NATURAL RESOURCES.

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A STUDY OF MARYLAND GREEN SCHOOLS & STUDENT ACADEMIC ACHIEVEMENT

report summary

BACKGROUND

The Maryland Green School Award Program recognizes and celebrates Maryland schools that make a commitment to environmental education. To qualify for the Green School Award, a school must prepare its students to develop the knowledge and skills needed to act on current and future environmental challenges. The program uses the environment as a framework for integrating mathematics, the sciences, reading, writing, social studies, and the arts as part of the regular curriculum. Students implement projects of their own design on their school grounds and within the community.

PREVIOUS RESEARCH

Evidence from previous research (Lieberman & Hoody 1998), indicates that using the environment as an integrating context for learning has far-reaching benefits, including increased student achievement in science and social studies as measured by standardized tests, increased student attendance, and a decrease in the number of student disciplinary referrals.

PROCEDURES

This study examines the relationship between Green School designation and student academic achievement as measured by the Maryland Student Assessment (MSA). This study uses a hierarchical regression model to "control" for differences in schools socioeconomic status and percentage of students receiving special education services.
Four hierarchical regressions were performed, examining the relationship between the designation of a school as a Green School and achievement in fifth and eighth grade reading and mathematics. The question investigated whether or not there are any differences in achievement beyond that afforded by differences in socioeconomic status and percentage of student receiving special education services, factors shown to significantly affect achievement.

RESEARCH FINDINGS

The results indicate that Maryland Green School designation significantly correlates with higher reading achievement in fifth grade; higher reading achievement in eighth grade; and higher math achievement in eighth grade. Designation as a Green School did not correlate significantly with higher fifth grade mathematics scores. **This study concludes that there is a positive relationship between achievement and a Maryland Green School designation.**

the maryland green school award program overview

"Involving students in environmental education connects students to the community they live in, both locally and globally. Through authentic activities students examine their role in the community and the environment. They find their "sense of place" in the world through exploring the interconnectedness of life and by seeing how they and their activities integrate into the total environment. It is a two-way street. The students grow from knowledge of their community and environment, and both of these, in turn, grow from the student involvement in the Maryland Green School Award Program."

— GEORGE RADCLIFFE, ***Centerville Middle School***

The Maryland Green School Award Program recognizes and celebrates Maryland schools that make a commitment to environmental education. To qualify for the Green School Award, a school must prepare its students to develop the knowledge and skills needed to act on current and future environmental challenges. Students are involved in designing their own projects, which are embedded within the regular curriculum and applied to their own school and community.

The Maryland Green School Award Program was announced in 1998 by the Governor's Office. The program was developed by a diverse team of educators representing the Maryland Association for Environmental and Outdoor Education, the Office of the Governor, the Maryland Association for Student Councils, and the Maryland Departments of Education and Natural Resources. It is administered by the Maryland Association for Environmental and Outdoor Education.

As of June 2004, there are 102 Green Schools throughout Maryland, representing nearly every school system in the state. Each March, a committee of environmental education leaders and educators from across the state reviews the applications. The review process is non-competitive. All schools that demonstrate they have adequately met the required criteria are recognized as Green Schools at the annual awards ceremony held each spring. After three years in the program, schools are asked to complete a re-application to show how their environmental education activities have been sustained.

characteristics of maryland green schools

Biology classes at Plum Point Middle School in Calvert County researched and grew submerged aquatic vegetation in their classrooms as part of the "Grasses in Classes" project sponsored by the Maryland Department of Natural Resources and the Chesapeake Bay Foundation. Students then planted the grasses in the Bay to help improve the overall water quality of the Chesapeake Bay.

Students from John Poole Middle School in Montgomery County studied their school's energy consumption. They designed and implemented a program that reduced their school's electricity consumption approximately 25 percent, saving their school thousands of dollars. The students were surprised and proud of their important contribution to the school's energy conservation and cost savings.

CURRICULUM AND INSTRUCTION

The Maryland Green School Award Program provides a model for environmental instruction and stewardship. Students have opportunities at all grade levels and across disciplines to learn about, study, and address environmental issues in the classroom, on the school site, and in the local and regional community. The school recognizes and celebrates student and staff achievement.

