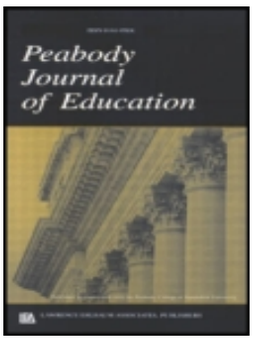

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Place-Based Stewardship Education: Nurturing Aspirations to Protect the Rural Commons

Erin Gallay
University of Wisconsin–Madison

Lisa Marckini-Polk
Civic Research Services, Inc.

Brandon Schroeder
Michigan Sea Grant Extension, Michigan State University

Constance Flanagan
University of Wisconsin–Madison

In this mixed-methods study, we examine the potential of place-based stewardship education (PBSE) for nurturing rural students' community attachment and aspirations to contribute to the preservation of the environmental "commons." Analyzing pre- and post-experience surveys ($n = 240$) and open-ended responses ($n = 275$) collected from middle school students in a Northeast Michigan school district, we found significant increases in students' environmental sensitivity, environmentally responsible behaviors, community attachment, and confidence in their capacities for civic action. Analyses of open-ended responses pointed to the potential of PBSE to nurture students' identification with their community and to increase their commitment to stewardship of their community's natural resources. This study makes a unique contribution to the literature on rural schools by focusing on the environmental commons and younger generations' commitments to preserve it as an asset of rural communities. By linking students' learning with collective action to preserve the environmental commons, PBSE can expand students' aspirations for the kind of world they want to live in and the roles they might play in it.

Rural schools face many challenges—most notably their small sizes, limited budgets, and remote locations. These very challenges, though, can be opportunities to engage rural students with community partners in learning that focuses on local place (Bauch, 2001). In this paper, we report on a partnership between a school district and community-based organizations in a rural area of Michigan that is rich in natural, cultural, and historical coastal resources, yet struggling economically. We look at the potential of place-based stewardship education (PBSE) for nurturing

Correspondence should be sent to Erin Gallay, 2275 Foss Street, Ann Arbor, MI 48103. E-mail: egallay@wisc.edu

rural students' identification with their community, their future aspirations, and their sense of responsibility for the environmental commons.

By "the commons," we refer to the environmental resources on which life depends and the public spaces where people gather to negotiate how they want to live together (Flanagan & Gallay, 2014). Historically, the commons referred to natural areas such as grazing land or fisheries that were "owned" in common and utilized by everyone. Gradually, this definition expanded to include cultural and societal commons such as shared practices, values, arts, information, traditions, beliefs, and knowledge. Today, the definition also encompasses public spaces and institutions, such as schools, parks, and the Internet (Bowers, 2006). These public spaces are where people come together, form relationships and group identities, and develop feelings of social responsibility for one another and for the social and ecological assets they share.

When people are aware of their connection to the commons and its value to their lives, they assume responsibility for it. As Ostrom (2010) demonstrated in studies across the globe, a "tragedy of the commons" driven by self-interest, whereby individuals will act against the best interests of the community by overusing and destroying resources, is not inevitable. Instead, when members of a community work together, communicate, and develop trust in one another, they are more likely to preserve what Ostrom referred to as common-pool resources. But how does this identification with and sense of responsibility for the commons develop? We contend that the ethic of caring for those things we hold in common emanates from the experience of being a citizen of a local place and from the realization that one is accountable to the commons of that community. Further, we expect that educational practices embodied in PBSE that focus students' attention on the natural resources of their local community can influence their aspirations to preserve the environmental commons.

The potential of a focus on local place for students' learning and aspirations is not unique to rural communities, although "place" has long been a core theme in rural education research (Gruenewald, 2003; Haas & Nachtigal, 1998; Theobald, 2006). The salience of *place* is due, in part, to the tensions that have historically vexed rural schools—of reconciling the identities and assets of local roots with the pull of economic forces and social changes outside the community (Schafft, 2010). These tensions surface larger questions about the purposes of education in preparing younger generations for their roles as workers and as citizens. Education focused on the former to the neglect of the latter has been described as "placeless" and criticized for creating a society "marked by few allegiances and almost no propensity to shoulder mutual obligations" (Theobald, 1997, p. 120).

The place-based stewardship education effort of the Northeast Michigan Great Lakes Stewardship Initiative (NEMI GLSI) and this school district is an example of what rural schools and communities are doing to "shoulder mutual obligations" and prepare students for the economic, social, and environmental challenges of the coming decades. It also points to the potential role of schools in reimagining the purpose of education and the definition of a meaningful life.

Environmental degradation is arguably the greatest civic challenge facing younger generations, and the realities of climate change alone demand a fundamental reimagining of those things that give human life purpose and meaning (Giddens, 2009). Lives measured in income and material achievements are aspirations the planet cannot sustain. Instead, many rural people find a sense of purpose in the social bonds and involvement in community affairs that reflect the attachment they

feel for their communities (Jennings & Krannich, 2013). As advocates of place-based learning have observed, the dignity of a human life inheres in the positive impact one can have on the lives of others, and education has a major role to play in cultivating such communal dimensions of the aspirations of younger generations (Theobald, 2006).

In light of the pressing challenges posed by environmental degradation and climate change, we contend that the traditional issues rural communities face are, in fact, opportunities to cultivate environmental concern—opportunities that have no clear counterparts in nonrural contexts (Coladarci, 2007). First, a remote location offers a rural way of life rooted in the natural environment. The local *place* offers ready access to natural areas for exploration, play, and learning—sites that are less available and much less accessible in urban settings. Even if students are initially unaware of the human impact on nature, the rural landscape provides a plethora of opportunities for PBSE to engender that awareness and provide motivation for them to become stewards.

