Journal of Extension
www.joe.org

October 2013
Volume 51
Number 5
Article # 5RIB8

Testing the Use of Natural Schoolyards to Develop Stewardship Attitudes in Students

Abstract

The study reported here measured the impact of natural schoolyards, within the science curriculum, on middle school students' environmental attitudes. It was expected that students engaged in such a curriculum would show increased pro-environmental attitudes and behaviors. Participants were 7th-grade students in Madison, WI. A modified form of the validated short-form Measurement of Ecological Attitudes survey (Maloney & Ward, 1975) was used in a pre-test/post-test format to measure changes in students' environmental attitudes. No gains were found between pre- and post-test scores. Implications for natural schoolyard curriculum design and research, and possible outdoor Environmental Education (EE) partnership with Extension are discussed.

Nicole Nelson
Garden Based Education Facilitator
Madison Metropolitan School District
Madison, Wisconsin
nmnelson@madison.k12.wi.us

Bret R. Shaw
Assistant Professor
University of Wisconsin-Madison
&
Environmental Communication Specialist
University of Wisconsin Extension
Madison, Wisconsin
brshaw@wisc.edu

Introduction

Natural schoolyards, native ecological communities on school grounds, provide a space for students to interact with their natural environment, which has been found to improve health, social development, and academic performance (Education Development Center, 2000). Furthermore, schoolyard restorations, such as rain gardens or butterfly gardens, increase the ecological services (e.g., storm water management, wildlife habitat) of school grounds (WDNR, 2013) while providing teachers with a natural habitat to teach on the school site. The primary aim of the study reported here was to test if the use of a science curriculum that integrated a natural schoolyard impacted middle school students' environmental attitudes. The results of the study may provide insight on how natural schoolyards might be integrated into a curriculum and implications for future studies attempting to measure environmental attitudes in students.

Background

Currently, a number of organizations are advancing the use of outdoor EE throughout the United States (e.g., California Association for Environmental and Outdoor Education, Michigan Alliance for Environmental and Outdoor Education, Maryland Association for Environmental and Outdoor Education, Connecticut Outdoor and Environmental Education Association, Wisconsin No Child Left Inside Coalition). Extension is already involved in environmental education (EE) programs such as youth horticulture, Wildlife Habitat Evaluation Program, Master Gardeners, and Master Naturalists (Smaldone, Boone, Selin, & See, 2011), potentially providing valuable resources for schools embarking on natural schoolyard projects. Smaldone et al. (2011) found that teachers' "lack of time to fully participate in programs" was one of the top three barriers to EE work. Extension could help provide support that classroom teachers are lacking to participate in outdoor EE through existing Extension programs.

Schoolyard restorations increase the ecological services of a site by reducing stormwater runoff to nearby bodies of water, providing a habitat for pollinators and sequestering carbon. The purpose of ecological restoration is to "assist in the recovery" of an ecosystem (Clewell & Aronson, 2007). Through the use of ecological restoration principles, students are able to determine the best way to restore their schoolyard ecosystem.

While student achievement is often focused on the Common Core State Standards (math and English/Language Arts) (National Governors Association, 2010), Wisconsin was the first state to require pre-service teachers (college students majoring in primary or secondary education) to be trained in EE and is one of few states with written K-12 EE standards (Ziede, 2008). Wisconsin EE Content Standard-E states, "Students in Wisconsin will develop an understanding and commitment to environmental stewardship" (Wisconsin DPI, 1998).

In terms of forming pro-environmental attitudes, Newhouse (1990) concluded environmental attitudes are formed by local and personal life experiences. Likewise, Chawla (1998) examined what life experiences had led people to having "environmental sensitivity" and thus lead to stewardship-based decision-making and actions. She found childhood outdoor experiences consistently ranked as the primary influence of people with high environmental sensitivity (1998). The use of a natural schoolyard could provide the natural area experiences children need to develop pro-environmental attitudes and behaviors.

Lessons from Current Research on EE and Attitudes

Several EE program approaches have been evaluated in terms of ability to improve students' attitudes towards the environment. In a study of 6th-grade students, Eagles and Demare (1999) found that for an EE program to change attitudes, it must take a holistic/cross-curricular approach over the course of many years.