OPERATION AND DESIGN OF SCHOOL BUILDING AND GROUNDS

Maryland Green Schools model environmental and conservation Best Management Practices in building and landscape design and operation. Green School buildings and grounds are managed and maintained to ensure that students and staff enjoy the benefits of clean air, clean water and a healthy learning environment. Green Schools model at least four of the following eight practices in their school operation:

- WATER CONSERVATION AND WATER POLLUTION PREVENTION
- ENERGY CONSERVATION
- SOLID WASTE REDUCTION AND RECYCLING
- SAFE USE OF CHEMICALS
- HABITAT RESTORATION
- BUILDING STRUCTURES FOR LEARNING ABOUT THE ENVIRONMENT
- THE ENCOURAGEMENT OF RESPONSIBLE TRANSPORTATION
- HEALTHY SCHOOL ENVIRONMENT

SCHOOL COMMUNITY PARTNERSHIPS

Maryland Green Schools encourage and support student, staff, and community partnerships in designing and implementing projects and programs. The community becomes the students' living laboratory, and the students begin to make the connection between their classroom studies and their own lives. By winning the Maryland Green School Award, the school also raises public awareness in the community, making its impact felt well beyond the classroom.

Roland Park Country School in Baltimore City joined the Baltimore Parks and Recreation Department in a project called "Bring the Bay to Your Backyard." Students served as community educators, teaching younger students about using best environmental practices in their daily lives.

The children and parents—and community—have learned to look at this world a little differently. The everyday things around us are not taken for granted as much. People have seen the accomplishments of the children and are aware that they can do the same things in their own backyards. They also want to be a part of making a difference. These projects have helped to bring the community together for a common cause, with wonderful results and a feeling of success in working together.

—PAM SHERFEY, ***Linton Springs Elementary School***

previous research relevant to green schools:

EVIDENCE FOR ACHIEVEMENT EFFECTS

Sound, high quality environmental education is good not only for the environment, but also for student achievement. Green Schools influences student learning and achievement through four channels:

- STUDENT MOTIVATION
- TEACHER, STUDENT & ADMINISTRATION COLLABORATION
- SCHOOL AND COMMUNITY COLLABORATION
- REWARD, RECOGNITION & CELEBRATION

"Green Schools provides the opportunity for students to learn by applying their knowledge and skills in the context of what they value."

— STEVE HEACOCK, *Carroll County Outdoor School Director*

'The Green School application process itself is extremely valuable. It allows and requires students, staff, and parents to examine and evaluate aspects of the school's operation and curriculum and how to integrate or promote sound environmental practices. Ironically that is one of the few opportunities where that happens in the educational community."

—GEORGE RADCIFFE, *Centreville Middle School*

STUDENT MOTIVATION

Research on effective schools shows that a student's sense of connectedness to school and community is an important element of achievement. Teachers from Green Schools repeatedly report that student interest in learning increases when students engage in authentic environmental investigations in their community and on their school grounds. Making learning relevant promotes motivation and helps students to see how skills can be applied in the real world (Lepper, 1988). When students see that content covered in their coursework can help to explain how actual, local problems were created or solved, they can sense the real power of academic knowledge and its potential to affect human lives.

COLLABORATION

The research on effective schools indicates that teachers work more effectively, efficiently, and persistently when they work collaboratively. Schools perform better when teachers work in focused, supportive teams (Fullan, 1991). Green Schools engage a team of parents, students, and school administrators in the on-going monitoring of school activities. Maryland Green School teachers find that the process of becoming a Green School allows for opportunities for cross-curricular collaborations.

SCHOOL COMMUNITY PARTNERSHIPS

For over 30 years, research has demonstrated that when parents, schools, and communities work together, children succeed in school (Newman and Wehlage, 1995). Activities that involve students in the community are relevant and thus more interesting. Students tend to work harder when they feel they can make a difference. Community resources strengthen the school program (Leithwood 2002, and Honig 2001), while students serve their community with a sense of purpose.

REWARD, RECOGNITION AND CELEBRATION

Research shows that one of the most effective means to cultivate a successful goal-oriented school is for staff to regularly reinforce and recognize their achievements, both privately and publicly. A clear school mission is one of the recurring themes from effective school research (Fullan, 2000). Regular public appreciation of a school's quality efforts can make a greater difference in student learning, possibly more than any other factor (Blasé and Kirby, 1992). Bestowing Green School awards celebrates the success of the students and the school in their community. The award designation brings public acclaim to these schools and provides recognition for their communities.

"Teachers at Mechanicsville Elementary were initially reluctant to spend any additional time in meetings, but when they saw their collective focus, increased involvement of their parents, the meetings became more meaningful. They began to invest more of their time and effort into the process. In the end, the students, administrators, parents and teachers were pleased with the results of their collective effort. Once I started seeing the obvious enthusiasm for environmental topics with my students and the other staff, I was hooked. This is the first time I have seen my students get so involved and committed to work for a common goal."