Second, the small size of the population in rural communities increases the likelihood that people will know one another (Shamah & Mactavish, 2009) and decreases the size of school administration and bureaucracy. Others have noted that small school size and a strong sense of community are advantages that rural schools have over their urban counterparts (Bauch, 2001; Theobald & Nachtigal, 1995), giving rural schools the potential to be more nimble in experimenting with educational innovations. The PBSE model discussed here, for example, is based on collaborations between schools and community partners that are unencumbered by regulations or excessive administration and enabled by personal relationships, communication, and trust, qualities that Ostrom and her colleagues identified as those that enhance cooperation in the preservation of common-pool resources (Cardenas & Ostrom, 2006).

Finally, decreasing county, state, and federal public funding for wildlife protection, natural areas conservation, and marine and land resource management has led to the development of new strategies in rural communities in which the volunteer efforts of citizens, including young people, are called on to preserve these environmental commons. Students' actions in PBSE, whether gathering data on the water quality of a local river or building interpretive trails, make palpable contributions that sustain their rural communities, and cash-strapped resource management agencies are increasingly open to the potential from partnerships with their local schools. For example, in the invasive species management efforts led by NEMI GLSI, students have worked with national, state, and local organizations to remove nearly two acres of invasive buckthorn through a project aimed at raising community awareness and enhancing aquatic habitats and native biodiversity within the watershed.

In fact, engaging young people in local community affairs is gaining increased traction as a development strategy for revitalizing rural communities (Andresen, Dallapiazza, & Calvert, 2013; Brennan & Barnett, 2009; Ivan, 2010). As noted by the Rural School and Community Trust (2013), "Given current economic circumstances, rural, remote, and other high-needs communities must look inward and bring all of their assets and strengths to bear on their local challenges" (p. 3). In the context of budget reductions for conservation and management of natural resources, the assistance of students and teachers can be a unique rural asset. We explore this rural resource and argue that by engaging in place-based stewardship, students develop an identification with their local place, a belief in their capacity to effect change in that place, and aspirations to contribute to and sustain the commons that they and fellow citizens share.

PLACE-BASED STEWARDSHIP EDUCATION

Place-based education is grounded in a pedagogy that extends the walls of the classroom into the local community and landscape through experiential hands-on learning where the natural, built, and social environments are studied. We use the term place-based *stewardship* education to distinguish those efforts that focus on the relationship between humans and the natural environment in the local community and the connections of learning and action(s) that benefit the local environment.

The focus on *place* is twofold: as a source for learning and as a community to which one can contribute (Smith & Sobel, 2010; Yoder, 2012). Woodhouse and Knapp (2000) argue that, by connecting students' identities to local communities, an ecological place-based paradigm reflects a philosophy of education that is broader than "learning to earn." Indeed, some believe that "placeless" curricula driven by testing mandates set students on a path toward jobs in urban areas and thus contribute to out-migration from rural areas (Shamah & Mactavish, 2009)—orientations that a place-based curriculum might counter.

Others have shown that education focused on the natural environment is valuable for motivating students' intellectual discipline and desire for learning. For example, scholars have documented that students who participate in environment-based education have a greater achievement motivation, disposition toward and skills in critical thinking than their peers who do not participate in environment-based education (Athman & Monroe, 2004; Ernst & Monroe, 2004). However, less is known about the implications of PBSE for students' civic development, that is, their sense of responsibility for the community and beliefs in their capacity to contribute to and sustain the commons (Flanagan & Gallay, 2014). Elements of PBSE such as young people's service and contribution to the community, student outcomes such as a sense of belonging to and identification with the community, and the formation of social capital have been identified as correlates of youth civic development (Flanagan, 2013). In addition, the PBSE focus on local place provides a foundation for young people to identify with and feel that they belong to the local community, which, in turn, should motivate feelings of social responsibility for that place (Flanagan & Gallay, 2014).

Psychological research on the human need to belong and literature on youth engagement in community-based organizations (CBOs) is also relevant to understanding the possible link between PBSE practices and civic development. Based on their review of psychological studies, Baumeister and Leary (1995) concluded that the need to belong is a fundamental human motivation. Thus, programs that emphasize and enable belonging to the commons should fulfill that need. In addition, scholars of youth development have identified feelings of "mattering" to others as the sine qua non of effective community youth organizations (Eccles & Gootman, 2002). Thus, programs that offer students opportunities to contribute to their communities should make those young people feel like they play an important role in the lives of fellow community members.

The sense of belonging or social incorporation that adolescents derive from being members of CBOs also informs their hopes and aspirations. For example, research on adolescents involved in CBOs found that a decade after their involvement, they had a greater sense of hope and agency, more positive ideas about the future, and the knowledge and confidence to plan for it, compared with their peers who were not involved in CBOs (McLaughlin, 2000). For those who did community service, optimism about the future was boosted by positive feedback from adults

and feeling valued by their community. Ultimately, society and adolescents both benefit from the personal bonds that form in such organizations.

Opportunities for adolescents to contribute to the community enhance their feelings of connection and identification with the community. Compared to other extracurricular clubs and activities, adolescents' engagement in groups in which they do some form of community service is associated with their more positive reports of bonding and bridging social capital, intergenerational harmony, and social support from fellow community members (Flanagan, Kim, Collura, & Kopish, 2014). Convergent evidence from the scholarship on academic service learning points to positive relationships between this pedagogy and students' civic knowledge, skills, and attitudes, social capital, and intentions to engage in additional service to the community (Billig, Root, & Jesse, 2005).

