FIELD-TRIP PEDAGOGY FOR TEACHING

“SENSE of PLACE”

IN MIDDLE SCHOOL

by Paul R. Sheppard, Rebecca Lipson, David Hansbrough, and Joan Gilbert

Go my children, ... burn your books, ... buy yourselves stout shoes, get away to the mountains, ... the deserts, ... and the deepest recesses of the earth; mark well the distinction between animals, the differences among plants, the various kinds of minerals ... . In this way, and no other, will you arrive at a knowledge of things, and of their properties.

—Danish physician Peter Severinus, Idea Medicinae Philosophicae, 1571

Sense of place can be defined as a comprehensive integration of the geology, ecology, and cultural history of an area, and as such it constitutes an objective topic for standards-based, academic instruction (Brown and de Lacerda 1986). Developing students’ sense of place is a good and worthwhile goal of education generally, and the middle school years are an excellent time to teach sense of place. Middle school students are ready for increasingly comprehensive instruction, and science objectives for this age group typically include knowledge of geology, ecology, and cultural history.
An excellent method for teaching sense of place is by sensing a place in person, i.e., by taking trips to the field. Seeing rocks and geologic structure in their original setting and observing plants and animals in the wild help solidify concepts such as biotic-abiotic relationships. Seeing evidence of human habitation from the distant past conveys the idea that long-term sustainability of communities is a key goal for society.

Teaching and learning any one of the disciplines of geology, ecology, or human-environment interaction is daunting in and of itself. Integrating all three together into a comprehensive understanding can be even more formidable. Field trips facilitate integration of these disciplines (Paradis and Dexter 2007). Indeed, field-based pedagogy has been considered essential for teaching and learning geology and ecology, far better than alternative methods (Fisher 2008).

Field trips have long been touted as highly effective pedagogy, to the point of being transformative (Whitmeyer and Mogk 2009). Hands-on, active learning, which typifies field-based education (Orion 1989), fosters comprehension and retention of course content (McKenzie, Utgard, and Lisowski 1986). Additional benefits that accrue from field-based instruction include self-confidence (McConnell 1979), critical thinking (McNamara and Fowler 1975), self-motivation (Giardino and Fish 1986), and socialization skills (Falk, Martin, and Balling 1978), all of which are desired outcomes of education generally, and all of which serve to prepare students for college and career options within the framework of Common Core State Standards (e.g., Arizona Department of Education 2012).

Unfortunately, field trips are logistically cumbersome and operationally inefficient (Salter 2001). Because of this, field trips are often considered infeasible and reduced in number or dropped altogether from education. However, the drawbacks of field trips are outweighed by their benefits. In this article, we describe a program to carry out field trips at the middle school level for the purpose of teaching sense of place.

**Sense-of-place pedagogy**

A sense-of-place course is offered at the college level in Tucson, Arizona (Butler, Hall-Wallace, and Burgess 2000). Quantitative analysis of this course showed high comprehension of course content and excellent long-term retention of details of the geology, ecology, and archaeological and cultural history of the area (Sheppard, Donaldson, and Huckleberry 2010).

That’s all well and good for college students, but what about younger learners? In theory, sense-of-place pedagogy is extendible to K–12 education, especially to middle school. Developmentally, middle school students are old enough to sustain all-day field trips and to handle more comprehensive instruction, and most middle school science curricula include geology and ecology. For example, science and social studies standards and performance objectives for the middle school level (grades 6–8) include geology (classifying rocks, identifying larger structures, and understanding plate tectonics), ecology (understanding the concept of ecosystems, describing interactions between living organisms and abiotic elements of a place, and recognizing disturbances like fire as a part of nature), and archaeology (describing human societies of the past by evidence of their lifeways and interactions with the environment) (Arizona Department of Education 2005, 2006).
Accordingly, we have begun extending sense-of-place, field-based pedagogy to the middle school level within the Tucson, Arizona, Unified School District. In addition to integrating geology, ecology, and archaeological and cultural history in real field settings, field-trip delivery techniques include all the details of making trips safe and comfortable and in compliance with legal standards, including proper clothing, protection from inclement weather or exposure to the Sun, first aid, and emergency contacts (Roy 2011).

