

Guidelines For Best Practices In Aquatic, Fisheries, and Environmental Education

Michaela Zint
University of Michigan

Abstract –This paper gives some "guidelines for best practice" based on a literature review of environmental (including aquatic and fisheries) education and my own perspectives. Some highlights include: (1) We must be careful to define communication, education, outreach, etc. and the goals that we would like to achieve through these types of interventions to avoid misunderstandings and increase likelihood of success. For example, many believe education refers solely to information transfer and that information transfer is sufficient for behavior change when this is not necessarily so (e.g. environmental educators and others have shown that behavior change depends not only on changes in knowledge but also changes in skills, attitudes, and other factors). (2) Although much is known about promoting change in knowledge, skills, attitudes, and behavior, this knowledge has not necessarily been applied. This is evident, for example, by the results of evaluations of environmental education materials and programs that find many lacking in terms of pedagogy and content. (3) Many materials and programs exist but educators are not necessarily aware of them or have the necessary pre- and in-service professional development to use these resources appropriately. To the best of my knowledge the above observations are also true also for fisheries education although relatively little is known about fisheries education. For example, there has only been one survey of state aquatic education programs (from the perspective of aquatic education coordinators) which is now dated (published in 1994). In addition, there has been only one expert review (which needs to be updated) and only a limited number of outcome evaluations of fisheries education efforts. These evaluations suggest that behavior change is possible through fisheries education but that many fisheries education efforts are probably unlikely to achieve such changes. Future evaluations should build on past evaluations and in addition to behavior change, determine to what extent these efforts accomplish other environmental education and general education standards and goals.

Introduction

The following "best practice" guidelines are based on my experience with environmental education as well as aquatic and particularly, fisheries education. Because my background and experiences are mostly with formal environmental education and psychology, my perspectives are generally limited to those areas. There are likely to be relevant lessons from non-formal education, informal (including mass media) education, environmental communication (Guillierie and Schoenfeld 1979), and environmental interpretation (Knapp 1998) and in the literature outside the U.S. that I have not captured.

Definitions

There is a need to define environmental education (EE) and come to agreement on definition and goals to facilitate communication. I believe that many think of "education" and "communication" (or information transfer or outreach) as the same thing when they are different. In addition, many still believe in the information—knowledge—behavior model. Those who have followed this model know that it is challenging to transfer infor-

mation in ways that will increase individuals' knowledge and that knowledge may be necessary, but is unlikely sufficient, for behavior change. Thus, providing individuals solely with information will not necessarily lead to individuals who are able and empowered to improve their own decisions or to participate in public decisions. Educators have a much broader view of education that focuses on the cognitive and affective development of individuals. Thus, educators view the transfer of information or communication as contributing to education but they do not assume that communication results in education (Guillierie and Schoenfeld, 1979). This view is also consistent with dictionary definitions (Random House Dictionary of the English Language, 1987) of "communication" as *the imparting or interchange of thoughts, opinions, or information by speech, writing, or signs*; and "education" as *the act or process of imparting or acquiring general knowledge, developing the powers of reasoning and judgment, and generally of preparing oneself or others intellectually for mature life*.

Disinger (1983, 1998) provides an overview of the origins of environmental education (i.e., nature study, conservation education) and subsequent definitions of

EE. The citation typically used, however, in support of the definition of EE is UNESCO (1987). UNESCO (1987) actually focuses, however, on what it calls "objectives" (goals would be more appropriate) for EE; that is, awareness, knowledge, attitudes, skills, and participation. The following EPA definition is also cited at times, "environmental education enhances critical thinking, problem solving, and effective decision-making skills and enables individuals to weigh various sides of an environmental issue to make informed and responsible decisions (Federal Register, 1996).

Definitions of aquatic/marine education can be derived from Goodwin and Schaadt (1978), Lemon et al. (1987), Fortner (1991) and of fisheries education from Zint and Dann (1995). These definitions are consistent with definitions/goals of EE but are set in a narrower context.

