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"Attitudes most difficult to transfer through elementary school environmental education programs are those that concern natural ecological processes such as the life-death cycle of living organisms" - John C. Benjamin, George H. Moeller, and Douglas A. Morrison

Measuring Environmental Attitudes of Elementary School Students

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ABSTRACT. A modified semantic differential was developed to measure environmental attitudes of sixth-graders. Classes were selected to represent different socioeconomic and residence backgrounds and degrees of previous exposure to structured environmental programs. Results indicate that: exposure to environmental education fosters favorable environmental attitudes; socioeconomic background and exposure to environmental education do not influence attitudes toward familiar, nonwater natural elements; urban students from low socioeconomic neighborhoods are unfamiliar with natural processes involving water resources; attitudes most easily transferred identify man as a contributor to environmental problems; and attitudes most difficult to transfer deal with ecological processes. Results provide a way to measure children's environmental attitudes and suggest a way to develop environmental programs for specific student groups.

THE INCREASED EMPHASIS placed on environmental education in public schools is an important development of the contemporary ecology movement. The transfer of knowledge about environmental systems is basic to successful environmental education programs. But an equally important result of environmental education is the extent to which the students' attitudes are changed by their exposure to such programs (Caldwell 1970). Studies have been carried out to test retention and cognitions, but the effect on attitudes of exposure to environmental education has gone largely unexplored.

A device for measuring attitudes toward the environment would be of value for identifying students' attitudes before they embark on an en-

vironmental education program. With this information, the instructor could put additional effort into areas where the students' environmental attitudes are poor, and spend less time on topics toward which they already have favorable attitudes. The same measuring device could be used to determine change in environmental attitude after the program has been completed.

The purpose of this study was to develop and test a method of detecting differences in elementary school children's environmental attitudes, and to use the method to find possible reasons for differences between children exposed to structured environmental education programs and those not exposed.

THE STUDY GROUPS

Three study groups were drawn from sixth-grade public school students—one school within the city of Syracuse, New York, and two schools in a nearby suburban community. A fourth study group consisted of graduate students and faculty at the State University of New York College of Environmental Science and Forestry.

The first study group consisted of 35 sixth-grade students from a school in an aging residential neighborhood in Syracuse, New York. The median family incomes for the two census tracts from which the students were drawn were \$7,241 and \$7,600 and the median housing values were \$12,500 and \$15,200 (*U.S. Bureau of Census 1970*). This group had not been exposed to a structured environmental education program.

The second group consisted of 37 students from a sixth-grade class at a school 2 miles from the center of a suburban community. The newly constructed building is in a rural setting, with a woods bordering on the school playground. The median family income in the suburban community was \$14,625 and the median housing value was \$32,000. No special effort had been made to teach the students about conservation or the environment.

The third student group consisted of 18 sixth-grade students who attended a renovated former high school near the center of the suburban community. The median family income and the median housing value were the same as for the other suburban school. This group had been engaged in a coordinated environmental education program during the school year before the study.

The final group, our criterion group, was made up of 12 faculty members and graduate students from the State University of New York College of Environmental Science and Forestry at Syracuse University, Syracuse, New York. It was assumed that these individuals, all of whom had at least 5 years of college-level study in some aspect of the natural environment, held ideal environmental attitudes.

STUDY PROCEDURE

The optimal device for measuring environmental attitudes should sample attitudes on a wide range of environmental topics. The

method should measure specific attitudes about environmental topics (e.g. the role of decomposition, air pollution, etc.). It should also measure the intensity of an attitude so that change in attitudes could be detected.

To meet these criteria, a technique was developed that used 24 color slides of various natural and man-dominated environments and elements in these environments. A modified form of the semantic differential was used to solicit attitudes toward the scenes (*Osgood et al. 1957*). The semantic differential was adjusted to the comprehension level of the sixth-grade students. The test instrument was set up so that students could judge each of the slides in terms of three adjective pairs; beautiful-ugly; bad-good; happy-sad. The range of alternatives between descriptive adjective pairs on each semantic scale was limited to five: e.g., *very good, good, neither good nor bad, bad, and very bad*.