**Example 1: A desert trip**

This trip explored the Sonoran Desert. Geology focused on Sentinel Peak, a local hill composed of volcanic and sedimentary rocks that formed during explosive volcanism 20 to 25 million years ago (Figure 1). Physical properties of rocks and how they illuminate mountain formation were emphasized. Ecology covered the exotic buffelgrass growing on rocky slopes of Sentinel Peak. Buffelgrass is native to Africa, but it was introduced into the Southwest in the 1940s and has since expanded throughout the Sonoran Desert. The trip finished at Mission San Xavier del Bac, a still-active church constructed in the late 1700s that provides a glimpse of the Spanish and Mexican periods of the American Southwest. The arrival in 1687 of Padre Francisco Eusebio Kino, the first Spanish explorer in the Tucson area and founder of many missions in the region, started a grand change of cultures and environments of southern Arizona.

Seventy students (sixth, seventh, and eighth graders) from Miles Exploratory Learning Center participated in this field trip, during which they described rocks in basic terms, drew buffelgrass in their notebooks, and took pictures of and wrote about the San Xavier mission. Approximately 37% of Miles students qualify for special education services. Even though the vast majority of students had lived in Tucson their entire lives, only 47% had been to San Xavier, and only 58% of students had been to Sentinel Peak.

To assess the educational effectiveness of the trip, we asked students to create pre- and post-trip concept maps (Andrews, Tressler, and Mintzes 2008) showing connections among words related to the Sentinel Peak geology and ecology and San Xavier cultural history. The following question was posed for the concept map: What places and events have been important parts of Tucson’s natural and cultural history?

Scoring of concept maps stressed the use of vocabulary and demonstration of higher-order thinking in displaying the concepts presented during the trip. Scores ranged from 0 to 3 in both concepts (vocabulary) and relationships (connecting descriptors of concepts), with the average concept score being 2.5 and the average relationship score being 1.8. Post-trip student concept maps were generally complete and comprehensive (Figure 2), indicating an overall improvement in the two areas scored. On average, greater than 100% more vocabulary words were used correctly in post-trip concept maps. Also, students were able to express the concepts learned using an equal amount of statements of fact and higher-order thinking, such as causal, hierarchical, and sequential relationships. This strategy demonstrates and highlights the importance of students being able to obtain, evaluate, and communicate information to indicate their thinking and learning, an important science practice as described in *A Framework for K–12 Science Education* (NRC 2012). In all, this field trip was successful at integrating geology, ecology, and cultural history.
for these middle school students, and this integration presumably served students well from that point on in meeting state science standards and objectives.

Students also liked this field trip. On a scale of 1 to 10, students rated how much they enjoyed the trip with an average score of 8.3. One student commented, “You should continue with the Sentinel Peak/San Xavier Mission field trip so that everyone who goes to Miles gets to experience these special Tucson, Arizona, landmarks.”

**Example 2: A mountain trip**

On this trip, we climbed nearby Mount Lemmon up to 2,438 m (8,000 ft.) above sea level. Mount Lemmon is a metamorphic core complex formed by regional crustal extension, thermal intrusion, and uplift, making this geology different from what is seen in the desert. Ecologically, Mount Lemmon is a textbook example of the impact of wildland fire. A large portion of the mountain burned recently in two fires, much to the grief of Tucson residents. Fire used to burn on Mount Lemmon frequently, but with low intensity such that mature trees typically were not killed. The crosscutting concept of cause and effect, also described in *A Framework for K–12 Science Education* (NRC 2012), was clearly represented on the trip. Causal relationships were explored and explained based on evidence from the field.