It is the "participation" goal that has and continues to provide a problem for environmental education. Because individuals engaged in environmental education are typically environmentalists, they tend to be advocates of specific behaviors more so than educators. Instead of advocating for specific behaviors, it is argued that environmental educators should focus on providing individuals with the knowledge and skills they need to engage in action (Hug 1977, Disinger 1998). Methods for how environmental educators can prepare individuals for environmental participation are summarized and reviewed by Bardwell et al. (1994).

Generally, EE has focused on promoting knowledge of the environment, environmental ethics/affect, and skills needed to engage in environmental behaviors. Instead, some argue that environmental education should improve students' literacy and the quality of education in general (Robottom 1987, Lieberman 1995, Simmons 1995, Wade 1996, NAAEE 1997). This is in part because EE is believed to improve teaching and student learning (Billings et al. 1996, Lieberman & Hoody 1998, Wiley, 1999, NEETF 2000). Thus, what is being called for is a different approach; one that focuses on the "education" as opposed to the "environment" part of environmental education. I believe we need to recognize both aspects of environmental education.

Behavior Theories and Models

Because the ultimate goal of environmental education has been "participation" or "action" or "behavior" (UNESCO 1987), environmental educators seek ways to promote durable (long-term, self-maintaining) behaviors that also generalize to other behaviors. Environmental educators have recognized that the determi-

nants of behavior are multiple (i.e., the Information – Knowledge -- Action model is insufficient) and have looked toward the more comprehensive model proposed by Hungerford and Volk (1990) [based in part on Hines et al. (1986/1987)]. The authors of the model and their colleagues believe they have empirical evidence to support this model. For example, see Volk and McBeth (1998) for a summary and review of relevant studies. Because the proposed measures of the constructs in the model may not be reliable or valid (Covitt and Zint In Review) and for other methodological reasons (e.g. use of past behavior as dependent variable), however, I believe that there is little evidence to support the Hungerford and Volk behavior model and that environmental educators should also consider other behavior theories/models. For example, Zint (in review) conducted some work on the theory of reasoned action and planned behavior with teachers that may be informative. There is also interesting work related to motives (i.e., material incentives/disincentives, altruistic reasons but particularly, intrinsic motivation such as competence) (e.g. see DeYoung 2000 for review and background). In general, I think we can learn much from health educators who have much experience with behavior change (see Glanz et al. 1997 for applied review of relevant theories and models). An interesting model pertaining to environmental risk education (Zint In Press) is provided by Gardner and Stern (1996) in Chapter 9 of their book. Lastly, much research on changing behavior takes a cognitive approach and we should not neglect affective approaches. Matthews and Riley (1995) have summarized perspectives on affective environmental education but again, I believe we would benefit from looking at work in other fields such as psychology (e.g., see Bagozzi et al. 1999 for definitions and overview).

Materials and Programs

I strongly believe that we do not necessarily need more materials and programs but that we need ways to easily find existing materials and programs and learn to what extent these resources are quality materials and programs with regard to both content and pedagogy. Development of new materials and programs should only occur if evaluations have identified gaps and if development builds on existing efforts.

Searches of databases (e.g., ERIC, Eisenhower Clearinghouse) and the web (e.g., EE-Link, GLIN, BRIDGE) reveal a wealth of environmental (including aquatic and fisheries) education materials and programs. There are few single sources, however, that provide comprehensive listings of materials and programs, and those looking for them may not know these sources. Moreover, many listings provide limited information about materials and programs.

There have been some efforts to identify relevant materials/programs on specific topics such as aquatic education (Gigar 1990/91), biodiversity (World Wildlife Fund 1998), environmental education (NAAEE 1997, 1998a, 1998b), fisheries (Crook and Zint 1998), Great Lakes education (Great Lakes Environmental Education Center, forthcoming), marine education (Broussard and Skupien 1994), and water (Andrews 1995). These materials should be updated and improved upon. For example, our listing of fisheries education resources (Crook and Zint 1998) is probably in need of revisions.

