

## Research Symposium Proceedings

### “Quantifying a Relationship Between Place-based Learning and Environmental Quality: Results of Phase One, Discovery and Design”

Michael Duffin, Ph.D.  
Program Evaluation and Education Research Associates Inc.

Michael Murphy, Ed.D.  
Massachusetts General Hospital and Harvard Medical School

Brian Johnson, M.S.  
Antioch University New England

#### ABSTRACT

Many place-based learning (PBL) projects and programs involve students in activities that relate directly or indirectly to efforts to improve environmental quality. Until now, however, research-based evidence exploring the link between PBL and direct measures of environmental quality has not been aggregated or synthesized to any significant extent. This two-year project, “Quantifying a Relationship Between Place-based Learning and Environmental Quality,” aims to add to the existing literature by reviewing the evidence for a direct connection between PBL and/or other types of environmental education and environmental quality. This paper presents findings from Phase I of the research, during which a nationwide search for air quality education programs was conducted and a PBL-environmental quality theory of change was developed. The authors then look forward to Phases II and III, during which a survey instrument will be used to harvest data from existing air quality education programs; a protocol for quantitatively analyzing environmental quality impacts as a dependent variable of PBL implementation will be developed; and case study research to identify PBL best practices for impacting environmental quality will be conducted.

## BACKGROUND AND RATIONALE

During the past several decades, research on environmental education has grown in both quantity and quality. Most environmental education outcomes research, however, has focused on the role environmental education can play in improving school performance and inspiring environmental citizenship. While this initial body of evidence is increasingly compelling, we believe the field of environmental education could be broadened and further legitimized by research that demonstrates a link between environmental education and improvements in environmental quality.

Our research is an EPA-funded project entitled, “Quantifying a Relationship Between Place-based Learning and Environmental Quality.” This two-year project (scheduled to be completed in December 2008) is a partnership between the National Park Service’s Conservation Study Institute, Program Evaluation and Education Research Associates, Shelburne Farms, Earthwater, Antioch University New England, and Massachusetts General Hospital. The project aims to add to the existing literature by reviewing the evidence for a direct connection between place-based learning and environmental quality. Specifically, the research is 1) harvesting data from existing place-based and environmental education projects that have measured changes in environmental quality, with a particular focus on air quality; and 2) developing a protocol for quantitatively analyzing those data as a dependent variable of PBL or environmental education implementation. The project also aims to explore whether greater effect sizes have been shown to be associated with specific PBL approaches.

## PHASE I: DISCOVERY AND DESIGN

The first stages of this project in early 2007 focused on defining the boundaries of our research. We drew from existing place-based learning literature and our expert base to identify core attributes and promising practices of place-based learning. We also conducted a preliminary search of air quality education programs in the United States in order to determine whether these programs would be able to provide the type and amount of data necessary for this study. “Environmental quality” was narrowed for this study to “air quality” for several reasons. First, comparing programs addressing a variety of environmental quality issues (e.g. water quality, air quality, invasive species, habitat restoration) would likely introduce an overwhelming number of variables for which it would be difficult to control. Second, air quality was chosen because of its links to asthma and children’s health (which we believed would result in a large number of air quality education programs) and because of the increasing number of programs focused on *indoor* air quality. We surmised that the indoor environment would represent a manageable scale for environmental education programs to engage in environmental quality investigation and problem-solving. This initial search produced enough evidence of the large number of air quality education programs to warrant a more thorough search.

We also called on existing literature, our expert base and our extensive research into air quality education programs around the country to help construct a place-based learning and environmental quality theory of change. So far, we have identified four key stages necessary to effect improvements in environmental quality. First is the implementation of a place-based learning program. Next, while many air quality education programs embody some or all of the core attributes and promising practices of

PBL, a smaller number actually include some sort of environmental quality measurement (e.g. air quality) as part of the program activities. This seems to be a key second step in the realization of environmental quality improvements as an outcome of the PBL program. The third stage is action based on measurement findings. Not all of the programs that measure environmental quality take action based on those findings. Those programs that do take action are the ones that are sometimes able to reach the fourth stage: measurable environmental quality improvements. While we have found programs that don't fit neatly within this change model, the stages identified here are the most common progression found to date in programs that have been able to impact environmental quality.

