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Forest Stewardship Education

Fostering Positive Attitudes in Urban Youth

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ABSTRACT

Philadelphia middle school students participated in a forestry education program that involved activities in the classroom, an urban forest, and a demonstration forest. A better understanding of forest stewardship, as evidenced by students' increased knowledge and shifting attitudes, was the cumulative effect, but activities and discussions in the demonstration forest proved the most effective educational method for fostering positive attitudes toward forestry.

Keywords: attitude change; demonstration forest; environmental education; program design; urban and community forestry

Above: **Eighth-grade students at Cobbs Creek in Fairmount Park, Philadelphia.**

For those of us who work in forest resources, there is no doubt that trees are the focus of our livelihoods. Sustaining forest resources is our common goal. But what priority would an inner-city youngster place on forestry? With competing issues like violence, gangs, decentralized families, poverty, and drugs, where do forestry concerns lie? How should forestry education programs be designed to reach inner-city youth? Exploring these issues formed the foundation for a forestry-based environmental education program in Philadelphia.

We created a three-stage educational program aimed at helping urban youth learn about forestry and forest management. We compared three methods of delivering forestry information: indoor classroom education, outdoor education in an urban park, and outdoor education at a demonstration forest. We then measured the success of those methods in fostering a forest stewardship ethic among urban youth.

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Philadelphia students learn about products derived from trees through a Project Learning Tree classroom activity.

Philadelphia, the nation's fifth-largest city, was an ideal place in which to conduct an environmental education effort because it typifies urban environments across the United States. Females without husbands constitute 28 percent of Philadelphia households (1990 census), 16 percent of the families are in poverty, and single mothers head 45 percent of those poor families; 59 percent of the city's youths (aged 8 to 18) are members of a minority. The striking statistics on family structure and poverty in Philadelphia demonstrate the challenges that many children face growing up in the inner city. Despite the ominous social problems, inner-city youth have strong perceptions about environmental issues and care about the environment and conservation (Kahn and Freidman 1995; Rockland 1995).

Our research evaluated the effectiveness of three increasing levels of educational programming on inner-city youths' attitudes and knowledge about forestry. Because hands-on, outdoor, interactive experiences are very effective ways to teach children about the environment, we incorporated outdoor educational components (Carlson and Baumgartner 1974; Schwaab 1982; Bowman and Shepard 1985). Urban environments represent ideal settings for urban environmental education and can lead to appreciation of cities' green spaces (Stranix 1975; Running-Grass 1994; Lutz 1995). To foster appreciation for the local environment, we added an urban forestry component. Because it is essential that attitude and behavior research be applied in the design of educational programs (Newhouse 1990), we measured both attitude and knowledge change at various points in the educational program.

We established the following research objectives:

- To compare knowledge of forest ecology, silviculture, and management practices among students in five groups: control, placebo, and students exposed to three forms of forestry education.
- To compare attitudes toward timber harvesting and clearcutting as forest management tools among the five groups of students.
- To examine the relationship between knowledge of forestry and attitudes toward timber harvesting and clearcutting.

Methods

Sample. We worked with three middle schools in the Philadelphia school district. One science teacher was chosen from each school on the basis of their school involvement, motivation, and willingness to participate in the study. Each of the three science teachers enrolled two classes in the research project. An additional science class was randomly chosen from each middle school to serve as the control and placebo groups. These nine classes made up the sample for the study, for a total sample size of 182 students. About 46 percent of the students were male and 54 percent were female. The students were in grades 6, 7, and 8 with ages ranging from 9 to 14. About 84 percent of the students classified themselves as African American, 4 percent as American Indian, 1 percent as Asian American, 0.5 percent as Latin-Hispanic, and 1 percent as Caucasian.

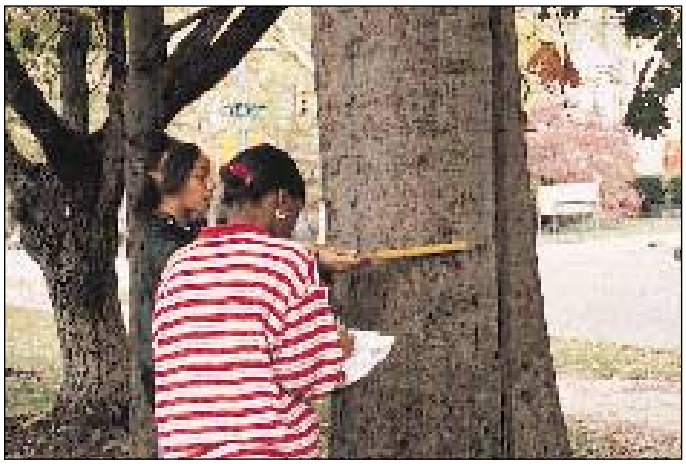
Educational programs. Our treatments consisted of three cumulative educational interventions: forestry education in a classroom, plus forestry education in a local urban setting, plus forestry education in a more rural setting at a demonstration forest. Because reinforcement is more likely to enhance attitude changes, three cumulative treatments were used, each one building on the knowledge gained previously while also introducing new topics. Some people may tend to perform or behave differently when they realize they are being observed or studied, a response known as the Hawthorn effect (Mayo 1933). To determine if students performed better on the questionnaires simply because there was a speaker and not because of the treatment, we included a placebo group as well. These students received a college preparation talk, and we did not cover any topics that would produce any knowledge or attitude gain for the measures in this study. For comparison, a control group receiving no treatment whatsoever was also included.