Engaging in service to the community also encourages adolescents to recalibrate their career aspirations. According to one panel study, after they had engaged in volunteer work, high school students expected that careers would hold less importance and contributing to the community more importance in their adult lives (Johnson, Beebe, Mortimer, & Snyder, 1998). Even aspirations about staying or leaving one's community appear to be affected by opportunities to make a contribution. McLaughlin (2000) found that for young people engaged in community-based organizations, aspirations to improve the quality of life for others in their community was the reason many gave for why they intended to stay in that community rather than move away. In summary, opportunities to connect to others in one's local place fulfill a basic human need to belong. In addition, opportunities to contribute to the local community inform the civic identities and aspirations that adolescents are developing (Youniss, McLellan, & Yates, 1997).

In the present study, we explore how PBSE contributes to the civic development of rural students, their understanding of and responsibility for the commons, and their future stewardship. We argue that by emphasizing connection to and identification with the local rural community, and by inviting and enabling youth to be stewards of that community, PBSE practices help young people connect their own future aspirations to the well-being of their communities.

FROM CIVIC DEVELOPMENT TO ENVIRONMENTAL STEWARDSHIP

In the current study, students' community work is intimately linked to the natural environment in a rural context. Thus, we draw from literature on environmental sensitivity to support our argument about the potential of PBSE for engendering an attachment to local place and a sense of responsibility for the environmental commons. Environmental sensitivity refers to a positive affective regard for the natural environment—feelings such as enjoyment, fulfillment, connectedness, and identity in relation to the experience of nature (Ernst & Theimer, 2011).

Theoretically, environmental sensitivity is the foundation for a lifetime of responsible environmental behavior. Meta-analyses of research on responsible environmental behavior (Hungerford & Volk, 1990) as well as integrative reviews of the significant experiences in the lives of environmental stewards (Chawla, 1998) highlight environmental sensitivity as the major "entry" variable, important for environmental awareness and for a predisposition to take responsible environmental action. Established early in life, it is a prerequisite to the investment in the local environment and sense of agency that might propel a lifetime of responsible environmental behavior (Chawla, 1998). Feelings of connection to and interdependence with the environmental community corre-

late with motivations and actions to protect that larger community (Bamberg & Moser, 2007). Therefore, insofar as human interdependence with nature is an integral part of place in many rural communities, PBSE that engages students in actions to monitor human impact and restore the local ecology (Smith & Sobel, 2010; Yoder, 2012) should nurture an ethical awareness rooted in an understanding of interdependence and community.

The goal of the current assessment was to determine whether PBSE would have a positive impact on students' environmental sensitivity, sense of identification with their rural community, propensity for environmentally responsible behavior, and feelings of responsibility for, and capacity to take action on, environmental issues of the commons. In short, we sought to understand how PBSE influences middle school students' identification with the rural environmental commons and their capacities to act on behalf of that commons. As sixth graders, the youth in our study were at an early stage in their identity formation (Meeus, van de Schoot, Keijsers, & Branje, 2012), but the generative nature of environmental stewardship makes salient the implications of their actions for future generations and communities (Pratt, Norris, Alisat, & Bisson, 2013). Thus, we contend that by engaging in PBSE projects, middle school students can become increasingly aware of issues of interdependence and that their personal aspirations can become intimately tied to the well-being of the natural environment in rural communities. As Arendt (1958) proposed decades ago, generative concern with the implications of one's actions for future generations reflects an awareness of the commons that transcends individual life spans.

NORTHEAST MICHIGAN GREAT LAKES STEWARDSHIP INITIATIVE

The school district on which the paper focuses was supported by the NEMI GLSI, a regional network of schools and community groups engaging students as partners in protecting the Great Lakes and other natural resources of Michigan. NEMI GLSI serves eight rural counties, including a network of more than 30 schools in which roughly 3,000 youth (approximating 20% of the targeted student population in this region) engage in place-based stewardship experiences in (and with) their communities each school year. Here, we report on projects with middle school students in one of these rural school districts.

NEMI GLSI is part of a larger network of school–community partnerships in Michigan, one of nine regional "hubs" of the Great Lakes Stewardship Initiative (GLSI). The GLSI neither requires nor offers any standard curriculum because the program operates in numerous contexts and respects the importance of *local place* and a community's unique environmental context as the foundation for learning. Instead, the GLSI is organized around three key activities, each adaptable to the local context and its stewardship needs: schools form partnerships with local community organizations, teachers participate in sustained professional development, and students engage in inquiry-based, hands-on, place-based stewardship education.

The "hub" that is the focus of our paper (NEMI GLSI) implements these strategies with a local emphasis on education enhancement, community development, and resource conservation stewardship. Partners include regional school districts; math and science centers; community youth development organizations; and regional, state, and federal agencies with natural resource

research and management investments in northeast Michigan. The NEMI GLSI and the larger umbrella of the GLSI are unique entities in the field of PBSE because of the larger statewide connection of "hubs" working on similar efforts in different regions and the intentional, sustained framework of support and funding provided by the GLSI to the local hubs.

The Region

Demographically, northeast Michigan, including the county where this school district is located, reflects little racial or ethnic diversity, with 97% of the populace identifying as Caucasian (U.S. Census Bureau, 2015). Socioeconomically, this once-prosperous region now has relatively high unemployment and low per capita incomes. Since 1990, northeast Michigan has suffered a loss of mining and manufacturing jobs, U.S. Air Force base closure, and decline in agriculture, among other industry struggles (Michigan Sea Grant, 2009). According to the U.S. Bureau of Labor Statistics, the county in which our target school district is located had an unemployment rate of 9.7% in 2013, slightly lower than other counties in the region (U.S. Department of Labor, n.d.). The percentage of students eligible for free or reduced-price lunch in the county is 52.8%, compared to a state rate of 48.2% (Michigan League for Public Policy, 2014). Sixteen percent of the adult population over 25 years of age has a bachelor's degree, compared to a state percentage of 26% (U.S. Census Bureau, 2015). The age of the county's population has shifted, with decreasing numbers in the 25 to 44 age range and a growing population of those over 45 (Northeast Michigan Council of Governments, n.d.).