While the literature indicates benefits to using an environment-based context for learning (Lieberman & Hoody, 1998), research that points toward a positive attitude change in students participating in a natural schoolyard curriculum is lacking (Sobel, 2005). Due to current budget restraints for public education from both the federal and state levels, it is necessary that each teaching strategy and curriculum be assessed for measurable results. A primary goal of EE is to promote pro-environmental

©2013 Extension Journal Inc.

attitudes and behavior (EPA, 2012). Therefore, it is necessary for the use of natural schoolyards to be evaluated in terms of attitude and behavior change in students.

Research Questions

The study focused on the following research question: Does the educational use of natural schoolyards within the class curriculum change student attitudes and behaviors towards the environment?

Methods

Participants

The population of the study was 7th-grade students from Madison, Wisconsin, participating in a curriculum that included the use of a natural schoolyard, during the 2010-2011 school year. Participants were students of Spring Harbor Middle School, a public environmental magnet school in the Madison Metropolitan School District.

Description of Study Site

During the 2010-2011 school year, Spring Harbor Middle School had 268 students in grades 6 through 8. The ethnic breakdown was: 63% white, 14% African American, 13% Asian, 9% Hispanic, 1% Native American (MMSD, 2011).

All participants had the same science teacher. Out of 87 seventh graders, 60 students (69%), who had completed assent forms and parental consent forms, participated in the pre-test survey (28 female and 32 male), and 59 students (68%) participated in the post-test survey (30 female, 28 male, one did not report gender).

The study focused on the use of the natural schoolyard as part of a science curriculum. The science teacher had taken an integrated approach to teaching EE in the schoolyard throughout the year. His stated goal was to use the natural schoolyard as a part of his structured science curriculum 1 day per week (minimum 36 days) for the entire school year, a goal that he met.

The teacher created the lessons that he used with the students outdoors. He was trained in the Project WET curriculum ("Water Education for Teachers"), which provided some ideas and guidance for his lesson planning. His lessons met the Wisconsin Department of Public Instruction (DPI) science and environmental education standards. This science class embodies an inquiry-based philosophy, where students are encouraged to become scientists in his classroom. Inquiry activities in the schoolyard included: water infiltration experiments, natural history studies, restoration planning, and garden construction (D. Ropa, personal communication, Aug. 31 2011).

Instrument

The survey measuring students' environmental attitudes was a modified form of the validated short-form Measurement of Ecological Attitudes survey (Maloney, Ward, & Braucht 1975). The primary

©2013 Extension Journal Inc.

purpose for Maloney and Ward's (1973) original survey was to better understand the population's feelings, attitudes, and behaviors towards the environment in an attempt to modify environmentally relevant behaviors. The original 128-item survey was then condensed down into a 35-item short-form survey (Maloney, Ward, & Braucht 1975).

The study reported here measured three different scales of attitude through the use of the short-form Measurement of Ecological Attitudes survey (Maloney, Ward, & Braucht, 1975). These subscales are verbal commitment, actual commitment, and affect. Verbal commitment measures what a person is willing to do through "I would" statements; actual commitment measures a person's self-reported behaviors; and affect measures how a person feels about an issue (Maloney, Ward, & Braucht, 1975). Maloney and Ward's (1973) original study found most people had relatively high levels of verbal commitment and affect and lower levels of actual commitment.

In the study reported here, instead of true/false response choices, modifications of the original short-form Measurement of Ecological Attitudes survey included use of a 5-point Likert scale (1 = "Strongly Disagree", 5 = "Strongly Agree" for the Affect and Verbal Commitment subscales and 1= "Never", 5= "Always" for the Actual Commitment subscale) to offer greater sensitivity to change and updating or modifying word choice for middle school aged participants. Each subscale consisted of 10 questions.

Two 7th-grade classes and a 6th-grade class informing revision of the survey questions prior to the study reviewed the survey. All question items can be found in Appendix A.

Survey Administration and Analysis

Attitude change was assessed through a pre-/post-test style self-administered survey during science class. The survey was administered on November 4, 2010 and again on June 7, 2011.