- *Classroom learning.* The first program was an indoor classroom session consisting of a slide presentation on Pennsylvania's forests followed by a Project Learning Tree activity. The slide show adapted for use in this study was created by Allison Harmon and is used to test the educational effectiveness of demonstration forest tours with private landowners (Harmon et al. 1997). The slide presentation covered topics of forest history, forest ecology, silvicultural treatments, forest growth and development, and threats to forest sustainability. After the slide presentation the students

were led through a Project Learning Tree activity, "We All Need Trees." The purpose of this activity was to help students discover the diversity and multitude of products derived from trees and their importance in society.

• *Urban forestry education in a familiar environment.* The second program was an outdoor urban forestry activity at Cobbs Creek in Philadelphia. Cobbs Creek is part of 8,700-acre Fairmount Park, the largest landscaped urban park in the United States. Topics included tree measurement, ecology, and reiteration of tree facts presented in the classroom. The students worked in pairs to become amateur foresters as they measured tree dbh, height, and crown cover. The students also identified the trees they measured. Back in the classroom, the students recorded all the data and created a graph of the tree characteristics for the section of Cobbs Creek they had visited. These urban forestry exercises were aimed at helping students make the link to an important natural resource in their community while further illustrating the role that forests play in their everyday lives.

• *Demonstration forest.* The third program was a guided tour of a Penn State forest stewardship demonstration area. In partnership with state and federal forestry and natural resource agencies, Penn State has established seven demonstration areas across Pennsylvania to encourage responsible forest resource management through education. The 12-acre demonstration area at French Creek, about one hour from Philadelphia, shows six silvicultural treatments: control, thinning from above (high-grading), thinning from below, shelterwood, improvement thinning, and a clearcut. The harvesting alternatives do not all represent good forestry, but they are all used in Pennsylvania. The purpose of the demonstration forest program was to compare harvesting options and encourage dialogue about their positive and negative consequences. Activities at French Creek included examining and comparing the silvicultural methods, and discussing how harvesting affects forest sustainability and how it is used as a management tool. We also covered forest facts and ecology.



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Middle-schoolers learn how to measure trees in their urban forest. Here students measure the diameter of trees at Cobbs Creek.

Questionnaire. All the students in the control, placebo, and experimental groups were tested before the educational activities. The control group did not participate in any of the educational programs and served as a reference point for the students who did. The placebo group received a college preparation presentation unrelated to the content of the study. The six classes in the experimental groups participated in all three educational programs—the forestry activities in the classroom, urban environment, and demonstration forest. Within those six groups, students were randomly chosen for testing after the first, second, or third educational program. Thus all students in the experimental groups took one test before and one test after; students in the control and placebo groups were also tested again.

The questionnaire, based on a version tested by Harmon et al. (1997) in a similar study comparing educational methods, began with 27 attitudinal questions. The students responded on a Likert scale of 1 to 5, with 1 being "strongly disagree" and 5 being "strongly agree." A factor analysis of the attitudinal questions produced five unique factors that measured the following attitude types:

1. Against timber harvesting.
2. Utilitarian view of forestry.
3. Forest preservation, not use.
4. Timber harvesting is a beneficial management tool.

Working with Schools

Schools can be effective avenues for environmental education. A majority of the Pennsylvania school districts have some type of environmental education program; nationwide, 30 states have formal environmental education programs (Hind 1988). Teachers would likely welcome new ways to teach their students about the environment. Some teachers indicated that lack of background knowledge was a barrier to incorporating environmental education into their curricula (Chamberlain et al. 1990). This is an area where foresters can lend their expertise, by becoming involved with local school districts and arranging classroom visits or field trips.