The order in which the adjective pairs appeared for each of the 24 slides was randomly determined. However, in each instance the polarity of the second adjective pair was reversed. Combined with the random order of occurrence, this reversal of polarity forced the students to read each of the alternatives carefully. The reversal also helped to break up response patterns like marking all the choices in one column. Thus, a typical set of scales for a slide was:

Very beautiful	Beautiful	Neither ugly nor beautiful	Ugly	Very ugly
Very bad	Bad	Neither good nor bad	Good	Very good
Very happy	Happy	Neither hap- py nor sad	Sad	Very sad

DATA ANALYSIS

Individual student responses on each scale were assigned numerical scores as follows:

- 1 = VERY: Good, beautiful, or happy
- 2 = Good, beautiful, or happy
- 3 = NEITHER: Good nor bad
Beautiful nor ugly
Happy nor sad
- 4 = Bad, ugly or sad
- 5 = VERY Bad, ugly or sad

An average response—one for each slide scene—was obtained from each subject by adding the three scale score responses and dividing by three. This score provided an indication of the student's relative attitude toward the particular slide scene.

Scheffe's method for multiple comparisons (Guenther 1964) was used to compare statistically the group response distribution of each elementary school group with those of the criterion group for each scene. The null hypothesis tested was that the response distribution of each of the student groups was the same as that of the criterion group. The magnitude and direction of differences between the responses of individual elementary school groups and those of the faculty and graduate student criterion group provided the basis for evaluating the impact of organized environmental education on elementary school students' environmental attitudes.

STUDY RESULTS

In discussing results, the study groups will be referred to as follows:

Criterion—Faculty and graduate student group

High E.E.—High socioeconomic suburban group with environmental education

High N.E.E.—High socioeconomic suburban group with no environmental education

Low N.E.E.—Low socioeconomic urban group with no environmental education

ENVIRONMENTAL ATTITUDES, EDUCATION AND SOCIOECONOMIC BACKGROUND

The average group responses to each of the 24 slide scenes and results of statistical tests are shown in table 1. Scenes in table 1 are arranged so that statistically significant differences between student groups and the criterion group can be examined for possible factors that underlie particular attitudes, e.g., whether group differences are due to exposure to organized environmental education programs, to socioeconomic or urban background, to residence exposure, or, perhaps, to age.

Attitudes toward scenes 1 through 9 (table 1) did not show statistically significant differences between any of the student groups and the criterion group. Most notably, these scenes describe nonwater natural landscape features and wildlife. The littered street scene also appears in this category. Environmental education programs that concentrate on these aspects of the environment may help to improve student understanding of the processes represented but would not substantially change their already desirable attitudes.

Students in the Low N.E.E. group held significantly different attitudes toward scenes 10 through 14 from those of the other groups (table 1). This difference may be accounted for by their lack of everyday exposure to the processes shown in these scenes. Although seashores and swamps are valuable elements of natural environments, urban students from lower socioeconomic groups are less likely to be exposed to them than suburban students from higher socioeconomic backgrounds. Except for the scene showing pine sawfly larvae, all scenes in this group involve water in some form. It would seem that for the most immediate benefit, an environmental education program directed toward inner city school children should be developed around water resource uses.

Regardless of socioeconomic background, students who were not exposed to the environmental education program held significantly higher attitudes about aspects of the environment shown in scenes 15 through 21 (table 1). Most of these scenes show man-altered environments or man-made inventions that may have adverse environmental effects. Here lies the most dramatic impact of an organized environmental education program—to clarify the role that man plays in influencing the operation of natural environmental systems.

