The Inclusion of Environmental Education in Science Teacher Education
Promoting the Use of Outdoor Learning Spaces by K-12 Inservice Science Teachers Through an Outdoor Professional Development Experience

Mark A. Bloom, Molly Holden, April T. Sawey, and Molly H. Weinburgh

Unlike our European and Australian counterparts, environmental education does not yet constitute a formal component of the public school curriculum in the United States (American Association for the Advancement of Science 1993; Connell 1999; Hicks & Bord 2001; National Research Council 1996). However, national interest in the environment has increased over the past few decades for a myriad of reasons particular to the variety of groups who express the interest. Despite the complexity surrounding environmental issues, they are all closely interrelated and, left unchecked, have the potential for disastrous economic, health, and biological consequences. Given these concerns, environmental topics are gradually being incorporated into national and state standards, mostly in the sciences and social studies (North American Association for Environmental Education 2004). Likewise, opportunities for environmental instruction in informal settings (natural history and science museums), outdoor spaces (school grounds, parks, other native land), and through environmental project-based community learning have increased significantly, as has research associated with these alternative teaching models (Corcoran 1999; Louv 2003; Sobel 2004).

Regardless of the means, the relevance of environmental issues to students’ lives is thought to most typically occur when learning experiences are situated in a meaningful context, and when human-environment connections are well understood (Connell 1999; Littledyke 2008), instruction addresses cognitive, affective, and behavioral domains (Littledyke 2008; Loughland et al. 2002; Loughland et al. 2003; Martin & Brouwer 1991), and environmental problems are presented as worthy of serious consideration and action but not as insurmountable. Sadly, few U.S. students today are exposed to natural spaces except for short periods of time.
School curricula, particularly based on textbook learning, generally do not support the use of outdoor spaces for instruction. Recess, now thought to be a partial antidote to such childhood epidemics as childhood obesity and attention deficit/hyperactivity disorder, has been shortened or cut altogether as a result of No Child Left Behind. A study by the Center for Public Education (2008) reported that while most children, regardless of location, continue to get recess on a regular basis, children who attend high-minority, high-poverty, or urban schools are far more likely than other children to get no recess at all. School administrators (and teachers) commonly have concerns about such issues as liability, safety, and actualization of academic benefits in many outdoor/off-campus activities, which are commonly perceived as time-consuming and not beneficial to students in terms of achievement gains for the effort expended.

The theoretical basis for the professional development (PD) program described in this chapter is that solutions to these issues cannot be conceived and acted upon without concern for the natural world and re-evaluation of our role in it. One way that this concern develops is from a deep understanding of the earth, its systems, and their interrelationships, an understanding that is significantly enhanced by direct experiences in the environment(s) one is attempting to comprehend. This chapter describes our observations and experiences in developing and conducting a PD program to educate teachers in the use of outdoor learning spaces (OLS) for environmental science instruction. An underlying assumption of the PD design is that, when properly conceptualized, planned, and aligned with appropriate standards, outdoor instruction can be beneficial to students and result in long-term gains that go beyond academic achievement. The first step in that direction is to help teachers identify and find ways to overcome the challenges they face in using outdoor learning spaces. The overarching goal of this PD experience was to “re-introduce” teachers to outdoor environments to: (1) supplement their content knowledge about environmental issues and their related scientific concepts; (2) improve their pedagogical skills by experiencing teaching strategies for transferring scientific knowledge in unique ways; and (3) align outdoor lessons with national and state teaching standards, with the short-term outcome of improving teacher efficacy concerning the use of outdoor spaces. What we report here are some of the challenges and successes we and our teacher-participants encountered as we worked to achieve these goals.

**Background and Description of PD**

This chapter discusses the work we conducted with K-12 science teachers during a 2-week, introductory component of an outdoor PD experience conducted from late July through early August 2008. It should be noted that only preliminary results of the experience are reported; we continued conducting 1-day workshops with these teachers once a month for the remainder of the 2008–2009 academic year. Most of the study participants were teachers from a local district “pyramid,” divided into two distinct cohorts for much of the workshop. The first cohort consisted
of 18 teachers from five local elementary schools. The second cohort consisted of 18 science teachers from the two middle schools and the high school to which the other seven schools feed. By working with the teachers within this pyramid of schools, we hoped to foster a consistent environmental education (EE) emphasis to be used throughout the K-12 progression. The schools within the pyramid are generally characterized as urban, economically disadvantaged, with a high number of English language learners and a low passing rate on the state standardized assessment for knowledge and skills in science.