The survey was conducted using the Web-based survey service Qualtrics. Under the direction of the science teacher, students were directed to the survey website address and asked to read the directions and complete the survey. Results were exported into Microsoft Excel 2007 to calculate summary statistics for the sample, and the Data Analysis ToolPak was used for analysis. Outcomes were the three subscale scores from the survey.

A Cronbach's Alpha test was completed on the results to determine the internal consistency of questions in each subscale of the survey.

The mean (M), standard deviation (SD), and change in mean (Δ M) were calculated for each survey subscale between the pre- and post-test data. It was hypothesized that the change in mean would be positive for all subscales. A single factor Anova test was used to compare the group means of the pre- and post-test scores for each subscale. All tests were two-tailed and an alpha level for statistical significance of 0.05 was established a priori.

Results

The results of the Cronbach's Alpha test showed that each section of the survey had an internal consistency of at least 0.70, generally the accepted reliability threshold in the social sciences

©2013 Extension Journal Inc.

(Nunnaly, 1978). See Table 1.

Table 1.

Cronbach's Alpha of the Subscales for the Short-form Measurements of Ecological Attitudes Survey - Pretest Data

Subscale	Spring Harbor Middle School
Verbal Commitment	0.84
Actual Commitment	0.85
Affect	0.82

Results indicated no difference between the pre- and post-test scores for any of the subscales (See Table 2).

Table 2.

Subscale Scores of the Modified Short-form Measurement of Ecological Attitudes Survey

	Pre-survey N = 60		Post-survey N=59			
Subscale	**M**	**SD**	**M**	**SD**	**Δ M**	**p-value**
Verbal Commitment	3.71	0.66	3.5	0.77	-0.20	0.14
Actual Commitment	3.26	0.68	3.37	0.73	0.11	0.42
Affect	3.58	0.67	3.60	0.72	0.02	0.84

Discussion

It was expected there would be positive gains between pre- and post-test scores, indicating an increase in environmental attitudes and behaviors, yet no differences between pre- and post-test scores were found. It should be noted that the mean scores for each of the subscales started greater than "3" on the pre-test, indicating a response between "Sometimes" and "Often," or "Neutral" and "Agree." Even though no change took place between the pre-and post-test, the post-test scores remained greater than "3." The lack of measurable attitude change may be due to confounding factors, including the possibility that the population already had higher environmental awareness, perhaps creating a ceiling effect where significant gains were not measurable through this instrument. Although public, Spring Harbor Middle School is an environmental magnet school, meaning students, and/or parents, choose to enroll in this school instead of the neighborhood middle

©2013 Extension Journal Inc.

school assigned by district boundaries. While this survey may not have been sensitive enough to detect environmental attitude change in this setting, it may prove more useful in a setting where the initial environmental attitudes are not as high.

Although the literature suggests that the use of natural schoolyards may be beneficial to students, the study reported here did not measure a change in attitudes or behaviors. In the future, having a paired dataset would make it possible to measure change for each individual student instead of comparing only the sample means, which would provide greater sensitivity to detect potential changes in attitude. Due to Institutional Review Board (IRB) regulations, identifiers could not be used to pair pre- and post-test scores. Future studies may consider having students create their own unique identifier. A control group would also provide a basis for comparison. In order to control for as many variables as possible, it would be ideal to have an EE teacher in one school teach half his or her sections with only traditional indoor lessons and the other half of his or her sections using the outdoor natural area.

According to the Cronbach's Alpha analysis, the questions within each subscale of the survey held together well, enabling a single attitude score for each subscale to be calculated. The importance being that the questions within each subscale are all addressing a similar concept, therefore generalizations about the overall averages of each subscale can be made.

The literature indicates that children need to have outdoor experiences in natural environments in order to form a positive stewardship ethic (Chawla 1998, 1999; Newhouse, 1990), and for attitude to change behavior there must be repeated and direct experience with the attitude object (Glasman & Alberacin, 2006). Using natural schoolyards within the curriculum provides this experience, yet the study reported here did not find evidence that students experienced an increase in pro-environmental attitudes through their ongoing exposure to the natural schoolyard.