Dissemination of Materials and Training

If we want educators to use materials, we must train them in using the materials. Mayer and Fortner (1987) found that simply mailing and/or disseminating materials for free will not result in use and that shorter workshops are more effective than longer (for credit) workshops. Educators who have received this type of training, however, are only likely to use the specific activities that they received training in, as opposed to other activities in the material (Pitman 1996).

Professional Development

In-service and pre-service environmental education preparation of teachers is limited (Lane et al. 1995). If barriers to environmental education are to be overcome (Ham and Sewing 1987/1988, Ham et al. 1987/1988) and to obtain fundamental change in how teachers teach about the environment (i.e., other than the activity mentality), we need more comprehensive professional development.

In-Service

Environmental education professional development is typically delivered by non-formal environmental educators in the form of short (about 2 day) workshops centered on activity guides such as Project Learning Tree and Project WILD or environmental topics such as water, wetlands, or wildlife (Lieberman 1995, Wade 1996). Such efforts are insufficient, particularly in light of current pressures to improve teaching and learning. There is a need for professional development programs that focus on education content, processes and/or pedagogy in addition to environmental content (Wiley et al. 1999, Wade et al., in review). We are currently conducting a study to learn about such innovative environmental education professional development programs (Giles and Zint, forthcoming). General education resources for how to improve teacher professional development include Birman et al. (2000), Loucks-Horsley et al. (1998), and Loucks-Horsley and Matsumoto (1999).

Pre-Service

Teachers who were exposed to environmental education during their pre-service are more likely to integrate environmental education in their classrooms (Lane et al. 1995). Unfortunately, teachers are typically not required to take courses in environmental education (Ruskey et al., in review). Moreover, few faculty teach environmental education courses (Zint and Giles 2000). I believe, however, that these faculties represent an important resource and more attempts should be made to collaborate with them.

Professional development for other educators

There is also a need for the professional development of educators other than teachers. Many non-formal environmental educators, for example, have no formal training in environmental education and/or in pedagogy in general (Wade, 1996). It is important that they, for example, learn how to promote behavior in ways that enhances the education of individuals. Again, this professional development should be provided in pre-service (e.g. human dimensions courses) and in-service contexts.

Standards

There are standards that we can and should follow. Concerns over environmental advocacy (e.g., Poore, 1993, National Environmental Education Advancement Project 1996, Schmidt 1996) as well as the movement to reform education (Simmons 1998) have led to the development of guidelines for environmental education. These include guidelines for materials (NAAEE 1996) and professional development (NAAEE 2000) as well as environmental literacy standards (NAAEE 1999). In addition to environmental education guidelines, we have a large number of national, state, district and school standards that we should help to meet if we are to be environmental educators. If new materials/programs are to be developed they should take into account these standards -- regardless of educational setting (i.e., formal, non-formal, informal).

Evaluation

If evaluations of environmental education programs are conducted [including of angling education programs (Burroughs and Reef 1996, Thomas and White 1995, Rupert and Dann 1998, Thieme and DiCamillo 1994), they typically have consisted of counting the number of participants and they sometimes consider program costs. More informative "outcome" evaluations of environmental education materials and program are rare but are

becoming more common in light of the need to defend environmental education from its critics (Samuel 1993).

Examples of expert reviews of environmental education materials include those by Simmons (1989), Pomerantz (1991), Boerschig and DeYoung (1993), Andrews (1995), Independent Commission on Environmental Education (1997), NAAEE (1997a, 1998a, 1998b), Crook and Zint (1998), and the Environmental Education Literacy Council (1999). These expert evaluations review the content and/or pedagogy approach of materials and programs. Future evaluations should build and improve upon these (e.g. use of greater number of reviewers). Content evaluations should be conducted based on agreed upon goals similar to the process used by Brody (1993) for water education and Crook and Zint (1998) for fisheries education. Pedagogical assessments should be conducted based on NAAEE (1996) guidelines and other relevant general education standards and guidelines.