Important tourism industries in the region have also suffered from compounding social and environmental factors. Hunting and fishing tourism was negatively affected by disease in whitetail deer herds and the ecological impacts of invasive species on salmon fisheries. In addition, economic conditions in the state reduced visitation and tourism contributions from southeastern urban areas (Michigan Sea Grant, 2009). In short, the region shares challenges that are common in rural communities: high unemployment, a reliance on low-wage work, and an aging population due to the out-migration of youth seeking more education and better employment prospects (Brown & Schafft, 2011; Johnson, 2006).

Nonetheless, northeast Michigan is rich in heritage and coastal and aquatic resources, and a viable future depends on stewardship of those resources, especially the Northern Michigan Lake Huron watershed, an ecologically, economically, and historically significant resource (Michigan Sea Grant, 2009). The region has expansive Great Lakes coastlines, boasting ecological biodiversity and maritime heritage reflected in numerous lighthouses and shipwrecks. Inland there are other natural resources such as lakes, rivers, and streams meandering through significant forestlands, including a unique jack pine forest stands protected as critical habitat for the endangered Kirtland's warbler. These natural areas provide important social and economic value through the forestry, fishing, hunting, wildlife watching, and ecotourism opportunities in the region. These resources and the rural nature of the region provide communities with a sense of place and quality of life that sustains its identity (Michigan Sea Grant, 2009). As a result, communities in this region continually seek to expand tourism opportunities for economic growth, but with a purposeful eye toward strategies promoting resource stewardship and community sustainability. These include such things as investment in sustainable coastal tourism strategies, some of which open

opportunities to engage youth voice and service in realizing broader community development goals (Johnson & Schroeder, 2012).

Regional Community Development and Integration of PBSE

A strong network of federal, state, and regional agencies as well as university partners monitor and manage natural resources in the area. These partners include government agencies, watershed councils, conservation groups, and various fishing and hunting groups. These many organizations are eager to partner with teachers who want to engage their students in learning about the environment, the Great Lakes, and stewardship (Fortner & Manzo, 2011; North American Association for Environmental Education, 2010). In fact, stewardship learning is considered a community development strategy, with education of the younger generation often listed as a priority of regional organizations. Ivan (2010) argues for the importance of this type of deliberate youth engagement, specifically suggesting that "reach[ing] out and engag[ing] youth on a variety of levels" is a key community development pillar and strategic opportunity for rural communities.

It is also the rural nature and small population of this area that can reduce the barriers that might otherwise impede action because people tend to know one another on a personal level. Students themselves have access to governmental representatives and others responsible for policymaking, a level of contact that is more difficult to achieve in large urban schools. In addition, students are viewed not only as community assets but also as critical partners by agencies, dealing with the twin challenges of budget cuts and pressures for services, and by CBOs that rely on volunteers. In a project reminiscent of President Franklin Delano Roosevelt's New Deal work relief program, the Civilian Conservation Corps, several teams of students have turned their research and writings on the local natural environment into interpretive signage and exhibits now on display at coastal state parks, local museums, and on Great Lakes education and coastal tourism websites.

The Program

Here we focus attention on the sixth-grade classes in a district middle school, where teams of students participated in one of two place-based stewardship education efforts. One team of students joined a regional effort focused on cleanup, monitoring, and protection of local beaches. This effort was coordinated regionally in partnership with the Alliance for the Great Lakes' Adopt-a-Beach program. Locally, the students conducted water-quality tests to determine the health of the water system, collected trash, recorded their findings, and educated local authorities as well as the public about invasive species and the effects of pollution. Students met with their mayor and presented their concerns about excessive plastic and cigarette butt pollution, catalyzing a policy conversation aimed at enhancing aesthetics of public beaches and protecting the ecological health of the lake.

Another team of sixth-grade students focused on their school campus habitats, collaborating with conservation partners to research water quality and restore stream bank habitats of a local creek running through their school's natural area. Students learned to identify and remove the invasive species in the area and monitor biodiversity as a measure of ecosystem health. They completed trail maintenance and enhancement to ensure its accessibility and utility for the school and community, created interpretive markers and educational brochures, and made plans to restore

the habitat with native plant species. Additionally, this student team enhanced habitats through a schoolyard butterfly garden project, learning about plants, animal habitats, and ecosystems in the creation of the garden. Aside from the ecological benefits, these projects served as community demonstration sites where parents and visitors could learn about the importance of (and threats to) local natural areas and contribute to public recognition of the school and its benefit to the community.

RESEARCH QUESTIONS

Our study focuses on how PBSE affects rural students' identification with the environmental commons, their abilities to take action to protect that commons and how time spent in natural areas affects their attachment to and identification with the environment. Do rural students spend more time outdoors than their urban peers, and does this affect how they see the natural world? Is the time a student spends outdoors positively associated with his or her reports of environmental sensitivity, environmentally responsible behaviors, and attachment to his or her community? And do these capacities, as well as their sense of civic capacity to address an environmental problem in their communities, increase after participating in PBSE projects? Finally, in making meaning of their work, do students reference the environmental commons and the impact of their collective efforts on other people, species, and the quality of life and future of their rural place? In other words, through PBSE efforts, do middle school students gain awareness of issues of interdependence and community attachment and see their personal aspirations as tied to the preservation of their communities' natural commons?