—BARBARA ABELL, *Mechanicsville Elementary*

research methodology & findings

THIS RESEARCH ADDRESSES THESE

4

FOUR QUESTIONS:

1. DOES DESIGNATION AS A MARYLAND GREEN SCHOOL CORRELATE WITH INCREASED STUDENT ACHIEVEMENT IN FIFTH GRADE READING SCORES?
2. DOES DESIGNATION AS A MARYLAND GREEN SCHOOL CORRELATE WITH INCREASED STUDENT ACHIEVEMENT IN FIFTH GRADE MATHEMATICS SCORES?
3. DOES DESIGNATION AS A MARYLAND GREEN SCHOOL CORRELATE WITH INCREASED STUDENT ACHIEVEMENT IN EIGHTH GRADE READING SCORES?
4. DOES DESIGNATION AS A MARYLAND GREEN SCHOOL CORRELATE WITH INCREASED STUDENT ACHIEVEMENT IN EIGHTH GRADE MATHEMATICS SCORES?

METHODOLOGY

This research was conducted as an exploratory correlation research study (Campbell & Stanley, 1966), using hierarchical regression to determine if Green Schools are more likely to have higher mathematics and reading achievement scores than non Green Schools. This method accounts for the differences in socioeconomic status (SES) and percentage of student receiving special education services.

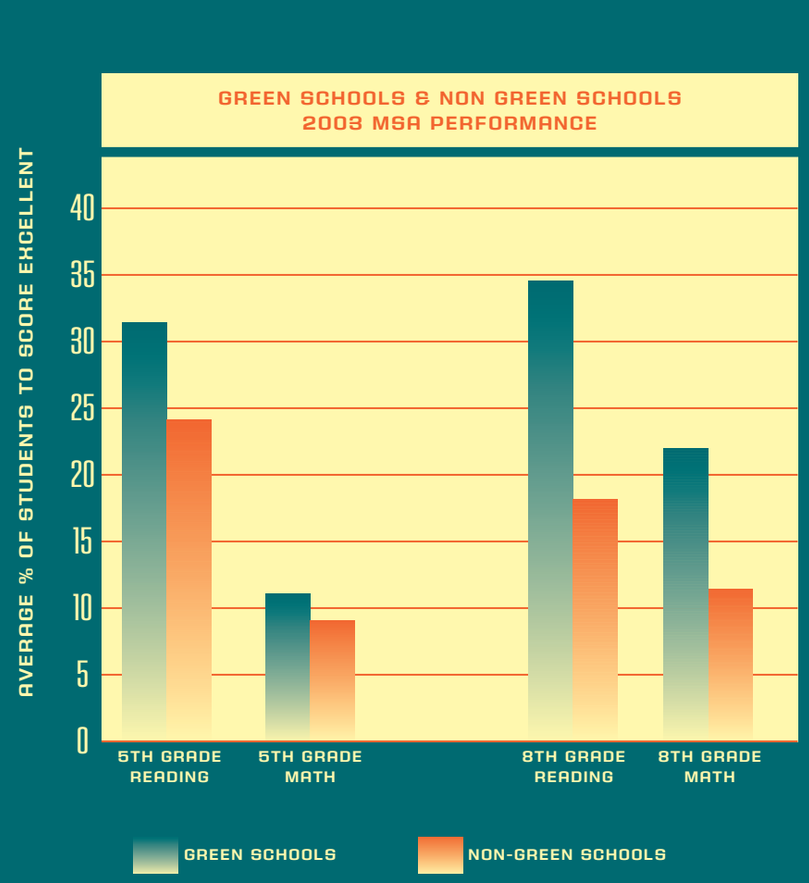
The data for this study was collected from the Maryland State Department of Education (MSDE) website. A data file containing the school identification number, percentage participation in special education services, percentage receiving Title One services, and percentage of students to score excellent in reading and mathematics on the 2003 Maryland School Assessment, was compiled. All data was imported into a Statistical Package for Social Science (SPSS) data file. Data analysis for each question included descriptive statistics and hierarchical regression.

VARIABLES IN THE STUDY

The dependent variable in this study is fifth and eight-grade achievement as measured by The Maryland School Assessment (MSA). The MSA is a criterion-referenced test that measures student proficiency and advanced proficiency on the Maryland content standards in reading and mathematics. In March 2003, the state's third, fifth and eighth graders took the Maryland School Assessment in reading and math. Two independent variables, identified in the literature as contributing to student achievement, were entered into the model first: these are socio-economic status as measured by the percentage of students receiving Title One services and percentage of student receiving special services. The principal independent variable in this study was a school's designation as a Green School.