When approaching schools with an environmental education program, it is best to present a program that can easily be incorporated into what the teachers are already doing in the classroom. For teachers, ease of use is an important characteristic of any educational program they are considering using. For example, the Project Learning Tree curriculum used in this program has activities classified by grade level, subject in school, indoor or outdoor, and time required. In addition, its curriculum activities are planned in 50-minute sessions, just as classes are.

Table 1. Students' forestry knowledge and attitudes in the control and placebo groups and the treatment groups, who participated in three educational programs.

	Mean scores, control and placebo	Mean scores, treatment groups	*F* statistic	*p*-value
Knowledge of forest practices and management	0.43	1.12	41.23	.000
Knowledge of forest ecology and history	3.39	3.78	10.66	.001
Attitude 1: Against timber harvesting	3.86	3.48	11.33	.001
Attitude 2: Utilitarian view of forests	2.37	2.74	7.30	.008
Attitude 3: Forest preservation, not use	3.39	3.04	11.03	.001
Attitude 4: Timber harvesting is a beneficial management tool	2.67	3.33	17.61	.000
Attitude 5: Timber harvesting permanently destroys forests	2.94	2.39	13.49	.000

5. Timber harvesting permanently destroys forests.

Nine of the survey questions were previously validated by Luloff et al. (1993). Two items were taken from Chunko's (1994) study of teachers, five questions came from Harmon et al.'s (1997) study measuring the attitudes of private landowners, and we developed the other 11 questions.

The second part of the questionnaire had nine multiple-choice questions designed to measure students' knowledge of forest ecology, forest management, silvicultural concepts, and forest facts. The last part consisted of sociodemographic questions about students' age, sex, grade in school, and race.

Results

We performed a repeated-measures analysis of variance (ANOVA) with time as the repeated measure for each attitude type and knowledge measure. If treatment—that is, participation in the program—was found to have an effect over time, we then performed one-way ANOVAs for attitude and knowledge scores to compare the means of the five groups (control, placebo, classroom, urban forest, and demonstration forest). Where the ANOVAs indicated a relationship between an independent variable and a score, we used a Scheffe's test to identify significant between-group differences.

Cumulative effects of educational programs on knowledge and attitudes. The students who took part in the cumulative educational activities had more forestry knowledge than the control and placebo groups *(table 1)*. Forest practices knowledge scores ranged from 0 to 1, with one being higher knowledge. Forest ecology knowledge scores ranged from 1 to 6, with 6 representing higher knowledge. The educational activities together resulted in significant changes in attitude as well.

Individual treatment effects on knowledge and attitudes. A closer look at each treatment reveals degrees of effectiveness in changing attitudes and imparting knowledge. The results demonstrate that although knowledge of forestry can be gained from classroom or urban forestry activities, the only way that attitudes about forest practices change is when students see the direct results of various harvesting treatments *(table 2)*. A tour of the demonstration forest not only raised knowledge scores significantly higher than for the control and placebo groups, but also was the only program that resulted in changes in attitude on four of the five attitude types.

The mean scores on each attitude type demonstrate several trends *(table 2)*. After each educational program, students began to move away from a strong bias against timber harvesting (attitude 1). But it was only after seeing and discussing the silvicultural treatments at the demonstration forest that the students experienced significant attitudinal changes on this measure, and their scores on this measure fell to neutral (3.15). The shift toward a more neutral view of timber harvesting was significant when compared not only with the control groups but with the first two educational program groups as well.

That was also the case for considering timber harvesting as a beneficial management tool (attitude 4). Students entered the program fairly neutral, as measured by scores ranging from 2.94 to 3.11. Only after the demonstration forest dialogue about harvesting applications did the students agree (mean score = 4.06) that timber harvesting was a beneficial forest management tool. Again, this attitude shift was significantly different from that of both the control group and the students tested after the classroom and urban forestry activities.

The French Creek demonstration forest activity was also the only treatment that resulted in students' feeling less strongly about not using forests for multiple uses and only preserving them (attitude 3). Similarly, before the educational programs, students agreed that timber harvesting permanently destroys forests (attitude 5); they strongly disagreed with that statement only after the French Creek activities.

Association between knowledge and attitudes. Before the students toured the demonstration forest, their knowledge about forestry was negatively correlated with a strict attitude in favor of forest preservation, not use (attitude 3). However, after seeing the various ways a forest could be managed at French Creek, the students who learned about forestry agreed that harvesting was necessary at times *(table 3)*. Students with a higher level of knowledge about forestry also believed that the trees would grow back and that harvesting trees did not result in permanent destruction of the forest (attitude 5).

Table 2. Students' knowledge and attitude measures after three levels of educational treatments.