METHODS

Sample

All sixth graders participating in NEMI GLSI projects from the district middle school were administered surveys before and after their participation in the projects. Surveys were administered to each classroom, resulting in a total of 240 sixth-grade students (51% female). In addition, 275 students responded to open-ended questions at the end of their projects, tapping their perceptions of the place-based stewardship project. (The open-ended data were collected at one time point, and thus the number of respondents is larger than the sample with two waves of data.) The broader evaluation from which we draw these data also surveyed 231 urban/suburban students participating in GLSI projects at other hubs. We use these urban/suburban responses to examine how our rural sample's preprogram characteristics compare to those of students living in more urban settings.

Measures

Data were collected by two of the study's authors. Survey items were adapted from measures used by the National Environmental Literacy Assessment (NELA) (Hollweg et al., 2011; McBeth et al., 2011; McBeth & Volk, 2009) and earlier efforts to define and foster environmental literacy

(Cheak, Volk, & Hungerford, 2002; Hungerford & Volk, 1990). Environmental literacy is a multifaceted construct that includes environmental knowledge, proenvironmental dispositions, and skills for analyzing issues and taking action.

The surveys included measures of environmental sensitivity ("I like places where there are lots of different plants and trees" [Bunting & Cousins, 1983]); responsible environmental behaviors ("To save energy, I turn off lights when they are not in use" [Leeming, Dwyer, & Bracken, 1995]); and place/community attachment ("I feel like this community is a part of me" [Williams & Vaske, 2003]). In addition, students were asked a set of six items relating to their capacity to take a variety of actions to address an environmental problem, including gathering data and information to describe the problem, getting other people to care, expressing views in front of a group of people, and identifying individuals or groups who could help with the problem (Flanagan, Syvertsen, & Stout, 2007). For each construct, we conducted a reliability analysis (alpha model) in SPSS 18 and examined the resulting Cronbach's alpha to determine whether items were sufficiently interrelated to warrant treatment as a scale. Alphas (pretest and posttest) were .78 and .83 for environmental sensitivity, .70 and .69 for responsible environmental behaviors, .80 and .84 for civic capacity, and .80 and .83 for place/community attachment.

Measures of involvement in outdoor recreation were collected at the pretest. These included whether students participated in the last 12 months in outdoor activities (e.g., hunting, fishing, camping, or nature walks/hiking) and the frequency with which students went outside to "relax, socialize with friends or family, or have fun." In addition, all students were asked an open-ended question at the end of their projects: "What did you most value about your stewardship project?" and "Anything else you would like us to know concerning your opinions about the stewardship project, or learning about the environment, or how the stewardship project affected you personally?"

Analytic Strategies

We used basic correlational analyses to examine our hypotheses about the intertwined character of attachment to nature and attachment to community in preprogram measurements. To examine change from pretest to posttest, we conducted paired samples *t* tests, and Cohen's *d* was used to measure effect size.

Coding of open-ended responses was done in stages with a modified grounded theory approach. First, one of the study's authors reviewed all of the responses and derived an initial list of emerging codes. Second, through consultation with the second coder, these initial codes were refined, and a general coding scheme of ten discrete codes was developed. Using this finalized coding scheme, the two coders then independently coded a random subsample of 10% of the responses to assess inter-rater reliability; Cohen's kappa was .86. Upon establishing inter-rater reliability, the primary coder completed coding the rest of the qualitative responses.

RESULTS

As the results in Table 1 show, students scored a mean of 3.94 on the five-point scale of environmental sensitivity on the preprogram measurement. Students also scored at the high end

TABLE 1
Means and Standard Deviations for Students' Environmental and Civic Behaviors Before and After Involvement in the Stewardship Programs

	Pre	*SD*	Post	*SD*	Diff	Std. error of mean for paired diffs.	*t*	*p*	Effect size	Wilcoxon Signed Ranks Test Significance
Environmental sensitivity	3.94	*.65*	4.06	*.65*	.13	.040	3.69	.000	.200	.000
Responsible environmental behavior	3.31	*.71*	3.50	*.67*	.19	.035	5.20	.000	.267	.000
Place/community attachment	3.78	*.78*	3.91	*.79*	.16	.048	3.33	.002	.167	.003
Civic capacity	3.22	*.82*	3.38	*.87*	.13	.043	3.03	.001	.190	.001

of the place/community attachment scale, averaging 3.78. Mean scores for responsible environmental behaviors and civic skills were scored closer to the midpoint of the scale. In addition, at baseline, environmental sensitivity and responsible environmental behaviors were positively associated with an ordinal measure of the frequency of outdoor recreation (gamma = .268 and .247, $p < .000$ for both variables). However, community attachment did not correlate with time spent outdoors. Only environmental sensitivity correlated with the type of outdoor recreation: students participating in a more diverse array of outdoor activities had higher sensitivity scores compared to their peers, who engaged in fewer forms of outdoor recreation.

Comparisons of students in the study to students of similar age in an urban/suburban setting (also participating in GLSI projects) confirmed that students from the rural sample spend more time outside and engage in more "rural" activities, such as hunting, fishing, and camping, than their urban/suburban peers. As expected, the baseline environmental sensitivity scores were higher for the rural sample than their urban/suburban peers.

Analyses of the data collected from the pre- to post-surveys of the sixth-grade participants in the NEMI GLSI projects revealed significant gains in each of the measures, with effect sizes ranging from .17 to .42. Because some of the aggregate scale variables exhibited some positive skew, we reanalyzed using nonparametric tests, specifically the Related Samples Wilcoxon Signed Ranks Test. All four pre-to-post changes were statistically significant.

