DESIGNING FOR IMPACT: A PERSPECTIVE ON RESEARCH IN ENVIRONMENTAL EDUCATION

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<u>Abstract</u>

The use of research in Environmental Education must be helpful to the teacher. It must also provide something tangible to guide the teachers in a positive direction in improving teaching methods and curriculum. This paper addresses possibilities for communicating research results for greater application.

If research in environmental education is good for anything, it must be helpful. It must be helpful for teachers, naturalists, and curriculum developers. It must assist them in answering the salient questions they have about their work and provide them with direction for making improvements. And when the emphasis shifts to the users of research results, then the ultimate issue is one of transfer. Judged in this light, a debate over sample size or research methodologies becomes of secondary importance. More critical might be: What questions do practitioners have? What are the beliefs, the assumptions, the models that guide their everyday work in the classroom? And how can research play a constructive role in all this?

The issue of transfer, of communicating useful research results to practitioners, is an interesting lens through which to view the qualitative/quantitative continuum, for neither extreme appears to contribute to this goal. Although the traditional scientific research methods which have dominated our field allow us to frame studies for some degree of generalization, one must admit that the application of research principles to practice doesn't often happen. Perhaps this is due to the quantitative researcher's own admission of constraints and her reluctance to think broadly about the transfer of her results. Another indication that something is inadequate with the quantitative position is the recent growth of interest in alternative models of research.

The qualitative researcher, however, is even less able to address the issue of transfer. This paradigm adheres to the belief that context is everything and that each case is unique (Lincoln and Guba, 1985). Therefore, each teacher in each classroom must ask his own researchable questions, and seek his own answers. Nothing more than the research procedure can be learned and shared from one experience to another. Busy teachers who want simple answers, unfortunately, don't find this perspective very helpful.

Given that transfer is important and that these two extreme positions of research paradigms have little to contribute to understanding how to transfer usable knowledge to practitioners, it may be helpful to reconsider what we know but all too often ignore about knowledge transfer, particularly that which directly influences research reports.

1.   <u>What is taught is not always what is learned</u>. Even in the best environments, from the most effective teachers, and with the most interested learners, information transfer may not occur.

Resnick (1983) suggests that a critical and often overlooked element for effective learning is understanding the mental model, the assumptions, and the misconceptions that the learner is currently using. What is learned, in other words, is not merely a function of what is given to the learner, but may be strongly affected by what the learner already knows (Rumelhart, 1984). In a sixth grade unit on photosynthesis, Roth (1989) observed that a well-delivered, hands-on, inquiry-oriented science unit failed to overcome and instead confirmed the students' original perception that plants utilize water and soil as food, not raw materials for manufacturing food.

Additionally, the measurement of learning requires that the student activate the cognitive structure into which the new information was coded. Thus the introduction of new material is not the only time when it is helpful to understand the learner's mental model. It is also important to understand their model (in this case, the newly acquired model) when creating the appropriate context for retrieval. Understanding the learner's mental model is thus helpful in engaging the appropriate cognitive elements both at the initial exposure and retrieval.

Therefore, we should not assume that environmental education practitioners are without conceptions of human cognition and behavior. If knowledge transfer is one of the reasons we engage in research, we should work to uncover these existing mental models that contribute to the practice we wish to affect. Our results should be communicated in such a way that the practitioner's misconceptions are adequately addressed and the appropriate mental model is engaged.

2.   <u>Data are not the most effective conveyors of new information</u>. Most documentation of research highlights one experiment or the results of one test in the context of how this particular issue has been treated in the literature.

If we continue to use the practitioner as the recipient and her behavior change as the goal in the communication of research results, it is rather unlikely that the reporting of one set of data will lead to an understanding of the issue sufficient for application. Single points of information are difficult to remember. Repeated exposure to similar, but not identical, messages is a reasonable way to build a cognitive structure around the issue under study (Medin and Smith, 1984). The practitioner's understanding is more likely

to grow from several sets of related data, complemented with his own experience. Swamping the practitioner with pages of data is not a recommended approach. Data can be useful, if they are not the focus of the report. The key to the appropriate niche for data is the key to relevant research, but before opening this issue it may be helpful to examine more closely exactly what researchers are trying to achieve.

Goals for Environmental Education Research

If the improvement of the practice of environmental education is the reason we are engaged in EE research, then some very clear goals can be articulated that will form the foundation of a research agenda that respects the above understanding of human cognition.

1.   The results of the research should be useful to practitioners. This implies that the researcher understands the problems practitioners face and their needs. Further, the results should carry some element of credibility so that practitioners have some requisite level of confidence in the recommendation.

2.   The success of the transfer of research results to a learner is dependent on how the information is communicated and the extent to which it is memorable. The learner cannot bear the full responsibility of remembering a poorly designed message.

The implementation of these suggested goals present us with a great variety of relevant, discussable, and researchable questions. Among them are: how does the researcher come to understand what practitioners need?, do researcher's observations influence the event?, what contributes to memorability in a research paper?, and what approach or combination of approaches achieves the most credibility with the intended audience? On these issues, we will no doubt have many opinions. And consequently, these discussions could be very helpful in moving forward the realm of EE research. One version of the possible answers follows.