As noted by Eagles and Demare (1999), to change attitudes the curriculum must span all content areas over the course of many years. Perhaps a change in environmental attitude cannot be measured in just one academic year, but would need multiple years and a cross-curricular approach to show measurable gains. Implementing an integrated, well-planned K-12 schoolyard-based EE program is a challenge to many schools, which do not have the resources to train an entire teaching staff in EE principles.

Schools could benefit from an EE partnership with Extension by gaining outdoor EE expertise and resources to create a more consistent natural schoolyard experience throughout grades K-12. In addition to providing educational support directly to teachers and classes, Extension could provide after-school and summer programs through already existing programs such as youth horticulture, Wildlife Habitat Evaluation Program, Master Gardeners, and Master Naturalists, as well as volunteers to assist as adult mentors or with garden maintenance. Extension could benefit from the partnership by being able to use the restoration as a demonstration site for the community. Obropta, Dinardo, and Rusciano (2008) found demonstration rain gardens, one type of ecological restoration, were useful in educating landowners in sustainable landscaping.

The study featured only three attitude scales in an attempt to quantify students' attitudes and behaviors, yet future research may explore additional attitudinal scales, or constructs of attitude,

©2013 Extension Journal Inc.

and knowledge. While generalizations based on the study are limited, continued evaluation of natural schoolyards' impact on student attitudes towards the environment is important in an ongoing attempt to improve environmental education practices.

References

Archie, M., & McCrea, E. (1998). Environmental education in the United States: Definition and direction. *In Environmental education in the United States-past, present, and future*. Troy, OH: North American Association for Environmental Education.

Bunting, T. E., & Cousins, L. R. (1985). Environmental dispositions among school-age children: A preliminary investigation. *Environment and Behavior*, 17(6), 725-768.

Chawla, L. (1998). Significant life experiences revisited: A review of research on sources of environmental sensitivity. *The Journal of Environmental Education*, 29(3), 11-21.

Chawla, L. (1999). Life paths into effective environmental action. *The Journal of Environmental Education*, 31(1), 15-26.

Clewell, A. F., & James. (2007). *Ecological restoration: Principles, values, and structure of an emerging profession*. Washington, DC: Island Press.

Eagles, P. F. J., & Demare, R. (1999). Factors influencing children's environmental attitudes. *The Journal of Environmental Education*, 30(4), 33.

Education, D. C. (2000). *Schoolyard learning: The impact of school grounds*.

Environmental Protection Agency (EPA). (2012). Environmental Education and Literacy. Retrieved from: http://www.epa.gov/education/basic.html

Glasman, L. R., & Albaracín, D. (2006). Forming attitudes that predict future behavior: A meta-analysis of the attitude-behavior relation. *Psychological Bulletin*, 132(5), 778-822.

Lieberman, G. A., & Hoody, L. (1995). *Closing the achievement gap: Using the environment as an integrated context for learning*. The State Education and Environment Roundtable.

Madison Metropolitan School District (MMSD). (2011). Enrollment information. Retrieved from: https://infosvcweb.madison.k12.wi.us/enroll

Maloney, M. P., & Ward, M. P. (1973). Ecology: Let's hear from the people: An objective scale for the measurement of ecological attitudes and knowledge. *American Psychologist*, 28(7), 583-586.

Maloney, M. P., Ward, M. P., & Braucht, G. N. (1975). A revised scale for the measurement of ecological attitudes and knowledge. *American Psychologist*, 30(7), 787-790.

Nunnaly, J. (1978). *Psychometric theory*. New York: McGraw-Hill.

National Governors Association Center for Best Practices, Council of Chief State School Officers. (2010). *Common Core State Standards*. Washington, D.C.: National Governors Association Center for Best Practices, Council of Chief State School Officers. Retrieved from:

©2013 Extension Journal Inc.

http://www.corestandards.org/the-standards

Newhouse, N. (1990). Implications of attitude and behavior research for environmental conservation. *Journal of Environmental Education*, 22(1), 26-32.

