Sense of place and place-based geoscience education and interpretation in the Colorado Plateau – Río Grande Rift region

Steven Semken, Arizona State University
EarthScope Colorado Plateau-Río Grande Rift Interpretative Workshop

We teach Earth, environmental, and ecological sciences in places...localities given meaning by human experience*

Our access to space and time is how they happen in a given place. Edward Casey, philosopher

Grand Canyon National Park, Arizona

Places populate a cultural landscape just as landforms and biota make up the physical landscape.

Think of a place on the Plateau or in the Rift that is meaningful to you. What meanings does it hold for you?

*Relph 1976, Tuan 1977

Places hold diverse meanings for different people and cultures.

Place meanings can be aesthetic, ceremonial, economic, historical, spiritual, etc., as well as scientific.

People and groups develop emotional attachments to meaningful places.

The sense of place engages all domains of learning

Sense of place = Place meanings + Place attachments

Cognitive domain “thinking”

Affective domain “feeling”

Psychomotor domain “manipulating”

Knowledge; intellectual abilities and skills

Interests, attitudes, motivations, and values

Motor skills
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American Indian and long-rooted Mexican-American communities in the Southwest possess rich, culturally-mediated senses of place.


In spite of deep place attachment and familiarity with Earth systems... they have long been underrepresented in geoscience and other natural sciences

[Riggs & Semken 2001, NSF 2009]

Teaching that contradicts or minimizes their senses of place may deter these students from scientific study and careers.


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Globalization, careerism, standards-based teaching, entertainment media, pop culture, etc., divert people from meaningful engagement with places.

[Payle 1976]

Misunderstanding, fear, avoidance of nature

[Louv 2005]

Possible harm to physical and mental health

[Riggs et al. 2005]

Obviousness to the aesthetic, cultural, ecological value of the local

[Meyrowitz 1985]

Acquiescence in environmental and social degradation of surroundings

[Riggs et al. 2005]

Disinterest in geoscience and other natural science studies and careers?

[Sutcliffe et al. 2007]

Place offers a meaningful context for teaching and learning, whether formal or informal.

Wisdom sits in places... You must remember everything about them. You must remember their names. You must think about it and keep thinking about it.

Dudley Patterson, late Ndee (Western Apache) elder, in Wisdom Sits in Places (Basso 1996)

[Experiences in places are] profoundly pedagogical [in] nature.

Gruenewald 2003, Foundations of Place-Conscious Education

Place supplies the context; disciplines the tools.

Ault 2008, Achieving Querencia

Place-based teaching and learning are explicitly situated in place.

In place-based teaching, sense of place defines the curriculum.

Local: focused on surrounding natural and cultural environments

Experiential: inquiry in field and lab with local features and materials

Trans-disciplinary: synthesizes geology, geography, climatology, hydrology, ecology, anthropology, history, art

Cross-cultural (sometimes multilingual): Incorporates or acknowledges different cultural perspectives on places and processes under study

Promotes environmental and cultural sustainability

[Druzinewich 2012; Sutcliffe 2004; Semken 2015]
Place-based teaching leverages the sense of place.

- Accepts, and as much as possible teaches, the diverse meanings of places: humanistic as well as scientific.
- Reflects (but does not impose) the teacher’s sense of place.
- Empowers learners of all backgrounds to find meanings in and form attachments to the places under study.
- Fosters life-long learning in, love of, and concern for places.
- Includes enrichment of the sense of place as a valid and assessed learning objective.

Comparing interpretation and place-based teaching

“[Interpretation is] an educational activity which aims to reveal meanings and relationships through the use of original objects, by firsthand experience, and by illustrative media, rather than simply to communicate factual information.” (p. 8)

“Any interpretation that does not somehow relate what is being displayed or described to something within the experience of the visitor will be sterile.” (p. 9)

“Interpretation is an art, which combines many arts, whether the materials presented are scientific, historical, or architectural.” (p. 9)

“Interpretation should aim to present a whole, rather than a part, and must address itself to the whole man rather than any phase.” (p. 9)

Place-based geoscience education and interpretation: evoking a sense of place by focusing on local or regional geoscience content

...including the deep Earth beneath the landscape
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Place-based geoscience education and interpretation: evoking a sense of place by integrating different locally relevant ways of understanding the Earth

Yák ashbáhí: External processes
- Volcanism
- Deformation
- Erosion

Niík ashbáhí: Internal processes
- Volcanism
- Deformation
- Erosion

Dzi Dzínáhoozí
- Laccolithic mountains
- Monoclines
- Tséyi'íán?
- Mesas
- Pinnacles
- Buttes

Ndíhosh
- Mafic volcanoes, necks, dikes
- Erosion of layered rocks
- High elevations
- Groundwater

Buttes
- High elevations
- Plateaux

Yábasháhí: Erosion of layered rocks
- Tsézhiin'íhí

Yábasháhí: Mafic volcanoes, necks, dikes
- Groundwater
- High elevations

Buttes
- Bicooh
- Cháshkëh
- Tó biyáázh

Plateaux
- High elevations

© NASA [Blackhorse, Semken, & Charley 2003]
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Place-based geoscience education and interpretation: evoking a sense of place by

Using place-conscious design elements

Tsás ná’ałkaah 101: Indigenous place-based geology

Bilingual; organized according to concepts of Dine ethnoecology and attributes of Colorado Plateau geology

[Semken & Morgan 1997, Semken 2005]

Place-based geoscience education and interpretation: leveraging sense of place by

Teaching outdoors and in the community

Tsás bit’aalí (Rock with wings) or Ship Rock, Colorado Plateau, Navajo Nation, New Mexico

The Trail of Time at Grand Canyon

Addressing current, locally relevant environmental issues

[New York Times, 2007]
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Place-based geoscience education and interpretation: leveraging sense of place by

Acknowledging the beauty of geologically important places.

Tsé bit’a’í (Rock with wings) or Ship Rock, Navajo Nation, New Mexico

It is an honor to walk where all around me stands an earth house made of scarlet, of jet of midnight, of white dust. It is more than beautiful at the center of the world.

Joy Harjo

Acknowledging the beauty of geologically important places.

Place-based geoscience education and interpretation: assessing effects on sense of place

The things I do at this place I would enjoy doing just as much at a similar site (reverse scored).

This place means a lot to me. I wouldn’t substitute any area for doing the types of things I do at this place.

Being at this place says a lot about who I am. Doing what I do at this place is more important to me than doing it in any other place.

I am very attached to this place. I get more satisfaction out of being at this place than at any other.

I identify strongly with this place. No other place can compare to this place.

This place is very special to me. This place is the best place for what I like to do. This place is a part of me.

Threatened Beautiful Crowded Wilderness Dangerous Relaxing Overdeveloped Scenic Spiritually valuable Tranquil Ancient A privilege to live here Historical A privilege to visit Important for Native culture Interesting Unusual Fragile Adventurous Scientifically important Authentic Unique Unspoiled Educational Remote Important to preserve Exotic Ecologically important

[Semken & Butler Freeman 2008] [Johnson & Reynolds 2005] [Williams & Semken, in prep.] [Williams & Semken, in prep.]

The first way of thinking and knowing has to do with one’s physical place... where one physically lives. One has to know one’s home, one’s village, and then the land, the earth upon which one lives. These are the hills, canyons, valleys, forests, mountains, streams, rivers, plains, deserts, lakes, and seas... the place where you live...

Look to the Mountain [Imagery Captie (Navajo), UNM science educator, 1994]

Quality of life is inextricably tied to a sense of place in this world

[Williams & Semken, in prep.]

White Sands National Monument, Río Grande Rift, New Mexico

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