DESCRIPTIVE STATISTICS

The percentage of students to score excellent from all Maryland Green Schools and non-Green Schools is presented in Figure 1. Green Schools have a higher percentage of students scoring excellent in fifth and eighth grade mathematics and reading than non-Green Schools. The presentation of the results of the regression in the findings section demonstrates that these differences are not due to school and student characteristics.



FINDINGS

1. RESEARCH QUESTION ONE:

Does designation as a Maryland Green School correlate with increased student achievement in fifth grade reading scores?

FINDING: YES.

The Green Schools had 5.7% higher average number of students scoring in the excellent range on MSA than Non Green Schools. Thirty-two percent of the variation in MSA reading scores is due to the socioeconomic level of the school and the percentage of students receiving special education services and designation as a Green School. The variables Title One and Special Education explained 31.2% of the variation in fifth grade reading scores. Designation as a Green School explains an additional 4.0% of the variance in fifth grade reading scores.

2. RESEARCH QUESTION TWO:

Does designation as a Maryland Green School correlate with increased student achievement in fifth grade mathematics scores?

FINDING: NO.

The results indicated that there was not a significant difference between Green Schools and non-Green Schools mathematics scores beyond that afforded by differences in socioeconomic status and percentage of students receiving special services.

3. RESEARCH QUESTION THREE:

Does designation as a Maryland Green School correlate with increased student achievement in eighth grade reading scores?

FINDING: YES.

Green Schools had 9.9% higher average of students scoring in the excellent range on MSA than non-Green Schools. Twenty-six percent of the variation in MSA reading scores is due to the socioeconomic level of the school, the percentage of students receiving special services and designation as a Green School. The variables Title One and Special Education explained 22.5% of the variation in eighth grade reading scores. Knowing that a school is a Green School helps explains an additional 3.4% of the variance in eighth grade reading scores.

4. RESEARCH QUESTION FOUR:

Does designation as a Maryland Green School correlate with increased student achievement in eighth grade mathematics scores?

FINDING: YES.

Maryland Green Schools students had 5.1% higher average than students in non-Green Schools. Sixteen percent of the variation in MSA reading scores is due to the socioeconomic level of the school, the percentage of students receiving special education services and designation as a Green School. The variables Title One and Special Education explained 14.7 % of the variation in eighth grade math scores. Knowing if a school is a Green School helps explain an additional 2.5% of the variation in mathematics score.

DISCUSSION

The results indicate that a Maryland Green School designation significantly correlates with higher reading achievement in fifth grade; higher reading achievement in eighth grade; and higher mathematics achievement in eighth grade. Designation as a Green School did not correlate significantly with higher fifth grade mathematics scores.

The results of this preliminary study support those of previous researchers (Lieberman and Hoody, 1998). The increase in student achievement is attributed to a number of factors that are inherent in the nature of environmental education. Students see relevance to their immediate community and themselves, they are highly motivated and eager to engage in activities that make a difference. The planning and implementation of the projects calls on a wide range of knowledge and skills, providing an opportunity for all students to participate in a way that maximizes their talents. Projects involve skills ranging from organizational ability and leadership, to artistic design, preparing budgets, preparing the site itself, writing letters, grants, and press releases, and preparing for public presentations.

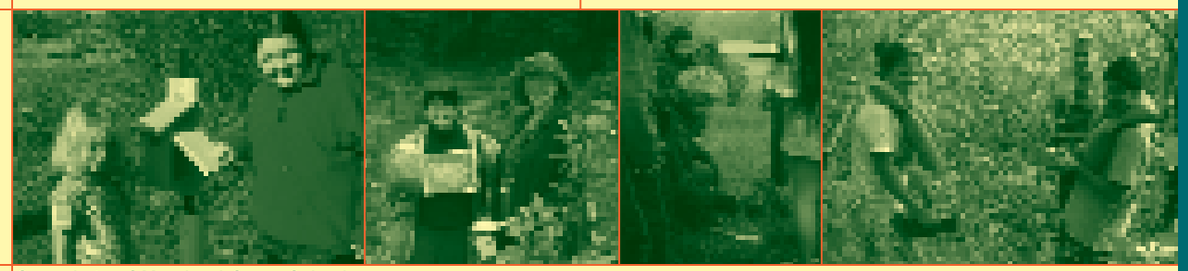
Research will continue as data from MSA is generated and a long- term trend can be investigated. Additional data will become available for grades 3 through 8 as the mathematics and reading requirements of No Child Left Behind are implemented. Further research must be done to investigate the discrepancy in mathematics achievement in grade 5. There are two working hypotheses at this time. The first hypothesis is that, because the mathematics that is incorporated into science instruction at grade 5 must, by necessity, be the math skills learned the previous year, only grade 4 math skills are being tested. A second hypothesis is that the type of mathematics skills used within science class may reinforce skills from lower grades, but do not use more rigorous skills as students move through school. For example, estimating and determining weight, capacity, or mass is a common skill used throughout science classes through the high school level. This skill is, however, first introduced in grade 3. Therefore, science teachers must incorporate increasingly rigorous math skills into the data collection process. A study of the relationship between the mathematics used in science classes and the mathematics curriculum may shed light on this question.