Some of the findings from our evaluation of fisheries education materials may be pertinent to state here (Crook and Zint 1998). For example, we concluded that coverage of biodiversity and of some concepts associated with building sustainable fisheries and promoting stewardship was limited. Broader aquatic resource education programs also seem to lack an emphasis on anglers as stewards (Thieme and DiCamillo 1994). We also concluded that materials that target students in K-3 and 9-12 levels, focus on global or marine fisheries, and provide multicultural perspectives are needed. It would be good to update and improve upon this fisheries education evaluation and a similar effort is needed for aquatic education materials and programs. Such evaluations provide information about existing resources that hopefully reduces the chance of duplication of efforts.

There are also examples of outcome evaluations of environmental education efforts. For example, there is a review of various Project WILD materials and program outcome evaluations (Pitman 1996) and a review of a number of environmental education outcome evaluations by Leeming et al. (1993) that should be informative. Because many aquatic education programs offer vessel-based education programs, an evaluation of such a program by Williamson and Dann (1999) should also be of interest. Similarly, our outcome evaluation of the Chesapeake Bay Foundation's environmental education programs (Zint et al. in review) might be helpful. There is also work to show how using the environment as an integrating context can improve general education outcomes (Lieberman and Hoody 1998, NEETF 2000).

Lastly, I have also come across a few fishing outreach program outcome evaluations. For example,

Rupert and Dann (1998) evaluated a fishing program targeted at novice anglers (including children). The authors were able to design a program that increased participant intention to fish, purchase a fishing license and fishing equipment and met other goals. Rupert and Dann (1998) also cite fishing outreach program evaluations by O'Malley and Crawford (1995), Reynolds (1996), and Thomas and White (1995). A series of publications prepared in response to conducting an evaluation of the Hooked on Fishing Not Drugs programs are also available including Siemer and Knuth (1998) and Siemer et al. (1998). Finally, there is an exploratory study by Adams and Higginbotham (1999) of the Texas Parks and Wildlife Departments' outreach (including angler) programs. Because of a number of methodological reasons it is difficult to reach conclusions in terms of the results of the evaluation by Adams and Higginbotham (1999). The authors identify issues that arose during their evaluation, however, that might be helpful to future evaluators. These types of evaluations can tell us what existing efforts are worthy of supporting and can help us improve our efforts.

Audiences

In general little is known about how to best meet the environmental and aquatic education needs of multicultural audiences, including in fisheries education contexts (Zint and Crook 1998). Rupert and Dann (1998) cite a study by Burroughs and Reef (1996) that might be of interest in this context.

Careers

Interest in the pursuit of environmental careers is evident by increasing enrollments in environmental science/studies programs (Romero et al. 2000). We recently conducted a study to identify information to help interested individuals learn about environmental careers (Zint and Hanson, In Review) and we also found that few environmental educators are aware of these resources (Hanson 2000). There may be a need for resources to help individuals learn about aquatic resources, including fisheries careers (Zint and Crook 1998), and to inform educators of these resources.

Status of Environmental Education and Needs

There is a great need for environmental education in the United States:

- Few teachers teach about the environment and/or use appropriate environmental education practices (Samuel 1993, Holtz 1996, Kirk et al. 1997, Smith-Sebasto and Smith 1997).

- Environmental literacy assessments of the U.S. public suggest that environmental concern is high but that environmental knowledge is poor (see www.neetf.org and review annual studies conducted by Roper). One of the most recent of NEETF's (2000b) national surveys included a question particularly relevant to this review: "The current worldwide reduction in the number of ocean fish is PRIMARILY due to which of the following (% of respondents who selected): a) pollution in coastal waters worldwide (40%), b) increased harvesting by fishing vessels (25%), c) changes in ocean temperature, or (12%), d) loss of fishing shoals and other deep sea habitats (6%), e) don't know (16%)."
- Several reports provide additional expert opinions on the status of EE and importantly, recommendations for improving EE (Ruskey and Wilke 1994,

National EE Advisory Council 1996, forthcoming, NAAEE 1997b). Recommendations that are made and that I also strongly agree with include the need

for partnerships to work more inclusively and for research (particularly evaluations and on role of partnerships) to improve environmental education practice.