Having established program impacts in the expected direction, we constructed variables to measure *change* (postscore minus prescore) and examined their bivariate correlations. As shown in Table 2, students whose environmental sensitivity scores increased preprogram to postprogram were also somewhat more likely to demonstrate increases in scores for responsible environmental behaviors, community attachment, and civic skills. However, these correlations are in the weak-to-moderate range, indicating that although there is an established, positive linear relationship between all of these forms of change in students, there is variation in the student change scores that is unique to each measure of change. Although there could be other outside factors, in our view, the gains in outcomes from pre- to post- were intercorrelated because these outcomes (e.g., civic skills, community attachment, etc.) are integrated in the program's theory and implementation, emphasizing *taking action* in the *local environment* to *benefit the community*. Students might

TABLE 2
Zero-Order Correlations of Change in Outcome Variables

		Change in community attachment	Change in responsible environmental behaviors	Change in civic skills
Change in environmental sensitivity	Pearson correlation	.380**	.291**	.372**
	Sig. (two-tailed)	.000	.000	.000
	N	266	255	260
Change in community attachment	Pearson correlation		.353**	.290**
	Sig. (two-tailed)		.000	.000
	N		273	277
Change in responsible environmental behaviors	Pearson correlation			.289**
	Sig. (two-tailed)			.000
	N			275

**$p < .01$.

exhibit positive outcomes relating to all of the program elements, to some, or to none, depending on their preexisting attributes and receptivity to the various elements of the place-based education experience.

Open-Ended Data

In responding to the questions, "What did you most value about the project?" and "Anything else you would like us to know concerning your opinions about the stewardship project, or learning about the environment, or how the stewardship project affected you personally?" ten codes were developed to categorize students' statements. Students could give more than one codeable statement in their open-ended responses with a maximum of four codes assigned to each statement. For the 275 students who provided open-ended responses, the ten codes were applied a total of 541 times. Although the questions did not ask specifically about the potential impact of their work in the community, a significant number of students referred to the effect that they felt their projects had on the human community or natural environment as important aspects of their projects.

Looking across these 541 coded statements, we find that 187 of the 275 students made some reference to concepts relevant to an understanding of the environmental commons in their response. The percentages given below indicate what percentage of the 275 student responses are reflected with a particular code; students' answers may be represented more than once if their responses fit into multiple codes. In the following, we discuss only the seven codes relevant to the environmental commons; not included are codes that referred to learning outside of the

TABLE 3
Open-Ended Coding Categories and Explanations

Code title	Code explanation
Human community as a commons	Response referenced a human community or people and members of the public as the beneficiaries of the project work
Environmental commons and a more-than-human community	Response referenced the benefits of their work to the environmental commons and nonhuman species such as plants, animals, and natural places
Personal connection with place or community	Response included modifiers of personal connections to or identification with place signifying a sense of belonging, ownership, or responsibility
Long-term stewardship, future actions, aspirations, and intentions for further work	Response referenced long-term or continuing stewardship as a goal, what should be done in the future, aspirations for continuing environmental monitoring and work
Positive or negative impacts of human actions	Response referenced the impact of consequences of human actions on the environment or other people
Environmental sensitivity or environmental identity, positive feelings about the natural world	Response referenced an environmental identity or sensitivity, reflecting a significance and connection to the environment and positive feelings about nature
Helping in general or making a difference with no specific beneficiaries	Response referenced making a difference through their actions in general without specifying who benefits: people, the community, or the environment

classroom; the work/activities students completed; and miscellaneous statements not otherwise captured by our codes (see Table 3).

In response to what they most valued about their stewardship projects, many students referenced the human community ($n = 87$; 32%), that is, people or members of the public who would benefit from their work, with one student stating, "The thing I most valued is the fact that the beach is going to be clean for this summer, that way more people will enjoy it." Students also mentioned benefits to the environmental commons and nonhuman species ($n = 75$; 27%). For example, one student said, "What I valued most about our stewardship project was the fact that we helped the environment and now it is cleaner for the wildlife." Another 20% ($n = 56$) of the responses referred, in general, to making a difference through their actions without specifying human or nonhuman species as beneficiaries, such as the student who wrote, "Knowing the water is clean, that is what makes me happy or proud."

Because of our interest in students' attachment to or identification with their local community, we included it in our concept of the commons, and we distinguished statements with modifiers of *personal connections* to *place* (i.e., the work benefited *my* family, *our* Great Lakes) from general references to the human or nonhuman community. Signifying a sense of ownership and responsibility, 17% ($n = 48$) of responses invoked words indicating an identification with place, such as the student who commented, "It does affect me because my family goes to the beach all the time and we see there is wrappers and cigarettes all over," or another student who wrote, "What I think that was most valuable in my stewardship project that I got to help my public beaches [sic] cleaner so others can enjoy them without garbage around them." In fact, many students whose responses indicated identification with the local place also wrote about their desires to continue

to make a positive impact on the environment and a difference in their communities. One student wrote, "The stewardship project affected me personally by making me think of ways I could help my environment and get me thinking how one change can make a difference," while another said, ". . . I learned a lot of new things that I can do to help our community." Students who referenced personal connections to place also wrote specifically about how their actions would affect others, such as the student who responded, "Other people will be able to enjoy the beach" or the student who mentioned, "People can use the trail now."

Taken together, the four codes described above all speak to "others"—humans and other living species, natural resources, and local places—that are part of the commons that students perceived as impacted by their work. Insofar as adolescence is a time for exploring identities, relationships, and values, we would argue that engaging in these PBSE projects enabled these early adolescents to conceive of the interdependence of their lives with *others.* In this sense they were formulating aspirations guided by self-transcending values (Schwartz, 2007). Also reflected in student responses was a sense of themselves as agents of change, and a belief in their capacities to take action on behalf of the local community and with others who share their local place.