The high school selected for this study was recently chosen by the district as one of 15 schools to participate in the Public Educators Accelerating Kids (PEAK) pilot program that encourages educator collaboration, cooperation, and professional growth over competition. PEAK is based on rewards and incentives and is consistent with the philosophy that teaching is a team sport. The program stresses that leadership capacity through development of teacher knowledge and skills will ultimately have the greatest impact on student achievement. One of the long-term objectives for the program at this high school is to create an “environmental curriculum” to improve student retention and prepare many graduates for viable postsecondary academic/professional careers with an environmental focus.

Our goals for the PD summer component with the teachers were to (1) provide integrated instruction on environmental issues, (2) model the use of OLS to help learners contextualize large-scale environmental issues in relation to their immediate surroundings, (3) provide guidance in aligning outdoor education experiences with state and national standards to fulfill curriculum requirements as mandated by many school districts, and (4) build a foundation for the academic year follow-up component of the PD.

Preassessment Results: Incentives and Challenges in Using OLS

To best achieve the initial goal of identifying challenges teachers face in using OLS for instruction, we conducted multiple preassessments to determine the factors that encourage or discourage them to teach outdoors. We hoped that by identifying both the challenges and the factors encouraging OLS use, we could tailor our PD in such a way that the teachers could realize ways to overcome the challenges and recognize the benefits of outdoor teaching already enjoyed by those who utilize this teaching strategy.

The first preassessment was administered to the teacher participants via an online survey before the first day of the PD. The survey included a section devoted to the teachers’ frequency and purpose of OLS use. On reviewing the answers provided, a distinct difference between the two teacher cohorts became apparent. The majority of the elementary teachers reported using OLS to teach, and did so on a regular basis, whereas only a few secondary teachers reported using OLS at all (and then only infrequently) and half reported never using them.

The elementary teachers listed several incentives for using OLS to teach. These ranged from pleasure for the students (“children like to learn outdoors,” “allowing
students to explore,” “getting fresh air”) to practical academic advantages (“making science less intimidating,” “reinforcing classroom content,” “connecting science to real-world experiences”). All of these seemed to align with our goal of connecting students with natural spaces to encourage development of an appreciation for their environment. The elementary teachers identified only a few challenges: difficulty with classroom management, inhospitable weather conditions, and lack of time (though one teacher qualified her response to the latter with “but probably not”).

In contrast, the secondary teachers listed fewer incentives and significantly more challenges. Only two of these teachers indicated that they took their students outside at least once a month; the motivating factors listed for these events included: “students like it,” “experiential learning,” and the teacher’s own “passion for teaching outdoors.” The remaining 16 secondary teachers either took their students outdoors “rarely” or “never.” All but one listed challenges, which included those presented by the elementary teachers as well as potential liability, expense, need for chaperones, administrative disapproval, and complicated logistics.

The second preassessment, implemented during the first day of the PD, was used to further explore teacher OLS use and perceived challenges. The teachers reviewed a set of statements posted around the classroom; these statements covered a wide range of issues involving use of OLS for teaching. Some were positive (“I like the outdoors,” “I regularly use outdoor spaces to teach,” “Students enjoy using outdoor spaces to learn”) and others were negative (“There is not enough time to use the outdoors to teach,” “My administration does not support using outdoor spaces to teach,” “liability is a concern”). Each teacher was provided five stickers and instructed to “vote” by placing the stickers on the statements that most strongly corresponded with their thoughts and beliefs about using OLS. The goal of this activity was to help us determine what they considered most important about OLS use, particularly “new” incentives and challenges not mentioned in the online presurvey responses. The new challenges were identified as being important by both cohorts of teachers. Consistent with the survey, the elementary teachers identified time, weather, and classroom management as challenging issues, but also “voted” for safety, lack of a specific curriculum, and inadequate pedagogical content knowledge (PCK). The secondary teachers also identified time, classroom management, logistical problems, and liability, but voted for “lack of a specific curriculum” as a factor discouraging OLS use.