- Specifically with regard to outreach efforts to teach individuals how to fish and/or to provide fishing opportunities, I believe there is a need to conduct similar work as with hunter education programs (see Duda et al. 1995, Wildlife Management Institute and International Association of Fish and Wildlife Agencies 1996, Hunter Education Standards Task Force 1999). There is one study that asked each state about their aquatic resources education program (i.e., description of program, number of individuals reached, budget, use of partners, special features, etc.) but this study did not analyze information across programs and is now dated (Thieme and DiCamillo 1994).

References

- Adams, C.E. and H. Higinbotham. 1999. Outdoor education program evaluation: Texas angler, boater and hunter education and becoming an outdoors woman program. Human Dimensions in Wildlife Management Research Laboratory, Dept. of Wildlife and Fisheries Sciences, Texas Agricultural Experiment Station, College Station, TX 77843-2258.
- Andrews, A. 1995. Educating young people about water: A guide to goals and resources with an emphasis on non-formal and school enrichment settings. ERIC, Columbus, OH.
- Bagozzi, R. P., Gopinath, M. and P. U. Nyer. 1999. The role of emotions in marketing. *Journal of the Academy of Marketing Science* 27(2): 184-206.
- Bardwell, L.V., Monroe, M.C. and M.T. Tudor, Eds. 1994. Environmental problem solving: Theory, practice and possibilities in environmental education. North American Association for Environmental Education, Rock Spring, GA.
- Billings, J.A., Plato, K., Anderson, J., and M.S. Wiley. 1996. Washington Environmental Education Model Schools Program. Final report submitted to U.S. Environmental Protection Agency, Washington, D.C.
- Birman, B.F., Desimone, L., Porter, A.C., and M.S. Garret. 2000. Designing professional development that works. *Educational Leadership* May: 28-33.
- Boerschig, S. and R. DeYoung. 1993. Evaluation of selected recycling curricula: Educating the green citizen. *Journal of Environmental Education* 24(3): 17-22.
- Brody, M. 1995. Development of a curriculum framework for water education for educators, scientists, and resource managers. *Journal of Environmental Education* 26(4): 18-29.
- Broussard, A. and L. Skupien, eds. 1994. Marine education: A bibliography of educational materials available from the nation's Sea Grant programs. Mississippi-Alabama Sea Grant Consortium, Ocean Springs, MS.
- Burroughs, T.M. and M.J. Reef. 1996. Latino outreach: outreach and education recommendations for state aquatic education programs. International Association of Fish and Wildlife Agencies, Washington, D.C.
- Covitt, B. and M. Zint. In Review. Advancing environmental education research through structural equation modeling: An introduction. *Journal of Environmental Education*.
- Crook, A. and M. Zint. 1998. Guide to fisheries education resources for grades 6-12. American Fisheries Society, Bethesda, MD.
- Disinger, J. 1983. Environmental education's definitional problem. ERIC/CSMEE, Columbus, OH.
- Disinger, J. F. 1998. An epilogue: EE's definitional problem: 1997 update. In Hungerford et al. (Eds.), *Essential readings in environmental education*, Stipes Publishing, Champaign, IL, pp. 29-31.