No Wisconsin Child Left Inside Coalition (2012). News and information. Retrieved from: www.ncliwisconsin.org

Obropta, C. C., DiNardo, M. F., & Rusciano, G. M. (2008). The demonstration rain garden. *Journal of Extension* [On-line], 46(2) Article 2TOT3. Available at: http://www.joe.org/joe/2008april/tt3.php

Ryan, C. (1991). The effect of a conservation program on schoolchildren's attitudes toward the environment. *The Journal of Environmental Education*, 22(4), 30.

Smaldone, D., Boone, D. A., Selin S., & See, A. (2011). Broadening extension's capacity – comparing extension agents' and environmental educators' perceptions of needs and barriers. *Journal of Extension*. [On-line], 49(3) Article 3FEA3. Available at: http://www.joe.org/joe/2011june/a3.php

Sobel, D. (2005). *Place-based education: Connecting classrooms & communities*. Great Barrington, MA: Orion Society.

Spring Harbor Middle School (2012). About us. Retrieved from: https://springharborweb.madison.k12.wi.us/about

Wisconsin Department of Natural Resources. (2013). Rain gardens: A beautiful way for you to reduce runoff pollution. Retrieved from: http://dnr.wi.gov/topic/Stormwater/raingarden/

Wisconsin Department of Public Instruction. (1998). *Wisconsin's Model Academic Standards for Environmental Education*. Retrieved from: http://standards.dpi.wi.gov/files/standards/pdf/envired.pdf

Ziede, A. (2008) Shades of gray: conservation education and women's activism in 1930s Wisconsin. Master's Thesis, University of Wisconsin, 2007.

Appendix A.

Survey

Verbal Commitment	1. I'd be willing to ride a bicycle or take the bus to school to help reduce air pollution. 2. I would join a club that is involved in improving the environment in my community. 3. I would be willing to help wildlife near my home (examples: putting up bird houses/feeders, planting flowers that attract butterflies or hummingbirds, providing food for squirrels). 4. I would take a class that teaches about plants and animals that live in my state.

©2013 Extension Journal Inc.

	5. I'm not willing to help the environment since that is the government's job. 6. I would donate a week's allowance to help improve the environment in my community. 7. I would be willing to stop buying products from factories that pollute the environment. 8. I'd be willing to email the Governor about protecting endangered animals. 9. I would hand out "Tips to Help the Environment" pamphlets to my neighbors. 10. I would donate $5.00 to help improve air and water quality.
Actual Commitment	1. I'm more willing to buy a product if it is safe for the environment. 2. I ask my teachers or other adults about ways I can help improve the environment in my community. 3. I make a special effort to recycle cans and bottles. 4. I try to encourage my parents to be more "environmentally friendly" at home (examples: energy efficient light bulbs, shop with re-usable bags, plant a garden.) 5. I try to buy recycled paper or notebooks for school. 6. I read books or watch TV shows about nature. 7. I make an effort to turn off lights when I leave a room. 8. I attempt to recycle used paper instead of throwing it in the trash. 9. I prefer to spend time outside in natural areas (forest, grassy area, lake, stream) rather than inside. 10. I write letters (or emails) to government officials about protecting the environment.
Affect	1. I feel people worry too much about pesticides (harmful chemicals) on food products. 2. I feel more relaxed when I spend time in nature (forest, grassy field, flower garden, etc.).

©2013 Extension Journal Inc.

	3. It angers me to think that the government doesn't do more to help control pollution. 4. I worry about the statement, "Polar bears could be extinct in 20 years due to global warming." 5. I become angry when I think about how cutting down forests hurts plants and animals. 6. I don't worry about water pollution. 7. I get frustrated when I think of the ways factories are polluting our air and water. 8. The "global warming" issue has never upset me. 9. I worry about how water pollution could hurt me and my family. 10. When I throw things away, I worry about landfills filling up.

Copyright © *by Extension Journal, Inc.* ISSN 1077-5315. Articles appearing in the Journal become the property of the Journal. Single copies of articles may be reproduced in electronic or print form for use in educational or training activities. Inclusion of articles in other publications, electronic sources, or systematic large-scale distribution may be done only with prior electronic or written permission of the *Journal Editorial Office*, *joe-ed@joe.org*.

If you have difficulties viewing or printing this page, please contact *JOE* Technical Support