

Conservation Education Session

Perceived Needs and Preparedness for Aquatic Education in Public Schools

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Abstract: Alabama grade school teachers were surveyed to determine (1) attitudes toward aquatic resource education, (2) experience and training in aquatic resource education, (3) receptivity towards various potential aquatic curricula, and (4) preferences for assorted aquatic teaching materials. In general, Alabama kindergarten through fourth grade teachers had very little formal training in either natural resource education or aquatic natural resources in particular; however, they recognized the importance of both topics, and the majority felt strongly that additional materials and curricula topics in the area should be provided. Most reported that their students had limited access to nature and natural resource educational experiences outside the classroom. Hence classroom materials would provide the major source of information for learning about aquatic natural resources. With regard to aquatic natural resource curricula topics, teachers preferred simpler, general topics such as "water pollution" or "life in a fish pond" to more complicated or specialized topics such as "identification of fishes." Some minor differences in preferred curricula topics were identified when teachers were grouped by subjects taught (science and other), geographic location (rural or urban), and grade taught. These findings indicate a recognized need for aquatic education curricula and materials as well as a willingness to prepare and teach these subjects. Perhaps now, more than in the past, public education is ready to introduce unique topics in natural resources into the classroom. Consequently, professionals must supply these materials now.

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The emergence of water-related topics as important environmental issues is no real surprise to most professionals trained in biological/ecological sciences. However, this emergence has spawned an awareness of the need to inform and educate the public in the wise use of this vital natural resource. Perhaps the best avenue for

public education is the public school system, and the best time for subject exposure is the early formative years of elementary education.

In order to determine how best to educate children about aquatic subjects, the logical first step is to determine the level of preparedness of public school teachers regarding water-related topics and what is needed to increase instructional effectiveness. Teacher skills and instructional materials are critical in the learning and adaptive processes. Hence the immediate questions of concern are, "Do teachers have the necessary training to teach basic aquatic science?" "Are instructional materials and curriculum guides adequate to inform and train teachers?" Negative or neutral answers to such questions would mean that future citizens and community leaders represented in the students may not be properly educated to make informed decisions on issues critical to our society. Obviously, students in grades K-4 do not require sophisticated or complicated models of aquatic resource use; yet they do need materials they can understand and absorb on their own social level.

With these concerns in mind, a study of public school teachers concerning issues relating to aquatic natural resource education was initiated. The intent was to provide a basic understanding of the state of aquatic education and to set the stage for determining what kind of program guides, curricula, and other teaching materials would fill the need expressed by teachers.

Literature Review

Environmental education in elementary schools has gained considerable impetus in recent years. General publicity regarding waste disposal, acid rain, toxic and other hazardous waste spills, nuclear energy power plants and radiation, etc., has increased public awareness regarding the state of the environment. However, translating this interest into educational materials for elementary school-age children seems to be difficult. This is especially true with respect to specific aspects of the environment, such as water use, quality, supply, and even more specifically, water as a habitat for aquatic organisms.

There are good examples of environmental education guides or curricula which may be used in teaching general concepts in upper elementary, middle, and high school grades (McVey 1989, Adams 1990). However, adequate materials for lower elementary levels are more scarce (Alaska, Anon. 1985, Hutto 1990, Loucks-Horsley 1990). These materials are useful in guiding professional development and instruction in water conservation, pollution, use, etc. They even contain references to fish in streams and ponds under the general subject of ecology and habitat management. Yet, there is little available material to help teach aquatic sciences or fish culture at less than the collegiate level of instruction.

Methods

A mail survey of Alabama public school teachers of grades K-4 was initiated in spring 1991, following standard mail research procedures (Dillman 1978). The sur-

vey was designed to gather information concerning Alabama teachers' training and interests in environmental education in general and aquatic resource conservation in particular. An incentive was provided by offering a payment of \$5.00 to each teacher responding to the survey and returning the questionnaire promptly. One follow-up reminder was sent to sample teachers 2 weeks after the initial mailing. Encouragement for early response and the early follow-up were necessary because the survey was taken in the spring school term and an awareness that the impending summer break might have made slow or non-response a problem.

Proportional representation of sampled teachers consistent with the public school teacher population in the state was sought. Specifically, a proportional sample representation from urban/rural public schools as well as grades K-4 was required. Hence a two-stage random sample procedure was established so that grade as well as geographic location goals were fulfilled. The resulting sample ($N = 2,500$) was distributed so that 250 teachers represented each of the 10 population subgroups (rural/urban and K-4th grade). A survey response rate of 58% was considered acceptable considering time constraints imposed by the school year.