During the final stages of Phase I of our study from May-October 2007, we conducted an exhaustive search of both peer-reviewed and popular literature to identify air quality education programs in the United States. Additionally, we carried out a nomination process to identify additional air quality programs whose work takes places on a smaller scale (e.g. individual classrooms) and thus is less likely to be featured in the literature. Email listservs, education newsletters, website postings, and phone calling were used to identify nearly 300 individuals and organizations whose work relates to air quality education. Of those, more than 100 programs and individual educators have been identified as having conducted air quality education programs. These programs occur on a wide range of scales, from individual classroom efforts to nationally distributed curricula. One of the outcomes of this work has been a comprehensive list of nearly all current and former (within the last ten years) air quality education programs in the United States.

## PHASE II: PILOTING THE RESEARCH MODEL

The initial design of the project hoped that enough air quality education programs could be found with existing outcomes data to facilitate the quantitative analysis phase of this project. While at least 40 such programs have been identified, their data are highly variable in terms of both content and quality. No two programs have the same types of data, and many data sets are incomplete for the purposes of our study. As a result and based on a study of asthma interventions that utilized similar methodologies (Center for Managing Chronic Disease 2007), we decided to collect new data through a survey.

In late 2007, we developed a survey instrument to collect relevant data from approximately 100 programs identified for further review. In early 2008, 45-minute telephone interviews will be conducted with the identified programs. The survey instrument is designed to gather background information on each program, including the extent to which the program embodied the principles of place-based learning; specific air quality education activities included in the program; and program outcome and evaluation data. Results of each interview will be input into a centralized database and analyzed using SPSS statistical software. Bivariate relationships between programmatic factors and air quality assessment/air quality improvement will be analyzed with  $\chi^2$  statistics using Fisher's exact tests ( $p < 0.05$ ). Pearson product moment correlations and non-parametric measures of association will be used when appropriate to study the impact of non-categorical variables. This analysis will conclude the second phase of our research (and with it, the project's funding) and will result in a white paper submitted to the EPA and hopefully the publication of the main findings in an academic journal.

### PHASE III: CRITICAL CASES AND REPLICATION

We also anticipate a third phase to this research project beyond the initial two years funded by the EPA. Part of this third phase involves the project's research fellow's dissertation research. If the data support our hypothesis that a relationship exists between PBL/EE and environmental quality improvements, the research fellow will then identify critical cases from the programs surveyed whose outcomes included measurable improvements in air quality. Interview research will be conducted with program administrators, educators, participants and collaborators to examine the key program strategies and contextual factors that facilitated environmental quality improvement outcomes. Additionally, curriculum documents, data sets, media coverage, funding applications and other relevant documents will be examined. We hope that this qualitative work will lead to more fine-grained explorations of educational best practices related to environmental quality improvements.

Also as part of Phase III, we anticipate applying for further funding to replicate and test the quantitative analysis model designed during the first two years of the project, and to explore its relevance to the assessment of other environmental quality measures (e.g. water quality and CO<sub>2</sub> emissions). We also hope that this type of analysis could be adapted for use by program practitioners in designing or revising environmental education programs.

Finally, we foresee future research that could use experimental design to further examine our PBL-EQ theory of change and to evaluate the effectiveness of certain educational methods in effecting environmental quality improvements.

## EXPECTED RESULTS

The results of this research are expected to impact several environmental education arenas. First, the findings may be useful to policymakers in decisions regarding federal, state and local support for environmental education. While existing research provides increasingly strong support for environmental education based on school performance and environmental citizenship outcomes, the results of this research could provide an additional justification for support of environmental education on the grounds of environmental improvement.

Second, the review of literature for this project will be further developed and submitted for publication in a peer-reviewed education journal. The review will be a summary of previous research related to the question of environmental education and environmental quality, and will help direct further research in this area.

Finally, we anticipate this study being the first foray into a new environmental education research arena. We realize that our research is preliminary in any kind of logical argument about causality. We believe our greatest contribution is taking the first small step on the path toward a research agenda of global significance.

## REFERENCES

Center for Managing Chronic Disease. 2007. Asthma programs with an environmental component: A review of the field and lessons for success. Ann Arbor, MI: University of Michigan.