- Disinger, J. F. 1998. Tensions in environmental education: Yesterday, today and tomorrow. In Hungerford et al. (Eds.), *Essential readings in environmental education*. Stipes Publishing, Champaign, IL, pp. 1-11.
- Duda, M.D. et al. 1995. Hunter education in the United States: A review of the literature and research. *Responsive Management*, Harrisonburg, VA.
- Gigar, B. 1990/91. National summary of aquatic education materials. Aquatic Education Program, Iowa Department of Natural Resources, Guthrie Center, IA.
- Guillierie, R. and A.C. Schoenfeld. 1979. An Annotated Bibliography of Environmental Communication Research and Commentary: 1969-1979. ERIC ED 184 852, Columbus, OH.
- DeYoung, R. 2000. Expanding and evaluating motives for environmentally responsible behavior. *Journal of Social Issues* 56(3): 509-526.
- Environmental Literacy Council. 1999. Science for Environmental Literacy: A Review of Advanced Placement Environmental Science Textbooks, Retrieved July 19, 2000 from the World Wide Web: <http://www.enviroliteracy.org/>
- Fortner, R.W. 1991. Abstracts of research in marine and aquatic education 1975-1990. Ohio Sea Grant OHSU-EP-077, The Ohio State University, Columbus.
- Gardner, G.T. and P. C. Stern. 1996. *Environmental problems and human behavior*. Allyn and Bacon, Boston.
- Giles, A. and M. Zint. Forthcoming. A new look of professional development in EE: The professional development of K-12 teachers in "EE model schools."
- Glanz, K., Lewis, F.M. and B. K. Rimer, Eds. 1997. *Health behavior and health education: Theory, research, and practice*, 2nd Edition. Jossey-Bass, San Francisco.
- Goodwin, H.L. and J.G. Schaadt. 1978. A statement on the need for marine and aquatic education. University of Delaware, Newark.
- Great Lakes Environmental Education Center. Forthcoming. Directory of Great Lakes education material. Buffalo, NY.
- Ham, S. and D. R. Sewing. 1987-88. Barriers to environmental education. *Journal of Environmental Education* 19(2): 17-24.
- Ham, S., Rellergert-Taylor, M. H. and E. E. Krumpke. 1987-88. Reducing barriers to environmental education. *Journal of Environmental Education* 19(2): 25-33.
- Hanson, M. 2000. A national needs assessment of environmental career development for middle and high school youth. Thesis, University of Michigan, Ann Arbor.
- Hines, J. M., Hungerford, H. R. and A. N. Tomera. 1987. Analysis and synthesis of research on responsible environmental behavior: A meta-analysis. *Journal of Environmental Education* 18(2): 1-8.
- Holtz, R. E. 1996. Environmental education: A state survey. *Journal of Environmental Education* 27(4): 5-8.
- Hug, J. 1977. Two hats. In Aldrich et al. (Eds.), *The report of the North American regional seminar on environmental education for the real world*. SMEAC Information Reference Center, Columbus, OH.
- Hungerford, H. R. and T. L. Volk. 1990. Changing learner behavior through environmental education. *Journal of Environmental Education* 21(3): 8-21.
- Hunter Education Standards Task Force. 1999. International Hunter Education Association hunter education standards: Performance guidelines for the basic hunter education course. International Association of Fish and Wildlife Agencies, Washington, D.C.
- Independent Commission on Environmental Education. 1997. *Are We Building Environmental Literacy?* Washington, D.C.
- Kirk, M., Wilke, R. and A. Ruskey. 1997. A survey of the status of state-level environmental education in the United States. *Journal of Environmental Education* 29(1): 9-16.
- Knapp, D. 1998. Environmental education and environmental interpretation: The relationships. In Hungerford et al. (Eds.), *Essential readings in environmental education*. Stipes Publishing, Champaign, IL, pp. 293-300.
- Knapp, D. 2000. The Thessaloniki declaration: A wake-up call for environmental education? *Journal of Environmental Education*, 31(3): 32-39
- Lane, J., Wilke, R., Champeau, R. and D. Sivek. 1995. Strengths and weaknesses of teacher environmental education preparation in Wisconsin. *Journal of Environmental Education* 27(1): 36-45.
- Leeming, F. C., Dwyer, W. O., Porter, B. E. and M. K. Cobern. 1993. Outcome research in environmental education: A critical review. *Journal of Environmental Education* 24(4): 8-21.
- Lemon, J. R. et al. 1987. Opportunities and new directions in aquatic education. *Trans. N. Am. Wildl. Nat. Resour. Conf.* 52: 443-450.
- Lieberman, G.A. 1995. *Pieces of a puzzle: An overview of the status of environmental education in the United States*. Science Wizards, San Diego, CA: .
- Lieberman, G. and L. Hoody. 1998. *Closing the achievement gap: using the environment as an integrating context for learning*. State Education and Environment Roundtable, CA.
- Loucks-Horsley, S., et al. 1998. *Designing professional development for teachers of science and mathematics*. Corwin Press, Inc, Thousand Oaks, CA.