Teachers were asked questions pertaining to their education and teaching experience, especially in the natural resources area. Teachers were then asked to contribute information about what topics they thought the curriculum should address. They were also asked what materials would be appropriate, and what kinds of materials and presentation methods they would most likely use. Classroom structure (self-contained or not self-contained) was also considered in the examination of differing teaching opinions.

Results and Discussion

Teacher Training

In an effort to determine teacher preparedness, several questions were asked about teacher professional background and personal knowledge of aquatic resources. College education, awareness of special programs aimed at natural resources, opinions toward a proposed aquatic resource educational program, and personal fishing habits were of particular interest.

Nearly two-thirds of the teachers indicated they held master's degrees; 39%, bachelor's degrees; and <1% held doctoral degrees. No significant differences between responses when controlling for educational degrees were found. Hence level of academic training was determined to have no effect on readiness to teach aquatic subject materials.

Only 15% of the teachers reported being trained in some field of environmental education (Table 1). Workshops and seminars such as Project Wild, Learning Tree, and Sea Lab or the equivalent accounted for most of the training for those exposed to environmental education (65%). Less than 10% of the teachers indicated any training in aquatic resource conservation. This means that materials may be presented by teachers who lack training to be able to properly interpret materials to students, unless extensive documentation and teacher guidebooks are provided.

The Alabama Science Curriculum Guide contains guide lines for teaching the

Table 1. Selected responses (%) from Alabama public school teachers by geographic location and grade, Alabama aquatic education survey, 1991.

Teacher responses	Geographic location and grade												
	Kindergarten		First		Second		Third		Fourth		All		
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Teachers
Trained in environmental education	14	13	10	15	14	22	15	12	16	17	15		
Trained through workshops and seminars	76	63	46	7	58	71	60	74	64	71	65		
Trained in aquatic education	3	5	6	5	6	8	7	6	5	5	6		
Offer supplemental science/aquatic lessons	63	64	61	73	63	60	39	47	45	52	56		
Take 1-5 natural resources field trips	57	67	44	54	39	54	38	51	38	51	50		
Students routinely interact with natural resources	25	16	30	12	31	17	27	15	34	17	22		
Aware of Project Wild or Aquatic Wild	18	19	15	22	19	21	15	20	22	15	18		
Aquatic resource education program extremely needed	27	29	38	36	37	28	26	27	32	35	31		
School curriculum should be developed	46	51	46	43	47	43	48	39	48	45	45		
Teach Life Science Curriculum (LSC)	67	61	68	68	76	62	66	64	63	64	65		

Life Science Curriculum (LSC). Nearly two-thirds of the teachers responding said they use the LSC, but almost as many indicated that subject materials were not sufficient for studies of the environment, including aquatic resources.

Effects of Specialization

An attempt was made to determine whether teachers who taught all subjects would differ in opinions from those specifically identified as science teachers. Science teachers were described as those who taught science as their only course of instruction or those who taught some other core courses but whose general speciality of instruction was science. Those who taught science in addition to other courses represented 63% of the teachers; whereas <1% indicated that they taught only science.

Only limited numbers of science teachers reported that students routinely had the opportunity to interact with outdoor resources. While most science instructors using the LSC responded that their classes took annual field trips, just about half reported that the field trips involved environmental or natural resource conservation. Thus, the data indicate that science teachers in general endeavored to overcome the apparent deficiency in students with respect to exposure to outdoor resources.

As an indication of their interest, most of the science teachers, provided students with up to 10 supplemental science lessons per year. Interestingly, of those providing extra assignments, 61% annually teach supplemental science lessons concerning aquatic resources. Thus, there was a significant difference between science and non-science teachers. This is true despite the fact that only 20% were aware of programs such as Project Wild or Aquatic Wild.

These statistics point to a relatively strong interest in the subject material on the part of science teachers. Yet, only 17% of science teachers indicated that they had specific training in environmental education, slightly more than the general teacher sample. A low proportion, 6%, also responded that they had had training in aquatic resource conservation. Based on the differences among interest, support, and training, it would appear that this group, representing nearly two-thirds (61%) of all teachers may be receptive to additional training and program support.

Thus it was not surprising to learn that development of school curriculum or alternative program for aquatic education was suggested by 81% of the science teachers. One-third regarded an aquatic resource education program as extremely needed, while another 38% thought the program was moderately needed.

Support for Aquatic Education Programs

One of the most important goals of the research was to obtain teacher opinions toward a possible aquatic resource education program. Since only 18% of all teachers responding were aware of existing public training opportunities like Aquatic Wild or Project Wild, some support for additional training was expected. Accordingly, 69% indicated that an aquatic resource education program was "extremely" to "moderately" needed (Fig. 1). However, nearly 30% replied that classroom limitations such as space, equipment, and limits on instructional content would impede the use of such a program in their classroom.