SHIPLEY'S CHOICE ELEMENTARY SCHOOL, ANNE ARUNDEL COUNTY

Students from Shipley's Choice Elementary have had first hand experience learning about water pollution and the design, ecology and maintenance of bogs. Their school site is the location of a stormwater management pond designed and funded to slow and filter stormwater before reaching the Severn River. As a result of this project, government, the business community, and Shipley's Choice students are acutely aware of the importance individuals have in the protection of the Chesapeake Bay. In addition, students raised and planted hundreds of Atlantic white cedar trees (a threatened species) and cranberry plants to enhance the wetlands that were created through a retro-fit of the stormwater management pond. They learned about the benefit of these species on the water shed. Their involvement in this project not only increased their knowledge of water ecology, it doubled the population of the Atlantic White Cedar on the western shore of the Chesapeake Bay.

CENTREVILLE MIDDLE SCHOOL, QUEEN ANNE'S COUNTY

Students from Centreville Middle School act as the data center for the Chester River Project. Twice a month, a group of students monitors three sites along the River and record levels of dissolved oxygen, pH, nitrates, salinity, and temperature. All data is entered into a spreadsheet, analyzed and the results are presented in the Chester River Annual Report. The report consists of an explanation of each test, the data, interpretations of the data, and graphs depicting the results. Students also present their findings to the community and government agencies.



Snapshots of Maryland Green Schools

PERRY HALL ELEMENTARY SCHOOL, BALTIMORE COUNTY

Perry Hall Elementary offers students hands-on opportunities to learn about all the school subjects by incorporating the environment into the curriculum: each grade has a chance to research, observe, or survey an aspect of the school grounds, which are being modified to be environmentally friendly. Planting trees, growing bay grasses and building of a rain garden, a meadow, and a large garden are the action projects that the students have completed in order to improve the school yard and health of the Bay. Several classes have also created projects to help the local community. For example, the fifth grade students have been involved estoration project on a local stream. They have spent time studying the local ecosystem and then planning ways to make the stream a healthier environment. Last year the fifth grade students also worked with the chief custodian to create "reef balls" out of cement that were lowered into the bay as part of an artificial oyster reef. Parents, members of the community, and local organizations have worked together to create a curriculum that sparks enthusiasm as the challenges of environmental protection are met.

BEL AIR HIGH SCHOOL, HARFORD COUNTY

The environment is a true, cross-curricular thematic concept at Bel Air High School in Harford County. Students can choose from a variety of Environmental Science courses and can put into practice what they learn. The 100 acre campus is surrounded by the town, providing many opportunities for involving the students and community in environmental investigations. Bel Air High School established partnerships with the Town of Bel Air and Harford County to create numerous environmental enhancements on campus. For example, students designed and built a 700 foot crushed stone walking trail through the forest at Homestead Elementary School, planted nearly a thousand native trees and shrubs on campus, installed native plant flower beds, performed post-construction erosion control on stadium grandstands project and maintained a tree nursery. "Being recognized as a Green School is a source of pride in the Bel Air School community. Each year more and more teachers and students are expressing interest in the environmental projects being conducted in and around the school. In fact, several teachers and students have used the knowledge and expertise gained by working on school projects to complete habitat projects in their homes,"explains Mr. Glen Hedelson, Bel Air teacher. This transfer of knowledge and skills into personal action is the hallmark of a successful environmental education project.

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CONCLUSION

This study concludes that there is a positive, statistically significant relationship between higher achievement and Maryland Green School designation, as indicated by MSA reading and mathematics scores.

IMPLICATIONS FOR EDUCATIONAL PRACTICE

Maryland COMAR 13A.04.17.00. Title 13A, requires each local school system "to provide a comprehensive, multidisciplinary program of environmental education within current curricular offerings to be taught at least once each in the early, middle, and high school learning years."

This study supports prior research that schools that incorporate environmental education across the curriculum are associated with higher overall academic achievement. Using the schoolyard, community, and local environment as an integrating context for instruction is associated with overall higher student achievement, regardless of student background differences.