Immediately after the voting activity, a third preassessment measure was implemented. The teachers responded to the following prompt in small focus group discussions: “You just voted on statements about using OLS including your schoolyard, parks, an Outdoor Learning Center, other outdoor areas. Talk about why you do, or do not use OLS to teach, including the perceived/actual benefits and limitations of their use.” These conversations were audio-recorded for the purpose of further “unpacking” what the teachers considered their most significant challenges. As a result of analyzing the teacher responses in conjunction with the preassessment measures, three major themes became apparent:

- Logistics – i.e. permission to leave campus, transportation, chaperones, potential liability
<table>
<thead>
<tr>
<th>Challenge/Obstacle</th>
<th>Elementary cohort</th>
<th>Secondary cohort</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Preassessment</td>
<td>Preassessment</td>
</tr>
<tr>
<td>Time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weather</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expense</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logistics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Administrative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>disapproval</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inadequate PCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No curriculum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geography (proximity, “primiveness”)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1: Online survey; 2: “Voting” on OLS statements; 3: Postvoting focus group discussion

- “Geography” – i.e. lack of suitable space close to school, outdoor spaces are too “primitive”
- Lack of administrative support – generally described as a narrow-minded focus on standardized testing, coupled with a lack of understanding about how outdoor activities can be successfully aligned with curricular frameworks and state science standards

Prior to our second meeting with these teachers, we reviewed the preassessment data to tailor the PD to participants’ stated needs. We recognized that although both cohorts identified many of the same challenges to using OLS, their definition and perception of these challenges differed significantly, as shown in Table 1. Those reported by the elementary teachers were perceived more as inconveniences to be dealt with rather than as absolute barriers to OLS use. Those reported by the secondary teachers appeared, in fact, to be perceived as obstacles that prevented their use of OLS for instruction. Further evidence of the distinction between the cohorts’ perceptions was found in the manner in which the secondary teachers repeated their challenges with each successive preassessment, whereas the elementary teachers identified new challenges with each preassessment, essentially “leaving behind” those mentioned previously.

**Professional Development Interventions**

We perceive that the participants in this PD represent a community of practice defined as a group of people who “...share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by
interacting on an ongoing basis” (Wenger et al. 2002). Subsequently, our PD was designed around the concept of providing several opportunities for members of the two cohorts to interact and thereby promote sharing of experiences, concerns, and ideas about OLS use. Specifically, we were hopeful that the elementary teachers could offer suggestions to the secondary teachers, since the former were, in large part, already using the outdoors for teaching. This section describes our efforts to foster a community of practice during the 2-week summer component of the PD experience.

Workshop activities included classroom presentations of environmental content followed by a gradual introduction of the teachers to increasingly “native” outdoor spaces, from a few minutes on the campus grounds, to a few hours at a local botanic garden, to two overnights at the school district’s Outdoor Learning Center (OLC), a 228-acre native limestone prairie and post oak woodland on the edge of a lake. At the OLC, the teachers were introduced to various types of field sampling and navigation equipment, and encouraged to identify a particular area of study to pursue for the duration of the outdoor experience. Teacher discussion and reflective dialogue were used daily to address PCK being taught, as well as how the teachers’ newly found skills (i.e. field equipment use) and knowledge (i.e. diversity and taxonomy of insects at the OLC) might fit the needs of their curriculum. Throughout the workshop, journaling was highly encouraged for documenting observations, making interpretations, and reflecting on experiences. The theoretical basis for this PD workshop is primarily based on Vygotsky’s (1978) ideas about teaching and learning, whereby the “more knowledgeable other” helps learners to scaffold experiences, and learners answer their own questions through newfound skills. The teachers were expected to practice inquiry by formulating hypotheses, using new process skills, and making evidence-supported claims.