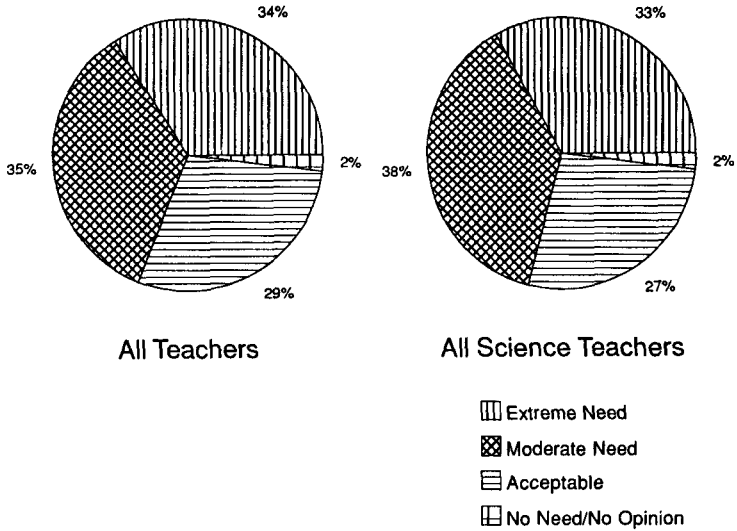


Figure 1. Teacher responses toward the need for an aquatic resource program, Alabama aquatic education survey, 1991.

Preferred Curriculum Topics

Teachers were asked for their input in ranking certain possible curriculum topics. Topics ranges from careers in aquatic resource management to the destruction of aquatic resources. Responses to each topic were scored from 1 to 5, where 1 indicated that the topic was highly desirable and would definitely be used in the classroom, and 5 indicated the topic was undesirable.

Overall, teachers decisively favored topics related to water pollution, fish ecology, fish pond life, and outdoor ethics (Table 2). There was no difference in rankings by science teachers alone.

Rural and urban schools differ in many ways, particularly in student background and school resource capabilities. The same could be said for different grade levels. Yet, teacher reaction to aquatic curriculum needs in rural and urban schools and among grade levels showed almost no differences. Only 3 topics, “endangered fish species,” “fishes in Alabama,” and “how different fishes reproduce” differed significantly between rural and urban teachers (Table 3). Rural teachers had greater preferences for these topics.

Rural science teachers expressed greater preference for “careers in aquatic management,” “Alabama aquatic resources,” “current topics of state-wide concern,” and “fishes in Alabama.” Only the topics concerned with outdoor ethics and the adaptation of different fish to different environments (e.g., pond/river fish, big/little fish, and fish in special environments) were significantly affected by the interaction of geographic location and grade.

Kindergarten and first grade teachers rated very basic and primary topics such

Table 2. Means of aquatic curriculum topics ranked in order of desirability by all teachers and science teachers, Alabama aquatic education survey, 1991.

Curriculum topics	All teachers	Science teachers
Water pollution	1.44 ^a	1.30
How fish live and differ from other animals	1.57	1.46
Life in a fish pond	1.75	1.62
Outdoor ethics	1.89	1.81
Alabama's aquatic resources	2.06	1.95
How fish eat and grow	2.05	1.99
Endangered fish species	2.21	2.10
Destruction of state aquatic resources	2.25	2.15
Aquatic ecology	2.25	2.51
How fish senses work	2.34	2.24
Different fish in different environments	2.36	2.27
Species relationships in aquatic environments	2.47	2.35
Current topics of state-wide concern	2.52	2.37
Fishes in Alabama	2.53	2.45
Interdependence in a balanced ecosystem	2.59	2.51
How different fishes reproduce	2.70	2.65
Careers in aquatic resource management	3.02	2.95
Fish management activities of the Fisheries Section of American Fisheries Society (AFS)	3.38	2.34
Fishing skills or how to catch fish	3.64	3.68

^aMeans closer to 1 indicate most favorable rating.

as "what are fish" and "how fish eat and grow" more desirable than did second, third, and fourth grade teachers (Table 3). Geographic location and grade combined did not appear to have a significant interactive effect on any mean scores for the topics.

Similar differences were found among grades for science teachers with self-contained classes. Water pollution was rated the most desirable topic by all except kindergarten teachers. More than 80% of second and fourth grade rural and urban science teachers rated water pollution as the most highly desired topic. Kindergarten teachers appeared to be concerned with basic topics and expressed more interest in fish descriptions and how fish live and differ from other animals.