Toward Relevant Research

Let us assume for the moment that the researcher, working in conjunction with dedicated practitioners, has come upon an issue that has significant application in the EE world. The results of this research could help teachers develop among students a concern for the environment and a willingness to take action. What should the researcher communicate that the practitioners will find useful and memorable?

Provided that teachers want to improve their practice, a clearer understanding of what they are doing and what they could do to improve their student's education could be helpful. One way to build understanding is with theory; theory can empower people to improve their practice (Murphy and Medin, 1985). Most teachers, however, don't have the

patience, the interest, or the memory for theory; it is rarely perceived as useful, despite researchers' claims. Now then, can researchers communicate theory?

One suggestion is to provide a <u>portable model</u> of the relevant theory (Kaplan and Kaplan, 1982). A portable model is a mental understanding that is rich enough to give the owner confidence, flexible enough to be applied to new situations, yet simple enough to be easily communicated. It is a coherent yet partial version of the entire theory, with landmarks to provide guidance but not so many details that one could become lost. In short, a portable model is something a teacher would want to own (because of its usefulness) and would be able to own (because of its simplicity). It does not require the investment that expertise does, and it builds upon the knowledge a teacher already has.

The idea of a portable model is in keeping with the constraints and goals mentioned earlier. The model is the framework to which the data apply, and from which new situations can make sense. This makes the model quite helpful to practitioners and easier to remember than a series of numbers, unconnected rules, or nebulous theses. The second goal presented for EE research addresses <u>how</u> information is communicated and here, too, the portable model provides guidance.

Concrete illustrations are a useful way to communicate a portable model. Examples help explain the theory. Data are a type of example; they provide support for the theory presented in the model. We know that direct experience is a strong source of mental examples, but people cannot have enough experiences to adequately be prepared for everything. Consequently, we use other people's experiences through examples, illustrations, cases, and data to build our own mental models (Copeland, 1931; Monroe and Kaplan, 1988). In addition, concrete illustrations help the learner by providing interesting, memorable landmarks throughout the model and direction for activating the relevant receptor of their existing cognitive structure. These goals might also be achieved by using a story-like structure for explaining the cases and examples (Vitz, 1990). The strong tradition and great potential of stories as a medium for communication offer possibilities for further exploration.

So how do these components of the portable model help achieve the goals for EE research? The first goal, usefulness with credibility is aptly provided by appropriately chosen concrete illustrations; the usefulness is possible because the theories are generalizable. The second requires that the portable model enhance both communication and memorability of the theory. The illustrations contribute interestingness through easily remembered examples or landmarks.

The portable model respects the constraints of human cognition, as well. Rather than data and literature, the examples allow the practitioner to glean the most relevant elements for themselves, to ignore one illustration, or

lean more heavily on another. Since educators already have experience with the problem, it is important that the model allow the recipient to engage their own ideas. Crafting the message with examples enables the practitioner to construct their own understanding -- their portable model -- as the research message unfolds. This is a very different process from telling learners the answer. It instead allows the learner to actively participate in their own learning.

Qualitative vs Quantitative Research Methods

If a simple, coherent, example-rich and theory-based portable model is <u>what</u> practitioners should receive from EE research efforts, some may still ask <u>how</u> to obtain this model. How should the researcher go about collecting the data and confirming the theory to share with practitioners?

If the portable model is driving the research agenda, it should be obvious that both research paradigms have important contributions to creating portable models. Qualitative research is known for building case collections and exploring the fine detail of particular scenarios. Quantitative efforts are essential in helping practitioners understand the generalizability of the model. In fact, research often benefits from using both qualitative and quantitative research tools, even on the same question. For example, a qualitative study may provide the basis for a more structured and quantitative approach, or an inconsistency uncovered in a quantitative survey may lead to further exploration through qualitative methods.

Conclusion

Our field's current discussion about appropriate research paradigms has opened the door to increased reflection and attention to the goals and outcomes of research in environmental education. Once we are over the obligatory hurdle of the qualitative/quantitative debate, a rich and potentially highly rewarding discussion around a host of issues might take place. We can improve, for example, on how we communicate research results for greater application, how we choose appropriate topics for research, and how we assist practitioners who are interested in doing their own research.

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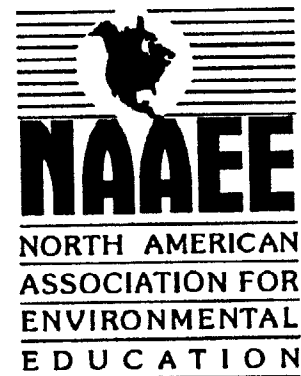
ALTERNATIVE PARADIGMS IN ENVIRONMENTAL EDUCATION RESEARCH

Edited by

Rick Mrazek
Faculty of Education
The University of Lethbridge

MONOGRAPHS IN
ENVIRONMENTAL
EDUCATION
AND ENVIRONMENTAL
STUDIES
VOLUME VIII

The North American
Association for Environmental
Education
P. O. Box 400
Troy, Ohio 45373 U.S.A.
1993

NORTH AMERICAN
ASSOCIATION FOR
ENVIRONMENTAL
EDUCATION

1993