- Loucks-Horsley, S. and C. Matsumoto. 1999. Research on professional development for teachers of mathematics and science: The state of the scene. *School Science and Mathematics* 99(5): 258-271.
- Matthews, B.E. and C.K. Riley. 1995. Teaching and evaluating outdoor ethics education programs. National Wildlife Federation, Washington, D.C.
- Mayer, V. J. and R. W. Fortner. 1987. Relative effectiveness of four modes of dissemination of curriculum materials. *Journal of Environmental Education* 19(1): 25-30.
- National Environmental Education Advancement Project. 1996. EE Criticism: Challenge and opportunity. The Environmental Education Advocate Fall.
- National Environmental Education Advisory Council. 1996. Report assessing environmental education in the United States and the implementation of the National Environmental Education Act of 1990. Environmental Education Division, U.S. Environmental Protection Agency, Washington, DC.
- National Environmental Education Advisory Council. Forthcoming. Second report assessing environmental education in the United States and the implementation of the National Environmental Education Act of 1990. Environmental Education Division, U.S. Environmental Protection Agency, Washington, DC.
- National Environmental Education & Training Foundation (NEETF). 2000. Environment-based education: Creating high-performance schools and students. Washington, DC.
- National Environmental Education & Training Foundation (NEETF). 2000. The National Report Card on Environmental Readiness for the 21st Century. Washington, DC.
- North American Association for Environmental Education (NAAEE). 1996. Environmental education materials: Guidelines for excellence. NAAEE, Rock Spring, GA
- North American Association for Environmental Education (NAAEE). 1997. Environmental education in the United States --- past, present, and future (Final Working Draft). Rock Spring, GA.
- North American Association for Environmental Education (NAAEE). 1997. The Environmental Education Collection: A Review of Resources for Educators, Volume I. Rock Spring, GA.
- North American Association for Environmental Education (NAAEE). 1998a. The Environmental Education Collection: A Review of Resources for Educators, Volume II. Rock Spring, GA.
- North American Association for Environmental Education (NAAEE). 1998b. The Environmental Education Collection: A Review of Resources for Educators, Volume III. Rock Spring, GA.
- North American Association for Environmental Education (NAAEE). 1999. Excellence in environmental education: Guidelines for learning (K-12). Rock Spring, GA.
- North American Association for Environmental Education (NAAEE). 2000. Guidelines for the initial preparation of environmental educators. Rock Spring, GA.
- Pitman, B.J. 1996. Project WILD: A summary of research findings from 1983-1995. Project WILD, Bethesda, MD.
- Poore, P. 1993. Enviro education: Is it science, civics - or propaganda? *Garbage* (April/May): 26-31
- Pomerantz, G. A. 1991. Evaluation of natural resource education materials: Implications for resource management. *Journal of Environmental Education* 22(2): 16-23.
- Robottom, I.M. 1987. Environmental education as education reform. *Environmental Conservation* 14(3): 197-200.
- Romero, A. et al. 2000. Not all are created equal: An analysis of the environmentally-related programs/departments in U.S. Academic Institutions until December 1999. *Eviron* <http://www.macalester.edu/~evirost/ENVIRON/equalarticle.htm>, accessed 16 November 2000.
- Rupert, J.D. and S.L. Dann. 1998. Fishing in the Parks: A research-based outreach program. *Fisheries* 23(6): 19-27.
- Ruskey, A. and R. Wilke. 1994. Promoting environmental education: An action handbook for strengthening EE in your state and community. National Association of Conservation Districts, League City, TX.
- Ruskey, A., Wilke, R. and T. Beasley. In Review. A survey of the status of state-level environmental education in the United States-1998 Update. *Journal of Environmental Education*.
- Samuel, H. 1993. Impediments to implementing environmental education. *Journal of Environmental Education* 25(1): 26-29.
- Schmidt, K. F. 1996. Green education under fire. *Science* 274(13) 1828-1830.
- Siemer, W.F. and B.A. Knuth. 1998. Youth participant outcomes associated with local Hooked on Fishing-Not on Drugs programs. Human Dimensions Research Unit HDRU Series No. 98-5, Cornell University, New York.
- Siemer, W.F., Knuth, B.A. and B.E. Matthews. 1998. Hooked on Fishing - Not on Drugs as a Stewardship Education Program: A literature-based program review with recommendations for comprehensive evaluation. Human Dimensions Research Unit HDRU Series No. 98-4, Cornell University, New York.

