Florida Journal of
Educational Research
Fall 1996, Vol. 36(1) 62-70

Measuring the Environmental Literacy of High School Students

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ABSTRACT. The Florida Environmental Literacy Survey was used to determine the environmental literacy of high school students. Environmental literacy is defined as: knowing ecology (KAS); being attitudinally predisposed to the environment (ATT); valuing responsible environmental behaviors (NEB); participating in responsible environmental behaviors (AEB); and knowing political action strategies (PAR). Students averaged a score of 37% in their knowledge of ecology (KAS); held a positive attitude towards the environment (ATT); knew environmentally responsible behaviors (NEB); and some participated therein (AEB).

Students demonstrated limited knowledge of political action strategies when asked to respond to an open ended question about civic action. (PAR). The Florida Legislature has mandated that the public educational system, from kindergarten through the university, act as the primary delivery system to create environmentally literate citizens. The legislature recognized that environmental education is critical to maintaining the delicate relationships among all forms of life and to preserve the earth's capability to sustain life in the most healthful, enjoyable and productive environment possible (Florida Statutes, 229.8005, sec. 30, para. 2, 1989). The Office of Environmental Education was charged with the responsibilities (in part) to: (a) assess environmental education needs in all school districts, (b) assist with environmental education comprehensive plans, and (c) evaluate the success of student and inservice training (Initiatives Bulletin, 1990).

Within this context, an evaluation of the environmental education curriculum in two school districts in central Florida was conducted. The purposes of the evaluation were to provide: (a) an indication of the impact of the previous decades' environmental educators' efforts on the knowledge and attitudes of students, (b) a guide for curriculum development, (c) a data-based indication of needs against which program proposals can be measured, and (d) a baseline to serve researchers in the decades ahead. It should be noted that prior to the 1989 legislation, environmental education was taught primarily at the discretion of the individual school districts. Curricula, when present, varied widely and depended on the interests of individual teachers and the monetary allocations of their districts.

Method

Sample

Three hundred and seventy students (n=370) participated from 14 high schools in two central Florida districts. The two districts were selected because they: (a) are geographically contiguous, (b) represent urban and rural demographic regions, and (c) offer community-supported environmental education nature center programs employing the expertise and services of teachers/schools, park rangers/facilities, state agencies and the higher education community. The 14 participating high schools were randomly sampled from a total of 29 high schools in the two districts. The student sample was obtained using a systematic random sample of the total group of seniors in the participating schools.

Survey Instrument

The Florida Environmental Literacy Survey (FELS) was built upon the concepts presented in the "Conceptual Frameworks for Environmental Education in Florida" (East Central Florida Environmental Education Service Project, 1990). These frameworks encompass the ideas delineated in the "awareness-to-action" model for interdisciplinary environmental education. In this model, the environmentally literate individual is conceptualized as one who (a) commands cognitive and affective knowledge about his or her biological and physical surroundings, (b) possesses political know-how (Bogan & Phillips, 1989), and (c) displays a willingness to engage in responsible environmental behaviors (Hines, Hungersford & Tomera, 1987). Specifically, the FELS was designed to measure environmental literacy, defined as (a) knowing the scientific principles of ecology, (b) being aware of the potential magnitude of human impact on the biosphere, (c) showing concern for all living species, (d) valuing responsible environmental behaviors, and (e) participating in political action strategies that lead to planetary well-being (California Department of Education, 1990; Hammond, 1988; McClaren, 1989; NASSP, 1990).

The FELS is divided into six subtests, as follows: 1) the Knowledge Assessment Subtest (KAS), consisting of 23 items (score range = 0 - 25, with higher scores representing greater knowledge), is a measure of students' knowledge of the principles of ecology as offered through Florida's basic, average, and honors biology courses (Fleetwood, 1974); 2) the 27-item Attitude Survey (ATT), with a score range of 27 to 135, is a measure of general ecological attitudes (Asche, 1972); 3) the Necessary Environmental Behaviors (NEB) subtest (score range = 5 - 25, with higher scores indicating greater recognition of necessary environmental behaviors) was designed to measure the degree to which students perceive that five specific environmental behaviors (conserving water/energy; planting vegetation; political activism for environmental concerns) are necessary for planetary health; 4) the Active Environmental Behaviors (AEB) subtest (score range = 5 - 25, with higher scores representing greater participation in necessary environmental behaviors) is a self report on students' participation in these specific environmental behaviors; 5) the Political Action Rating (PAR) is a constructed-response measure of students' political action knowledge, with a score range of one to five. In the PAR, students were asked to read a newspaper article (1 paragraph in length) that suggested that a local lake was becoming too polluted for community use. Students were asked to recommend political action strategies that they might employ to gain public support for an

Political Action Rating (PAR). The open-ended responses to the PAR were evaluated by two independent raters using the following criteria: (a) data had to be collected to validate the pollution allegations, (b) a report had to be written based on the data collected in the investigation, (c) the media had to be used to apprise citizens of the situation, (d) the government had to be informed of the progress of the study and asked to intervene in the situation and (e) a strategy to ameliorate the situation had to be proposed. Participants accumulated one point for each of the five strategies mentioned.

Students demonstrated limited facility in knowledge of political action strategies. Twenty-two percent (22%) of the students in the study did not or chose not to respond to the item; 4.3% gave no response which fit the evaluation criteria. Twenty-one percent (21%) of the students suggested the validation of the newspaper's allegation that the lake was polluted. Once gathered, said data would be committed to a written report by only 2.7% of the respondents. Only 16.5% of the survey participants suggested governmental intervention. An especially troubling finding was that the suggested governmental interventions cited were controlling or punitive in nature.