Summary and Conclusions

Classroom subjects taught were examined to determine if teachers who taught all subjects would differ in opinion from those who were specifically identified as science teachers. Results revealed that there were few differences according to classroom subject and structure responses. Most differences were associated with geographic location and grade.

The majority (approximately 80%) of all teachers (rural and urban) were unaware of Project Wild, Aquatic Wild, or other similar programs. The same propor-

Table 3. Comparative mean ratings of teacher responses by curriculum topics, geographic location, and grade, Alabama aquatic education survey, 1991.

Curriculum topics	Geographic location and grade										All teachers
	Kindergarten		First		Second		Third		Fourth		
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	
Water pollution	1.59 ^a	1.59	1.40	1.36	1.32	1.35	1.51	1.59	1.31	1.38	1.44
What are fish	1.50	1.35	1.44	1.48	1.51	1.46	1.78	1.67	1.67	1.78	1.57
Life in a fish pond	1.80	1.80	1.83	1.69	1.66	1.70	1.84	1.77	1.64	1.78	1.75
Outdoor ethics	2.00	1.79	1.87	1.88	1.84	1.83	1.81	2.01	1.85	1.95	1.89
Alabama aquatic resources	2.25	2.35	1.98	2.08	1.94	2.08	2.03	2.12	1.84	1.89	2.06
How fish eat and grow	1.94	1.96	1.86	1.90	2.13	2.05	2.25	2.21	2.08	2.14	2.05
Endangered fish species	2.50	2.52	2.20	2.38	1.91	2.27	2.07	2.25	1.93	2.03	2.21
Destruction of state aquatic resources	2.63	2.57	2.27	2.36	2.11	2.31	2.12	2.23	1.94	1.94	2.25
Aquatic ecology	2.38	2.31	2.21	2.35	2.19	2.08	2.34	2.37	2.19	2.08	2.25
Fish senses	2.36	2.35	2.26	2.30	2.48	2.37	2.35	2.42	2.21	2.29	2.34
Different fish in different environments	2.47	2.51	2.32	2.44	2.39	2.28	2.40	2.53	2.07	2.15	2.36
Species relationships in aquatic environments	2.80	2.65	2.56	2.55	2.46	2.38	2.41	2.36	2.20	2.26	2.47
Current topics of state-wide concern	2.99	3.18	2.53	2.75	2.35	2.53	2.32	2.47	2.04	2.03	2.52
Fishes in Alabama	2.53	2.66	2.40	2.76	2.52	2.57	2.57	2.64	2.23	2.41	2.53
Inter-dependence in a balanced ecosystem	3.17	3.06	2.76	2.84	2.58	2.51	2.41	2.55	2.02	1.99	2.59
How fish reproduce	2.92	2.74	2.91	2.74	2.78	2.71	2.71	2.63	2.46	2.44	2.70
Careers in aquatic resource management	3.13	3.31	3.20	3.15	2.99	2.99	2.89	3.09	2.71	2.70	3.02
Fish management activities by AFS	3.53	3.64	3.36	3.49	3.35	3.30	3.33	3.55	3.08	3.16	3.38
Fishing skills	3.61	3.68	3.67	3.74	3.62	3.64	3.56	3.61	3.57	3.70	3.64

^aMeans closer to 1 indicate most favorable rating.

tion felt that the typical student in their classroom only occasionally, rarely, or never had the opportunity to interact with outdoor natural resources.

A majority of those responding to this questionnaire thought that the State of Alabama could not afford continued ignorance of resource and conservation issues. In fact, 69% responded that an aquatic resource education program is needed in Alabama's classrooms. Less encouraging is that an additional 30% thought the program a good idea only if time permits. Some teachers commented that they could not find enough time during the day to teach something other than state requirements.

Overall, the relatively strong support for additional resources by teachers and their admittedly limited skills in aquatic topics point to their need for help. Expressed preferences regarding types of materials and curriculum topics proved a clear direction for new programs if such are developed. Uncertainty on the part of many teachers regarding time and skills necessary to implement new programs indicate that a pilot program should be the next step. Small curriculum modules for use with the Life Science Curriculum already in place may be appropriate. Also, local or regional workshops on aquatic topics to train teachers in the subject appear to be a preferred source of information.

The prevailing need for austerity in public education also means that funds may not be immediately available to support new programs or travel to a central resources center. Yet, planning for a brighter future should not be stopped. If appropriate plans are in place when funds are more available in the future, implementation will be much easier to accomplish. With the support for more and better programs expressed by teachers in this survey, planning should certainly go forward.

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