Many of the interventions conducted during the PD experience were specifically designed to address teacher challenges in using OLS. We introduced them to three continua from which they could view and interpret what constitutes an “outdoor education experience”: geographical, temporal, and instructional content. Geographical pertains to the characteristics of a space suitable for outdoor instruction. The space may vary in size, proximity, and complexity from a small, manicured garden located just outside the classroom window to a highly primitive, natural space located far from campus. Temporal refers to the duration of any visit to an OLS, regardless of purpose, that may vary from a short trip to the school garden for a specific observation, to an entire class period in a local park, to a full school day at a more remote locality. Lastly, instructional refers to the manner in which an OLS is used as well as the “depth” of instruction. These may vary from the extremes of conducting a “traditional” classroom lecture under the shade of an oak tree to a well-planned, interdisciplinary lesson that looks at the concrete connections of plants, water, and soil in an outdoor space. Some of the teachers were biased toward one or more of these extremes. For example, a few teachers possessed the perspective that “outdoor education” necessitated that lessons be taught in their entirety in primitive outdoor settings located far from the school campus. Others recognized the benefit of OLS for instruction, whether introducing a topic in the physical environment in
which it is located, teaching an entire lesson or unit there, or using the space as an alternative classroom. It was anticipated that bringing these continua to the teachers’ attention would result in re-evaluation of their preconceived notions of “outdoor education” and the variety of ways in which it can be implemented.

**Geographical Continuum**

The PD component that most likely had the greatest impact on the teachers was helping them to recognize that outdoor learning does not necessarily involve primitive, native spaces far from their schools. We began the PD by assigning the first journal entry while sitting on the manicured lawns of our university campus (where the first few days of the PD took place). The next day we moved to a more “natural” (but still highly manipulated) space: the local botanic garden, and instructed them to consider and journal about their perceptions of “the garden as nature.” Day four of the PD took us to the school district’s OLC. By introducing the teachers to increasingly “primitive” outdoor spaces, we helped modify their perspective on what potentially constitutes an OLS, depending on the two other variables on the continuum (available time and instructional goals).

Throughout the PD, we reminded them of available alternatives to the district’s OLC that require significantly less time and logistical effort to accomplish these goals. We posit that teacher recognition of something as seemingly insignificant as a patch of grass outside the classroom or an abandoned tennis court can help them address the challenges of lack of appropriate space, time, classroom management (particularly the need for chaperones), liability (typically a nonissue if they remain on school property), and logistics (such as securing permission and transportation), among others. If teachers who do not use OLS begin by utilizing proximal spaces for outdoor teaching, they will come to realize that many of the perceived challenges are more easily avoided and in time, they can venture to further, more natural spaces as they come to be perceived as more suitable.

**Instructional Content Continuum**

A similar distinction was made regarding how much of any particular lesson could potentially be taught in OLS. While some lessons, such as identifying plant growth forms to better understand the botanical taxonomy, could easily be transferred to an outdoor setting (and most appropriately should be, in our opinion), others, like cell respiration could be much more challenging. What we attempted to emphasize to the teachers was that, depending on the complexity and abstract nature of the content, differing levels of content depth should be considered when planning what topics to teach outdoors, and what that outdoor activity should be. All that may be necessary for certain content would be a quick trip to the garden to observe and/or
document a particular phenomenon that has just been discussed in the classroom. For other content, a full outdoor immersion would be more beneficial. Because many of the teachers (at all grade levels) identified “lack of a specific curriculum” as a significant challenge to using OLS, we incorporated into our PD an assignment that they “transfer” their favorite science activity or lab to the outdoors. The purpose of this exercise was for the teachers to thoughtfully consider exactly what components of their own curricula most reasonably lend themselves to being taught outdoors, and when varying degrees of OLS use might be most fitting.

**Temporal Continuum**

To further help the teachers realize that their perceived challenges were not insurmountable, we emphasized that we were not advocating that every lesson be taught outdoors. Rather, we wanted them to perceive OLS as one of the several tools that can be utilized to teach science content (or nearly any other discipline, for that matter) more effectively. Once many of the originally reticent teachers became aware of the suitability and availability of many outdoor spaces and that certain science content naturally lends itself to outdoor instruction, their intimidation at the thought of using OLS, at least for short periods, began to decrease. This distinction allowed them to recognize the flexibility that OLS can add to content delivery, that just being outdoors has its own benefits, as does developing and teaching an entire lesson around a “natural” phenomenon.