	Mean scores, control and placebo	Mean scores, indoor classroom	Mean scores, urban forest program	Mean scores, demonstration program
Knowledge of forest practices and management	0.43	1.13[a]	0.94[a]	1.28[a]
Knowledge of forest ecology and history	3.39	3.69	3.76	3.88[a]
Attitude 1: Against timber harvesting	3.86	3.62	3.64	3.15[a, b, c]
Attitude 2: Utilitarian view of forests	2.37	2.68	2.75	2.81
Attitude 3: Forest preservation, not use	3.39	3.11	3.11	2.88[a]
Attitude 4: Timber harvesting is a beneficial management tool	2.67	2.87	3.11	4.06[a, b, c]
Attitude 5: Timber harvesting permanently destroys forests	2.94	2.43	2.56	2.17[a]

[a]*Statistically significant difference from the control-placebo group scores at the p <. 05 level.*
[b]*Statistically significant difference from the classroom scores at the p <. 05 level.*
[c]*Statistically significant difference from the urban forestry scores at the p <. 05 level.*

Table 3. Correlation between attitude type and knowledge for all five treatment groups.

Attitude	Control	Placebo	Indoor classroom	Urban forest program	Demonstration forest program	Interpretation
1. Against timber harvesting	+	+	+	0	–	After the demonstration forest program, those knowledgeable about forestry did not have negative attitudes about timber harvesting.
2. Utilitarian view of forests	0	0	0	0	0	No correlation found between knowledge and a utilitarian view of forests.
3. Forest preservation, not use	–	–	–	0	0	After the outdoor programs, those knowledgeable about forestry shed views about strict forest preservation.
4. Timber harvesting is a beneficial management tool	0	0	0	0	+	After the demonstration forest program, those knowledgeable about forestry endorsed the use of timber harvesting as a forest management tool.
5. Timber harvesting permanently destroys forests	0	0	0	–	–	After the outdoor programs, those knowledgeable about forestry were less likely to think that timber harvesting permanently destroyed forests.

\+ *Significant positive correlation between knowledge and attitude type at the .05 level.*
– *Significant negative correlation between knowledge and attitude type at the .05 level.*
0 *No significant correlation between knowledge and attitude type.*

Recommendations

The results of this research provide guidance for urban environmental education program design, learning styles, and information transfer. One aspect we would like to reflect on is indoor versus outdoor educational experiences. Although outdoor education has unique benefits and the demonstration forest was the most effective educational tool for attitudinal change, indoor instruction should not be discounted. The classroom and urban forestry exercises were both effective in imparting knowledge. The ideal educational program would therefore incorporate both indoor and outdoor sessions.

Another essential component of forestry education programs is acclimating students to the forest. Researchers have found that some students express fearful responses to learning in natural environments (Metro et al. 1981; Bixler et al. 1994). The indoor and urban forestry exercises allowed time to address any fears or discomforts associated with being in a forest. In the urban park in this study, the children were able to make a connection with the natural resources in their own communities and learn in a familiar natural environment. Valu-

ing the urban environment and using it as a learning resource were important components of this environmental education study. Translating the educational experience into something the children could relate to in their own neighborhood was the key.

That having been said, demonstration forests hold much promise for forestry education. The French Creek Forest Stewardship Demonstration Area was a valuable educational tool that changed children's attitudes about forestry beyond what could be achieved by indoor or urban forestry experiences alone. Similar studies comparing indoor and outdoor education found that outdoor experiences were more effective than classroom study in promoting students' cognitive achievement (Eaton 1999). Working with private landowners, Harmon et al. (1997) also found demonstration forests more effective than indoor instruction in producing changes in attitudes and increasing knowledge.

Demonstration forests represent a real opportunity in forestry education and can be used with a variety of audiences—from urban youths to private landowners. The silvicultural demonstrations encourage informed dialogue beyond the typical negative reactions to clearcutting and timber harvesting. Looking at forest practices on the ground, with a forestry educator to stimulate discussion and debate, fosters a citizenry that is better prepared to make informed decisions.

Conclusion

Based on the findings of this study, we conclude that classroom exercises, urban forestry activities, and demonstration forests are all valuable components of an educational program because they help participants gain knowledge and promote changes in attitude. The program we conducted resulted in students' learning more about forestry and shedding their negative views about forestry while adopting attitudes in favor of harvesting trees sustainably. Although knowledge can be imparted through both classroom and outdoor education, demonstration forests might be best way to effect attitude change.

Only when youths understand society's need for forests and the benefits they provide will they be more likely to have a sustainable forestry management perspective. We, as foresters, need to address this educational need by reaching America's urban youth. They are our fellow citizens who will become increasingly more involved in decisions about the management of public and private lands.

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