Sixteen eighth-grade students from Pistor Middle School participated in this Mount Lemmon field trip, during which they described rocks in basic terms, estimated forest fuel loading, drew burned forests in their notes, and discussed out loud what it means to lose healthy forests to fire. Approximately 80% of Pistor students are on free lunch or have reduced lunch rates. This was the first time up the mountain for many of these students, and they knew little about its geology and forest ecology. A pre-test covering critical ideas middle school students should know about Tucson geology and ecology showed poor comprehension of how nearby mountain ranges formed and of ecological form and function within different ecosystems along

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**Figure 3** Questions asked on the Mount Lemmon pre- and post-trip test about geology and ecology

Word in parentheses indicates level of learning (Anderson and Krathwohl 2001). Sixteen students took this test and the Mount Lemmon field trip.

<table>
<thead>
<tr>
<th>Question</th>
<th>Number of students answering incorrectly</th>
<th>Pre-trip</th>
<th>Post-trip</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What are the characteristic properties of rocks? (knowledge)</td>
<td></td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>2. How are igneous rocks formed? (comprehension)</td>
<td></td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>3. How does faulting relate to basin and range formation? (comprehension)</td>
<td></td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>4. Where are surrounding mountain ranges located? (knowledge)</td>
<td></td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>5. What are the characteristics of basin and range topography? (comprehension)</td>
<td></td>
<td>14</td>
<td>6</td>
</tr>
<tr>
<td>6. What are some biotic features present in ecosystems at specific elevations? (knowledge)</td>
<td></td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>7. What are the characteristic properties of leguminous trees? (comprehension)</td>
<td></td>
<td>16</td>
<td>7</td>
</tr>
<tr>
<td>8. How does moisture availability change with elevation? (comprehension)</td>
<td></td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>9. What information can be gathered from tree-ring growth? (knowledge)</td>
<td></td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>10. What are some biological characteristics of trees and how they grow? (knowledge)</td>
<td></td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td></td>
<td><strong>10</strong></td>
<td><strong>6</strong></td>
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the Mount Lemmon Highway (see opening photo on page 68). This test required students to use Bloom’s lower-level recall types of responses, such as knowledge and comprehension, which can also be obtained from memorization and recall (Anderson and Krathwohl 2001). This trip resonated with students as they saw the geology and experienced different ecosystems. Student notebooks and discussion facilitated a deeper understanding of why distinct ecosystems were present at specific elevations.

A post-test with the same questions as the pretest was given unannounced to students in class the day after the trip. The number of students answering each question incorrectly went down significantly from the pre-test, demonstrating the efficacy of this field trip for comprehensively integrating knowledge of the geology and ecology of Mount Lemmon (Figure 3).

This Mount Lemmon trip also promoted student enthusiasm for learning. A survey of parents of students who took this trip showed various positive responses (Figure 4). Most parent respondents reported more interaction than usual with their children back at home about the field trip relative to most other school activities, and with more detail than usual. Most of the student participants would like to go on more field trips. Representative parent comments were all favorable. Especially notable was the case of a student wanting to travel up Mount Lemmon as a family in order to show (teach) his or her parents what was learned on the trip. Overall, this feedback was positive, showing that students were enthused by the field trip and able to relate the information they learned to their parents. As with the first example, this field trip was successful at integrating geology, ecology, and cultural history for these middle school students, and this integration presumably served students well from that point on in meeting state science standards and objectives.
Conclusion
Sense-of-place pedagogy is applicable everywhere. Every place has a geological history that underlies topography and other physical geographic features. Every place has native plants and animals that constitute ecological biodiversity. Many places also now have exotic, nonnative species that threaten ecological balance. Places with human societies also have cultural history, a time line of people living on the geology of that place and exploiting its ecology. Middle school is a good time to begin applying sense-of-place pedagogy, and it should be only a matter of middle school teachers becoming familiar with the specific content of each trip as well as with techniques of field instruction before taking advantage of the transformative opportunity of learning by seeing and doing in the field. Once field instruction becomes part of a curriculum, ways of overcoming logistical and funding limitations will emerge to continue taking trips each year with new students.

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References

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