Regardless of socioeconomic background, residence, or exposure to environmental education, all student groups held significantly different attitudes from those of the criterion group toward scenes 22 through 24 (table 1). The scenes that showed natural processes, fungi on a log and the skeleton of a deer, were given lower attitude ratings, and the scene of housing development was given a higher attitude rating by student groups than by the criterion group. Thus, study results suggest that natural environmental processes—recycling through the

Table 1.—Average responses to slide scenes and statistical differences between groups

Slide scene	Group mean attitude toward scene			
	Criterion	High E.E.	High N.E.E.	Low N.E.E.
1. Mountain lake	1.56	1.65	1.63	1.74
2. High mountains	1.64	1.59	1.55	1.91
3. Deer in field	1.67	1.39	1.34	1.48
4. Farm country	1.72	1.57	1.46	1.46
5. Desert	2.00	2.33	2.25	2.57
6. Shed in woods	2.00	1.80	2.12	2.38
7. Prairie dog	2.14	1.69	1.65	2.21
8. Rattle snake	2.58	3.02	3.00	3.10
9. Littered street	4.42	4.50	4.59	4.21
10. Seashore	1.69	2.09	1.89	2.51*
11. Swamp	2.47	2.96	3.21	3.62*
12. Pine sawfly larvae	3.06	3.37	3.77	4.15*
13. Sludge pit	4.14	4.00	4.05	3.06*
14. Polluted stream	4.33	4.06	3.70	3.52*
15. Subway station	3.33	3.02	2.81*	2.54*
16. Downtown street	3.53	2.96	2.73*	1.90*
17. Airport	3.56	3.07	2.71*	2.30*
18. Jet airplane	3.64	2.98	2.70*	2.05*
19. City buildings	3.89	3.45	2.87*	2.41*
20. Old houses	4.09	3.48	3.39*	3.25*
21. Air pollution	4.20	3.79	3.41*	2.84*
22. Fungi on log	2.08	2.72*	3.08*	3.65*
23. Skeleton of deer	2.78	3.61*	3.76*	3.86*
24. Housing development	3.64	2.37*	2.11*	1.52*

*Response difference statistically significant at the .05 level between criterion and student group using Sheffe's method.

life cycle—cannot easily be taught to elementary school children. Similarly, elementary school children have difficulty understanding the impact of man-made alterations on the functioning of natural ecosystems.

RESULTS BY KIND OF SCENE

The 24 slides were classified as (1) natural environments, (2) wildlife, (3) natural processes, (4) man-altered environments, (5) pollution, and (6) modern inventions (table 2). The following differences in responses were found within these categories:

Natural Environments

The natural environments category contained five scenes of natural areas with no evidence of man's influence (table 2). The Low N.E.E. group gave significantly more negative responses to the swamp and seashore slides than did the criterion group (table 1). It might be surmised that the children in this group, from urban families with limited income, had not had the opportunity to visit the seashore as frequently as the children from higher income families.

Table 2.—Scenes classified according to environmental category depicted^a

<i>Natural Environments</i>	<i>Modern Inventions</i>
Mountain lake (1)	Airport (17)
High mountains (2)	Jet airplane (18)
Desert (5)	
Seashore (10)	<i>Man-Altered Environments</i>
Swamp (11)	Farm country (4)
	Shed in woods (6)
<i>Wildlife</i>	Subway station (15)
Deer in field (3)	Downtown street (16)
Prairie dog (7)	City buildings (19)
Rattlesnake (8)	Old houses (20)
	Housing development (24)
<i>Natural Processes</i>	<i>Pollution</i>
Pine sawfly larvae (12)	Littered street (9)
Fungi on log (22)	Sludge pit (13)
Skeleton of deer (23)	Polluted stream (14)
	Air pollution (21)

^a Number in parenthesis refers to scene number in Table 1.

Therefore, they responded from a position of unfamiliarity, which, in this case, fostered a negative environmental attitude. Students in the High E.E. and High N.E.E. groups shared similar attitudes about these scenes. Thus, results indicate that environmental education

programs do not substantially influence already favorable student attitudes toward natural environments.

Wildlife Scenes

The wildlife category contained three slide scenes (table 2). No statistically significant differences were found between any of the student groups and the criterion group. All student groups, regardless of their exposure to environmental education or socioeconomic background, rated wildlife scenes in the same way as the criterion group.

Natural Processes

The three slides in the natural processes category were used to determine student attitudes toward the vital processes of returning nutrients to the soil through the natural life cycle (table 2). The Low N.E.E. group held significantly more negative attitudes toward all three of these scenes than the criterion group. Both the High E.E. and High N.E.E. groups held significantly more negative attitudes toward the fungi on log and skeleton of deer scenes (table 1). These results suggest that regardless of socioeconomic level or previous exposure to environmental education programs the attitudes of sixth-grade elementary school students toward natural processes that operate in environmental systems are relatively consistent.