**Postassessment: Observed Effects of Professional Development**

As mentioned previously, we observed marked distinctions between the two teacher cohorts throughout the PD experience. The elementary teachers generally conveyed a positive outlook on OLS use and reported utilizing outdoor spaces in their teaching prior to the PD, whereas the secondary teachers were generally less enthusiastic about the prospect of teaching outdoors and few reported ever using outdoor spaces for teaching prior to the PD. We attributed this observation to the realization that the challenges they reported reflect significantly different perceptions and beliefs about the use of OLS. The elementary teachers viewed their challenges more as inconveniences to be tackled, whereas the secondary teachers viewed them as obstacles preventing them from using outdoor spaces to teach.

At the conclusion of the second week of the PD, we administered postassessments, comprising written reflection and small group discussion (three to five teachers per group) on the teachers’ PD experiences; the latter were audio-recorded. The groups were asked to discuss the challenges that the PD had helped them overcome and in what areas they felt they needed additional help or guidance. Because both cohorts reported all the challenges identified during the preassessment, all were addressed in the postassessment as well. These are shown in Table 2.
Table 2  Focus groups that identified solutions to challenges in OLS use

<table>
<thead>
<tr>
<th>Challenge/Obstacle</th>
<th>Elementary focus groups</th>
<th>Secondary focus groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>All</td>
<td>None</td>
</tr>
<tr>
<td>Weather</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>Management</td>
<td>All</td>
<td>Some</td>
</tr>
<tr>
<td>Liability, safety</td>
<td>All</td>
<td>Some</td>
</tr>
<tr>
<td>Expense</td>
<td>All</td>
<td>Some</td>
</tr>
<tr>
<td>Logistics – chaperones, transportation, permission</td>
<td>All</td>
<td>None</td>
</tr>
<tr>
<td>Administrative disapproval/State Science Standards</td>
<td>All</td>
<td>None</td>
</tr>
<tr>
<td>Lacking PCK</td>
<td>All</td>
<td>None</td>
</tr>
<tr>
<td>No curriculum; lack of difficulty with TEKS alignment</td>
<td>All</td>
<td>None</td>
</tr>
<tr>
<td>Location (proximity, too “primitive”)</td>
<td>All</td>
<td>None</td>
</tr>
<tr>
<td>Other teachers do not support my efforts*</td>
<td>All</td>
<td>All</td>
</tr>
<tr>
<td>Individual student challenges*</td>
<td>All</td>
<td>Not discussed</td>
</tr>
</tbody>
</table>

All = all focus groups within the cohort identified solutions; Some = some, but not all, focus groups within the cohort identified solutions; None = none of the focus groups identified solutions

*New challenge identified during postassessment focus group discussion

For the most part, the elementary teacher groups were able to perceive challenges as opportunities for improvement by the end of the PD. They also mentioned, and arrived at, possible ways to overcome issues that had not been previously reported: students with learning disabilities, physical disabilities, or English language deficiencies, and possible lack of support from fellow teachers.

We did not observe similar positive discussion within the secondary groups. Overall, they no longer perceived weather as a significant issue. They also expressed concern about the potential lack of support from their colleagues who participate with them in grade-level or cross-discipline teams. However, they acknowledged that significant effort is required for these collaborative teams to function effectively, regardless of subject or location. Some groups were able to identify possible solutions for classroom management, liability, and expense, but despite their PD experience, time, logistics (specifically transportation and lack of possible OLS near campus), administrative support, and lack of PCK and/or a specific “outdoor curriculum” continued to be expressed as troublesome or challenging for some of these teachers. These issues were further addressed during the academic year component of this PD through the instructors’ continued modeling of the outdoors as an instructional resource, and continued collaboration within the learning community, whether informal (i.e., through e-mail communication) or formal (i.e., one of the teachers’ “assignments” was to develop an outdoor lesson and teach it to us during a Saturday meeting).
Discussion

Reflection on our experiences and observations has informed us of differences in how teachers of varying grade levels can use OLS for teaching science. It further helped us understand what they perceive outdoor learning to be. These differences are rooted primarily in their past experience with learning and teaching outdoors, the content they teach, and how they respond to the pressure of high-stakes testing. The teachers who participated in this PD demonstrated varying levels of success in overcoming perceived and actual challenges.