- Simmons, D. A. 1989. More infusion confusion: A look at environmental education curriculum materials. *Journal of Environmental Education* 20(4): 15-18.
- Simmons, B. 1995. Environmental education, social studies, and education reform. *Social Studies and the Young Learner* 8(1): 9-11.
- Simmons, B. 1998. Education reform, setting standards, and environmental education. In Hungerford et al. (Eds.), *Essential readings in environmental education*, Stipes Publishing, Champaign, IL, pp. 67-74.
- Smith-Sebasto, N. J. and T. L. Smith. 1997. Environmental education in Illinois and Wisconsin: A tale of two states. *Journal of Environmental Education* 28(4): 26-36.
- Thieme, M.L. and J.A. DiCamillo, eds. 1994. Survey of state fish and wildlife aquatic resources education programs. International Association of Fish and Wildlife Agencies, Washington, D.C.
- Volk, T.L. and W. McBeth. 1998. Environmental literacy in the United States. In Hungerford et al. (Eds.), *Essential readings in environmental education*, Stipes Publishing, Champaign, IL, pp. 75-88.
- Wade, K.S. 1996. EE teacher inservice education: The need for new perspectives. *Journal of Environmental Education* 27(2): 11-17.
- Wade, K., Wiley, M. and S. Toth. In Review. Model schools in environmental education. Green Teacher. Wildlife Management Institute and International Association of Fish and Wildlife Agencies. 1996. Review of the national hunter education program with recommendations for improvement. Division of Federal Aid, Fish and Wildlife Service, U.S. Department of the Interior Federal Aid Grant 14-48-0009-94-1257.
- Wiley, M.S. 1999. Model Links Environmental Education & School Improvement. Seattle, WA.
- Wiley, M.S., Toth, S.T., and G. Wallace. 1999. State-wide model EE and school improvement programs: Lessons to-date from Washington, Florida, and Missouri. NAAEE 28th Annual Conference presentation.
- World Wildlife Fund. 1998. The biodiversity collection: A review of biodiversity resources for educators. North American Association for Environmental Education, Rock Spring, GA.
- Zint, M. In Review. Comparing three attitude-behavior theories for predicting science teachers' intentions. *Journal of Research in Science Teaching*.
- Zint, M. In Press. Advancing environmental risk education. *Risk Analysis*.
- Zint, M and A. Crook. 1998. A needs assessment of Fisheries education materials for youth. *Fisheries* 23(10):24-34.
- Zint, M. and A. Giles. 2000. Environmental education undergraduate and graduate programs and faculty in the United States, Second Edition. NAAEE, Rock Spring, GA.
- Zint, M. and M. Hanson. In Review. A guide to environmental job and career resources. Environment.
- Zint, M., Kraemer A., Northway, H. and L. Miyoun. In Review. An evaluation of the Chesapeake Bay Foundation's conservation education programs. *Conservation Biology*.