Modern Inventions

The modern inventions category contained two slides of airplanes (table 2). These scenes were included to ascertain students' attitudes toward modern inventions that account for a great deal of environmental damage. Both the High N.E.E. and Low N.E.E. held significantly more favorable attitudes toward these two scenes than the criterion group. Noise and air pollution caused by airplanes do not appear to be recognized by students who are not exposed to environmental education. These subjects were covered during the environmental education program of the High E.E. group. Their attitudes compared closely with those of the criterion group (table 1).

Man-altered Environments

This category contained seven slides showing human alterations of the natural environment of various intensities (table 2). The scenes rang-

ed from very little alteration (shed in woods) to complete human domination of the environment (city buildings).

Except for sheds in woods and farm country, the High N.E.E. and Low N.E.E. groups held significantly more positive attitudes toward all scenes depicting man-altered environments than did the criterion group. The response of the High E.E. group was nearly identical to that of the criterion group on all scenes, except that they held a significantly more positive attitude toward the housing development scene (table 1). These results suggest that organized environmental education programs significantly alter students' attitudes toward the effect of man's development activities on environmental systems.

The attitudes of all three of the student groups differed most from those of the criterion group on the scene depicting housing development. All student groups held significantly more positive attitudes than the criterion group did. The criterion group evidently saw much more in this scene than did the students. Regardless of exposure to organized environmental education programs, elementary school children appear to lack the sophistication of thought required to associate urban housing development with overpopulation and the quality of life.

Pollution

Environmental pollution was shown in four slide scenes (table 2). The Low N.E.E. group held significantly higher attitudes toward three of the four scenes than did the criterion group. Both the High E.E. and High N.E.E. groups had attitudes like those of the criterion group (table 2). With the possible exception of the littered street, the scenes in the pollution category should have been equally familiar to all the subjects. These results suggest that attitude toward pollution is more a function of residence than of exposure to environmental education.

All test groups expressed their most negative attitude toward the littered street scene. The fact that all groups unanimously gave this scene the most negative response is perhaps testimony to the numerous and widely publicized anti-litter campaigns waged over recent years.

The results obtained in this category show a wide disparity in the subject's abilities to distinguish between a natural and polluted condi-

tion. The criterion group made a very obvious and emphatic distinction between a natural area with no evidence of environmental damage and an almost hopelessly polluted situation. The High E.E. group's reactions were quite obvious but not as emphatic. By comparison, the High N.E.E. group made little differentiation. The Low N.E.E. group actually held a more positive attitude toward the polluted stream than they did toward the swamp.

CONCLUSIONS

The following conclusions appear to be appropriately drawn from results of this study:

- The slide evaluation technique is a workable method for measuring sixth-grade school children's environmental attitudes.
- The concepts on which the attitude-measuring method depends do not appear to be difficult for elementary school students to understand or accept.
- Children exposed to an organized environmental education program held attitudes about various environmental conditions significantly different from those of children who received little or no exposure to environmental education. Attitudes of children who were exposed to environmental education programs were more comparable to those of college-trained environmental specialists than to those of children who had received little exposure to environmental education.

- Neither socioeconomic background nor exposure to an environmental education program influenced already favorable student attitudes toward familiar nonwater elements of natural environments.
- Children from lower socioeconomic levels and with urban backgrounds would benefit most from environmental education programs oriented toward unfamiliar natural processes, particularly water-resource uses.
- Attitudes most easily transferred through elementary school environmental education programs are those that relate the role that man plays as a contributor to environmental problems.
- Attitudes most difficult to transfer through elementary school environmental education programs are those that concern natural ecological processes such as the life-death cycle of living organisms.

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"In general, the qualitative studies find considerable positive influence for urban children in camp and outdoor education experiences. . . . The findings from quantitative studies provide a less optimistic perspective" - William R. Burch, Jr.