Prior Learning and Teaching Experience Outdoors

Many of the elementary teachers were already well-versed in using OLS as part of their teaching practice before the PD experience; reporting frequent use of OLS throughout the school year in varying “intensities”; from a quick trip outside to see a bird’s nest to a comprehensive lesson to study habitat and observe/collect organisms. Because of this “on-the-job” experience, many already possessed the means to overcome challenges they faced when incorporating OLS in their instruction.

The majority of the secondary teachers lacked similar experiences. As a matter of fact, our intervention efforts may have increased their sense of futility by allowing them to expand their list of perceived challenges. It has been argued (Barrett 2007) that traditional Western education (of which most, if not all, of these teachers are a product) is antithetical to EE in general and outdoor education in particular. Such experiences are generally limited to recreational activities during the elementary years, and limited instruction as a component of an advanced elective in the natural sciences in secondary years. It is within this culture that the teachers in our PD now practice their craft and are being asked to modify it to include elements that are relatively foreign to them. Since many reported that they lacked the experience of being a student in outdoor environments themselves, it came to us as a little surprise that they have not included outdoor instruction in their own teaching.

Content Differences

Another explanation for the observed discrepancy between the cohorts’ use of OLS and their perception of challenges in using them pertains to the differences in what they teach. Elementary science content is relatively straightforward, concrete, and descriptive (i.e., observation of characteristics, and changes in these over time), can often be presented in terms of binary opposites (i.e. living/nonliving, rough/smooth, shiny/dull), and readily lends itself to direct, physical observation in natural environments. For example, a lesson on plants can be easily adapted to include
observations in a school garden, landscaped areas on campus, or a nearby park. On the other hand, secondary science content, particularly that of a theoretical or abstract nature, is not as readily adapted (i.e., properties of elements, cell structure and function, photosynthesis and cellular respiration). In fact, further scrutiny into our data revealed that the commonly referenced challenge of “lack of curriculum” had different meanings between the two teacher cohorts. For the most part, the elementary teachers hoped to receive from us general “guidelines” to help them implement more interactive and educationally meaningful ways to teach outdoors, to improve on what many of them already practiced. On the other hand, the secondary teachers were seeking a set of “instructions” on how to even approach teaching their subject matter outdoors. Some of these teachers could envision teaching outdoors only by taking advantage of the space’s physicality (i.e., role-playing how chemical bonds between salt ions, played by some students, can be separated by water molecules, played by other students) rather than its naturalistic components (i.e., study of a topic at the “microlevel” through observation of its macromanifestations in nature). While this type of outdoor teaching does not fulfill the primary objectives of our PD, it does provide teachers with an idea of the range of possible opportunities for taking their students outdoors and is, in the authors’ opinion, better than being taught exclusively in an indoor classroom. At the very least, it is one step in the direction we hope to see our teachers move in their use of outdoor spaces for instruction.

**State Science Standards**

One of the most notable observations during our experience is the fear of administrative accountability that secondary teachers face when asked to employ a new teaching strategy such as teaching in an OLS. Consistently, throughout our assessments, we found that the secondary teachers cited administrative disapproval as a major challenge to using OLS to teach. We found this strange considering that the high school included in our study was emphasizing EE (in all subject areas) and that the administration strongly encouraged our participating teachers to attend our PD for the very purpose of enhancing their understanding of environmental issues and outdoor teaching. With more detailed analysis of the data, we realized that each time the secondary teachers referenced “administrative disapproval,” they would connect this disapproval to a lack of alignment with State Science Standards on which their students are tested. Most of the teachers who are participants in the PD, regardless of grade level, referenced the Curriculum Frameworks (which outline the standards to be taught on any given day) as mutually exclusive to using outdoor spaces for their teaching. Even if they became skilled at translating their content to outdoor teaching, they still feared they would “fall behind” on the scope and sequence mandated by their administration and their students would not perform well on standardized tests, which would subsequently reflect poorly on them. Through our PD, these teacher-participants witnessed intensive, inquiry-based, EE taught in
outdoor learning spaces and realized that such instruction requires a willingness to devote significant advance planning to successfully deliver meaningful content to their students in these settings. During the PD, they also witnessed, and realized, that successful outdoor educators must be flexible in their actions based on environmental variables, both abiotic (i.e., moving our activities indoors during the warmest part of the day to minimize health risks) and biotic (i.e., no tracks at the scent trap – how do we provide possible explanations with no data?). Teachers felt that they lacked this flexibility due to the rigid constraints of the Curriculum Frameworks. This lack of pedagogical flexibility, coupled with an inordinate focus on traditional instruction as the only way to successfully prepare students for standardized tests, results in teachers’ perception of outdoor instruction as too challenging for all but the most die-hard outdoor enthusiasts.