Other students wrote of an environmental sensitivity or affinity for the environment that reflects a connection with nature ($n = 36$; 11%), like the student who reflected, "It helped me remember how much I enjoy nature and care about it." These responses indicate caring about or positive feelings toward the environment. Another 6% ($n = 16$) mentioned human impact on the environment, such as the student who wrote, "It has affected me by how I just realize how important keeping things clean is. I learned littering can be extremely dangerous which changed my mind about everything." Each of these themes alludes to aspirations, albeit in different ways. Students' references to identification with nature parallels the environmental sensitivity that has been identified as an entry point for the formation of an environmental identity (Chawla, 1998). The second statement ("changed my mind about everything") hints at the recalibrating of aspirations that Johnson et al. (1998) noted occurred after students had engaged in community service projects. Exposure to social issues that they may have never considered can be the basis for rethinking their future goals and aligning them with the common good.

Students also mentioned long-term stewardship as a goal that came out of their work. In other words, they were aware that a single stewardship project was not enough and expressed the aspiration to continue their work. As one student reflected, "I feel we should do more stewardship projects so we understand it more. So instead of playing video games in summers we could go outside and be healthy and know everything we are doing affects the earth." Others alluded to the need to recruit more people to be environmental stewards. One student described the potential ripple effect this way: "From the data we found we can help the problem and let other people see the results and maybe get them interested in helping." Fifteen percent ($n = 40$) of the responses referred to continuing stewardship—the need to continually monitor environmental quality and human impact. One student commented, "I wish we didn't just clean beaches. I wish we could clean up other areas such as parks, parking lots, sidewalks, etc. This activity made me feel a different [sic] about how I think about the environment. I feel like I should start helping out more." These responses often indicated a motivation and resolve to continue engaging in actions to benefit their communities and the environment and a desire and intention to influence others. As one student wrote, "I felt that good about helping and making our town look good, it made me think twice about littering and to tell my friends not to litter." Comments also referenced future intentions and goal setting, such as the student who said, "Next time I do something like this I

would get my family out to help." These expressions of changes in students' self-concept and intentions to recruit others as environmental stewards speak to their motivations to continue to act as agents of change for their communities. The orientation toward future generations inherent in environmental issues—that future generations will be impacted by the actions of people today—is closely connected to students' aspirations. As others have shown, there is a positive relationship between environmental actions and concern about the impact of one's actions on future generations (Pratt et al., 2013). In summary, these students seem to be imagining a hopeful future for their communities through actions they are taking today to improve those local places.

In order to gain insight into the ways that students' identities and aspirations were taking shape through stewardship projects, we looked at how references to different themes were combined in their statements. Students' understanding of human impact on the environment often accompanied references to learning about the effects of an issue such as pollution or invasive species on their community. One student commented, "I think my class project helped me realize how much of a problem there still is with litter on beaches," while another wrote, "I wouldn't have known that when the city cleans the beaches some things are left behind without all the information I got about the beaches."

Those students who referenced an environmental sensitivity and identity or understanding of human impact on the environment also tended to reference the environment as a community commons. As one student noted, "The stewardship project let me know that I did something good for not only my benefit but my town's. My opinion is that more people should do stewardship projects. . .. The beach stewardship helped me learn how careless some people are about taking care of their garbage." Another student remarked, "I valued about the beach because I got to help clean it up and see how deeply litter affects our community, animals and water. And how the water is all gross but we are trying to fix it." In their own words, these students echoed the findings of Elinor Ostrom and her colleagues that show a "tragedy of the commons" is not inevitable. These students think twice about their own behaviors now that they are aware of human impact; they recruit friends and family to monitor the commons rather than assuming that government alone will take care of the beach; they recognize the challenge of "gross water" and aspire to fix it.

In addition to changes in awareness, students reflected in some cases that they had personally changed through their projects. Participating in public life, especially presenting in public venues, typically the province only of adult decision makers, can be daunting. However, it can also change a student's sense of efficacy. For example, one student who presented the class's work in the public venue of a city council meeting noted: "The stewardship helped me a lot in life more than I can describe. It helped me get out of my comfort zone. When I presented to the city council, I was so nervous. But after that I felt like I could accomplish anything. And I just want to thank the stewardship for that." Concerning the formation of aspirations, this middle school student suggests that presenting the stewardship work in a public venue was a risk that pushed her out of her "comfort zone" and, as a result, she now imagines future accomplishments that had not even occurred to her prior to this experience.

Students' open-ended responses reflect that their PBSE efforts have helped them understand themselves as stakeholders whose civic actions affect the quality of life for others, today and in the future. In particular, the model guiding the project focuses on the local environmental commons and emphasizes students' capacities for action, which may help to explain why students develop an identification with and attachment to their local community, an awareness of their interdependence

with other people and species, and an understanding of their capacities for taking action on behalf of the local community.

DISCUSSION

One of the core purposes of public education is to develop the next generation's capacity to work collaboratively to determine and achieve what is in their mutual best interest (Carnegie Corporation & the Center for Information and Research on Civic Learning and Engagement, 2003). The results reported in this paper point to the potential of PBSE as one effective way to realize this goal. In this rural area rich with natural resources, the school–community partnerships and community stewardship work of the NEMI GLSI seemed to increase students' awareness of the interdependence of nature and human beings and of their capacities to recruit and work with fellow citizens to monitor that fragile balance. Because we found that rural students spend more time outdoors than their urban and suburban peers and use their natural surroundings for recreation and other activities, our findings are especially important to rural students who have a direct stake in the sustainability and integrity of the natural environments in which they live and work.

Analyses of the pre/post data point to increases in students' environmental sensitivity, environmental behaviors, community attachment, and civic competencies. The fact that the gains were intercorrelated likely reflects the integration of outcomes in this PBSE model—that is, an attachment to local place, an identification with the environmental commons and people that define that place, and the students' capacities to take actions on behalf of that place.