Fifty-seven percent (57%) of the students indicated that the media should be used to inform citizens of the impending problem. Approximately 48% of the students reported a mechanism through which the pollution problem could be ameliorated. Very few students presented a multifaceted strategic approach to the scenario. Raters agreed that three of the 369 participants (less than 1%) offered a response that fit the entire evaluation criteria. Nine participants (less than 3%) offered four of the five elements of an effective political action strategy.

Areas of Critical Environmental Concern for Florida.

Students were asked to select three environmental problems from a list of eight that they felt were of most critical concern to the Florida environment. In addition, students had the option to add to the list of concerns. As a group, the sample of high school students perceived a need to: (a) educate the public (62%), (b) manage wildlife habitat (53%), (c) monitor industrial pollution (53%), and (d) manage water resources for human consumption (34%). Because more than 50% of the respondents indicated that monitoring industrial pollution is of critical concern to Florida, these students may seem more aware of general environmental problems than they are of those specific to Florida.

Additional concerns about Florida's environment included (a) public indifference towards Florida's environmental concerns (31%), (b) the influx of human population into the state (29%), (c) land use management practice for the human population (19%) and (d) lack of a sufficiently large tax base from which to pay for Florida's environmental concerns (17%).

Students did not cite the rise in human population in the state as one of Florida's most critical concerns. They did not connect the human population as underlying extant environmental problems. Even though all other problems are directly dependent on the human population, 71% of the students did not consider the influx of the human population to be of critical concern to the Florida environment.

Findings in this area are consistent with findings reported by other investigators. For two decades, scholars in the field of environmental education have investigated environmental attitudes and knowledge and their influence on human behavior (Perkes, 1973; Bruvold, 1973; Schmidt & Buys, 1974; Passineau, 1975; Kellert, 1978). Studies that focus on specific content areas (dealing with attitudes towards wildlife, growth management, and the human-wilderness interface) indicate that respondents do not connect the science of ecology with either the human behaviors needed to protect habitats or with environmental policy development. On the other hand, research participants typically indicate great concern for maintaining environmental quality (deHaven-Smith, 1987; Duda, 1987; LaHart, 1978). The high school students who participated in the current study appear to be following this pattern.

Correlational Analyses.

Zero-order correlations for the sections of the Florida Environmental Literacy Survey are presented in Table 2. The highest correlation was that observed between the environmental attitude measure (ATT) and recognition of necessary environmental behaviors (NEB) subtests ($r=.60$, $p<.01$). Moderate levels of correlation were observed between the KAS and ATT subtests ($r=.38$, $p<.01$), between the KAS and PAR subtests ($r=.37$, $p<.01$) and between the ATT and PAR subtests ($r=.35$, $p<.01$). Additional bivariate correlations were more modest, although statistically significantly different from zero: a correlation of .26 ($p<.01$) between ecological attitude (ATT) and active participation in environmental behaviors (AEB), a correlation of .25 ($p<.01$) between recognition of environmental behaviors and participation in these behaviors (NEB and AEB), a correlation of .13 ($p<.05$) between NEB and PAR scores, and a correlation of .12 ($p<.05$) between KAS and NEB scores.

The environmental attitude subscale is one component in three of the four obtained correlations larger than .30. These findings suggest the importance of attitude in the assessment of environmental literacy, and in the development of environmental literacy curricula. Congruent with the awareness-to-action model, simple awareness and knowledge about the environment may not drive individual action about the environment. Within the limits of correlational research, these findings suggest the importance of considering the influence of attitudes when developing curriculum process models for environmental education.

Table 2

Zero-order Correlations Between Subscales of the FELS

	Environmental Attitude	Necessary Environmental Behaviors	Active Environmental Behaviors	Political Action Rating
Knowledge Assessment	.38**	.12*	.09	.37**
Environmental Attitude		.60**	.26**	.35**
Necessary Environmental Behaviors			.25**	.13*
Active Environmental Behaviors				.08

Note. *p<.05; **p<.05.

Conclusions and Recommendations

The efforts in environmental education in the two districts participating in this study yielded neither the desired curriculum outcomes based on the ecology component of the course standards for biology nor the desired learning based on the 1989 curriculum frameworks. Environmental education delivered through science content does not engage the expressed intentions of the "awareness to action" model for environmental education. The current delivery media of science education do not facilitate achieving environmental literacy. The good intentions of the legislative mandates are therefore unlikely to be achieved in this manner.

Course standards that integrate disciplines should be developed. Such integration facilitates the creation of and development of important links and connections across subject-specific content areas. Cross-disciplinary curriculum activities that encourage participants to define their personal views and the basis for these views should be presented in the environmental education classroom since attitudes play an important part in actuating behavior. Students should participate in: (a) non-threatening values clarification forums to gain an understanding of belief and knowledge-based attitudinal biases about environmental issues, (b) community action projects, working with elected officials, and (c) active reflective writing (Bogan, Easton, & Kromrey, 1994).

The findings of this research suggest a need for systematic, comprehensive assessment of the environmental literacy of Florida's high school students to determine if the level of environmental literacy of the general population of high school seniors is as low as that suggested by this sample. If these results are verified by such an assessment, curricular alternatives can be generated and tested

in an attempt to ameliorate this apparent level of illiteracy. Determinations of the efficacy of environmental education programs should be routinely conducted. Longitudinal studies will be required to effectively assess environmental literacy. Researchers in environmental education should strive to answer the question, "How do we become environmentally literate?" The interdisciplinary nature of environmental education necessitates the pursuit of systematic research programs that allow for the development of an understanding of the complexities that content, attitude, and action present.

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