Real Obstacles Overcome (A Brighter Note)

Our data may give the impression that the success of our PD efforts with the secondary teachers were minimal when compared to the elementary teachers. Nevertheless, we would be remiss not to mention what we consider real successes with this group. First, their stated challenges in using OLS – no matter how legitimate – have been brought to the fore, where they could be addressed directly through the remainder of the academic year. Second, most of the high-school teachers had not worked together since being hired to work at this PEAK school, but developed a genuine sense of community during the field immersion component of the PD experience. The teacher “teams” that coalesced had already begun discussing the incorporation of certain outdoor experiences into their science curriculum. We look forward to working with them further and watching their ideas become reality. In addition, we can infer improvements in efficacy, at least anecdotally. Several of the teachers, including a few in the secondary cohort, shared with us their initial apprehension about being “in the outdoors” or “fearful of insects and spiders,” but later reported that their experiences were “exciting” and “reminded them of being a kid.” One of these teachers, who admitted to being entomophobic, was so thrilled at the prospect of scorpion-hunting that she strapped a black light to her hat and hunted well into the night, despite exhibiting flu symptoms.

How These Observations Can Inform Other PD Providers

We have learned through this experience that development of PD aimed at encouraging teachers’ use of outdoor learning spaces for instruction must first recognize qualitative differences between participants at the elementary and secondary levels. These are based primarily on the content and on the expectations placed on
them by their administration due to No Child Left Behind and State/National Standards. We cannot approach outdoor teaching merely as a function of a teacher's knowledge, skills, and motivation, but rather in consideration of the potentially dramatic influence that these factors may have on a teacher's feeling of self-efficacy in utilizing outdoor strategies as one component of their teaching practice.

We further realize that many teachers in the U.S. feel compelled to explicitly follow the guidelines set forth in the National Standards due to the high-stakes nature of state-wide assessments and repercussions if their students fail to reach achievement goals. As a result, teachers are not compelled to explore beyond rigid curricular boundaries set forth in district-developed scopes and sequences. Without placing importance on student interactions with natural and outdoor environments, the State/National Standards will continue to restrict teacher ability to incorporate this element into their teaching practice. An omission on the part of these standards, then, is a mandate of exclusion.

We believe that meaningful experiences in natural environments is essential for development of a deep understanding of nature which, in turn, is crucial for its appreciation and the motivation necessary to affect positive change toward environmental issues. With this in mind, we promote the type of PD described herein as one way of increasing the use of outdoor learning spaces by K-12 science educators and suggest that perhaps the national and state standards should consider incorporation of these experiences into the K-12 curricula.

References


In the coming decades, the general public will be required ever more often to understand complex environmental issues, evaluate proposed environmental plans, and understand how individual decisions affect the environment at local to global scales. Thus it is of fundamental importance to ensure that higher quality education about these ecological issues raises the environmental literacy of the general public. In order to achieve this, teachers need to be prepared as well as classroom practice enhanced. This volume focuses on the integration of environmental education into science teacher education. The book begins by providing readers with foundational knowledge of environmental education as it applies to the discipline of science education. It relates the historical and philosophical underpinnings of environmental education, as well as current trends in the subject that relate to science teacher education. Later chapters examine the pedagogical practices of environmental education in the context of science teacher education. Case studies of environmental education teaching and learning strategies in science teacher education, and instructional practices in K-12 science classrooms, are included.

This book shares knowledge and ideas about environmental education pedagogy and serves as a reliable guide for both science teacher educators and K-12 science educators who wish to insert environmental education into science teacher education. Coverage includes everything from the methods employed in summer camps to the use of technology as a pedagogical aid. Studies have shown that schools that do manage to incorporate environmental education into their teaching programs demonstrate significant growth in student achievement as well as improved student behavior. This text argues that the multidisciplinary nature of environmental education itself requires problem-solving, critical thinking and literacy skills that benefit students' work right across the curriculum.