In addition, although the prompt for the open-ended question did not make any mention of nature, people, or their community, a majority of the responses referred to the pride that students felt in taking actions that benefited the local environmental commons, both the Great Lakes and the town, as well as the desire to do more. The educational model we studied encourages youth to reflect together about what matters to their communities and to decide on actions to address these issues. Results suggest that participation in local civic life, which provides opportunities for students to engage in public forums, influence others in their communities, and have their voices heard by people in positions of power, correlates positively with students' motivation to recruit others into civic action.

Open-ended responses also suggested that students recognized the value of applying their learning to address community issues. In this sense, their PBSE work accomplished a critical first step in nurturing educational aspirations—enabling students to see the impact they can have on their communities by applying knowledge and skills learned in school (Moje, 2007). In this PBSE model that linked schools with community partners and science with civic action, students learned core content and, simultaneously, applied what they learned to address environmental issues threatening their community commons. Results showed that this focus on place—who and what it is, what we can learn from attending to it, and how we can contribute to sustaining it—reinforced civic engagement and the value of learning.

The concept of place—as a source of and purpose for learning—has been at the heart of debates about rural schools. Here we have argued that schools can reimagine rural places by reframing both their challenges and their young people as community assets for learning and civic action. By encouraging affiliation with, and responsibility for, the local place, this PBSE model is an

example of what others have discussed as learning to reinhabit communities—that is, learning to restore relationships to other people and the land (Gruenewald & Smith, 2008). Reinhabiting communities and working with fellow community members to address issues of public concern affect both how students see their communities and their aspirations and capacities for addressing issues of the commons.

Through these projects, students gained a more critical awareness of human impact on the environment and developed more confidence in their capacities to take civic action to protect the environment and their community. Students may come to see that future success is not governed by economic gains alone, but can be measured in the wealth of one's membership in and contribution to a community. This, in turn, can influence students to make career decisions informed in part by communal well-being.

School–community partnerships such as those in the NEMI GLSI, which connect students with adults who might inform them about career opportunities in the local community, offer a potential model for rural community revitalization. That said, we want to be clear that we are not claiming PBSE is a panacea; it cannot *solve* issues such as youth out-migration from rural communities. However, research does show that students' aspirations are informed by their relationships with adults at school and by their perceptions of the future possibilities their rural communities offer. As Petrin, Schafft, and Meece (2014) found, when rural students discuss their postgraduation plans with school personnel, they hope to remain in, rather than, leave their community, and perceptions of bleak employment opportunities, rather than actual economic conditions, increase high-achieving students' aspirations to leave. If we think of "the commons" as the public spaces where people gather, form relationships, and decide how they want to live together, these results point to the critical role of schools as public spaces that enable students to participate in conversations and decisions about their communities and to imagine futures that are alternatives to the status quo.

As students revealed in their open-ended responses, people will protect what they come to know and value. Belonging to, having a voice in, and taking actions on behalf of a local community are the ways in which we become citizens of a place. As citizens, we also have obligations and are accountable to the place where we live and to others who reside in it. And that sense of obligation evolves when one identifies with and cares about a place. It is also a core expectation and responsibility of schooling to promote the values of democratic citizenship and catalyze civic agency.

Education that neglects this civic mandate, which responds only to market forces, has been criticized for the absence of accountability and allegiance to "place" (Theobald, 1997). Furthermore, valuing education based solely on monetary returns to years invested is myopic in light of the ecological crises with which younger generations will have to contend. Surely the point of education cannot be to provide us with the ability and incentive to consume more.

The PBSE model we have discussed gives students a cultural message about education and success that challenges notions that a successful life can only be found outside of the rural community and defined by financial gain. Rather, meaning and purpose—in learning and in life—inhere in being a contributing member of a community where one can exercise the prerogatives and assume the obligations of membership. We believe that, through their PBSE work, students developed a sense of community in the way that Wendell Berry has defined it: "A community is the mental and spiritual condition of knowing that the place is shared and that the people who share the place define. .. the possibilities of each other's lives" (2012, p. 71). Although schools cannot guarantee

that students will remain in or return to their rural roots, when education focuses students on the value of and responsibilities to local place, students will value and be able to live *in community,* no matter where they end up (Corbett, 2007).

AUTHOR BIOS

Erin Gallay works in place-based stewardship education and environmental civic action in the Great Lakes region. Her scholarship focuses on young people's commitments to the commons through EcoJustice and place-based education. Erin received her bachelor's degree in environmental education from the University of Michigan and both her secondary science teaching certification and Master's degree in EcoJustice education from Eastern Michigan University.

Lisa Marckini-Polk earned her bachelor's and master's degrees and completed coursework for a Ph.D. in political science at Wayne State University. She was employed by Public Policy Associates, Inc. between 1999 and 2003 and established Civic Research Services, Inc. in January 2004. She has worked on numerous evaluations and program-development efforts with the environment as a common theme. Since 2007, she has managed the evaluation of the Great Lakes Stewardship Initiative.

Brandon Schroeder works with the Michigan Sea Grant College Program and Michigan State University Extension serving coastal communities in northeast Michigan, to apply science-based knowledge to address Great Lakes issues locally. He received his bachelor's and master's degrees from Michigan State University's Department of Fisheries and Wildlife. His current Sea Grant Extension role and expertise includes fisheries science, sustainable coastal tourism development, and Great Lakes literacy and aquatic education.

Constance Flanagan is the Vaughan Bascom Professor of Human Ecology and Associate Dean of the School of Human Ecology at the University of Wisconsin–Madison. Her scholarship focuses on the factors in communities that foster identification with and action for the common good in young people. Flanagan's 2013 book, *Teenage Citizens: The Political Theories of the Young*, won the 2014 Best Authored Book Award from the Society for Research on Adolescence.

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