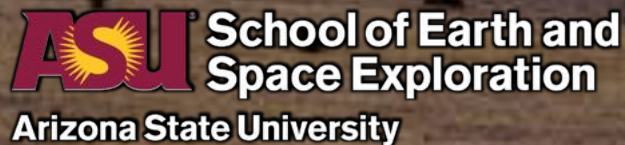


Place, Cultural Context, and Geoscience Teaching

Steven Semken



Roberto Ibarra



THE UNIVERSITY of
NEW MEXICO

Earth Educators' Rendezvous 2017
Albuquerque, New Mexico

(shown here as seen from the West Mesa volcanoes)

Place, Cultural Context, and Geoscience Teaching

Goals for this two-day morning workshop:

- Review the essential characteristics of place, sense of place, and place-based/culturally informed teaching.
- Exemplify the process of leveraging place and culture in geoscience teaching and assessment.
- Identify opportunities to introduce or increase use of place-based and culturally informed modalities in our own teaching.
- Discuss the relevance of place-based and culturally informed geoscience teaching to fostering natural and cultural resilience and sustainability in our home communities.
- Review the essential components of a context diversity model for adoption in teaching and research using place-based learning.
- Be able to evaluate aspects of your teaching that may be more conducive for different student populations using a context diversity model.
- Be able to build curricula that are conducive to multicontextual learning.

Place, Cultural Context, and Geoscience Teaching

Introductions:

Your name, and the place that you identify most with

08:30 to 08:45 am



Place, Cultural Context, and Geoscience Teaching

**Introduction to *place* and *sense of place*
and their relevance to geoscience**

08:45 to 09:00 am

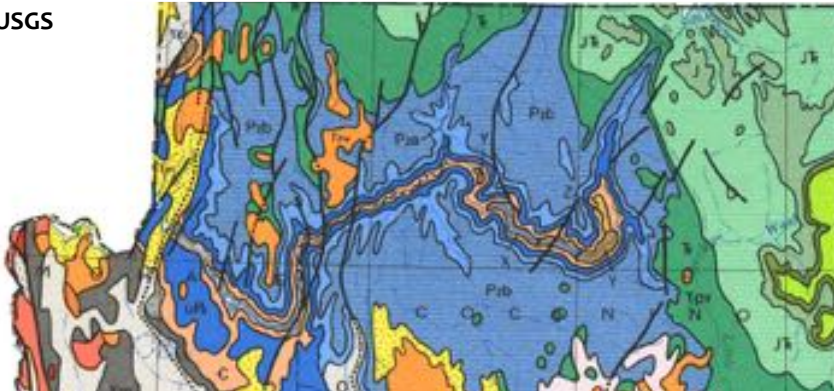
When we envision, name, explore, inhabit, or in any other way experience a locality, we make it a **place**.

What begins as undifferentiated space becomes *place* as we get to know it better and endow it with value. **Yi-Fu Tuan, *Space and Place* (1977)**

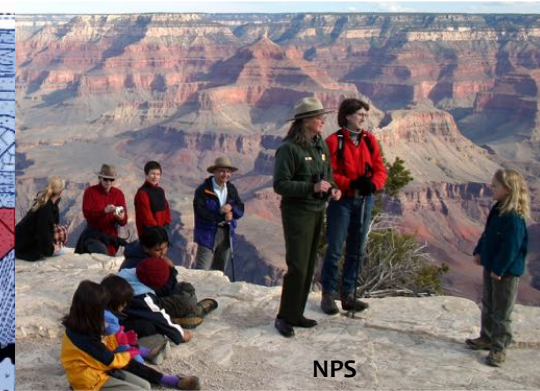
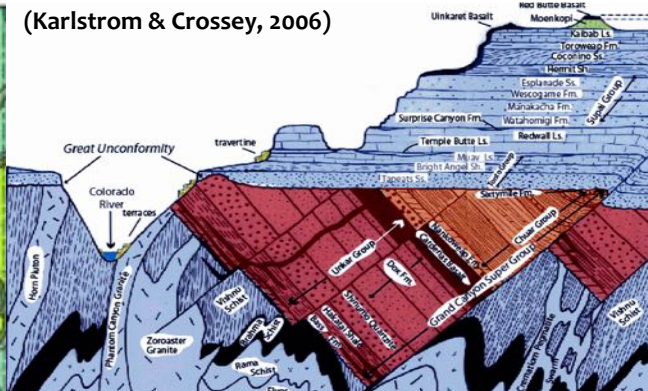
Places are **human** constructs.

e.g., Grand Canyon National Park

USGS



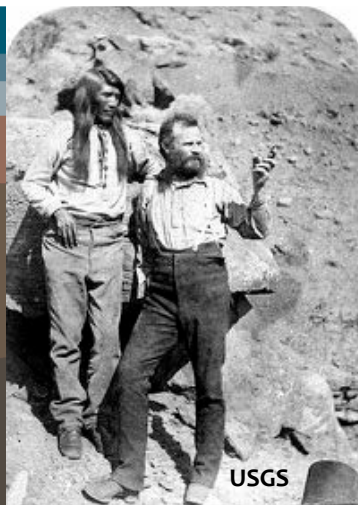
(Karlstrom & Crossey, 2006)



NPS



RTGraphics



USGS



NPS



PewEnvironment.org

Places populate the **cultural landscape** just as landforms, water, and biota comprise the physical landscape.

[Landscape] may be defined as an area made up of a distinct association of forms, both physical and cultural. **Carl Sauer, *The Morphology of Landscape* (1925)**



Cartoon tourist map of central Arizona (Bloodgood, 1950)

Place is relevant to geoscience because we **teach and learn about the Earth** by means of places, whether *in situ* or by proxy.

Our access to space and time is how they happen in a given place.

Edward Casey, philosopher



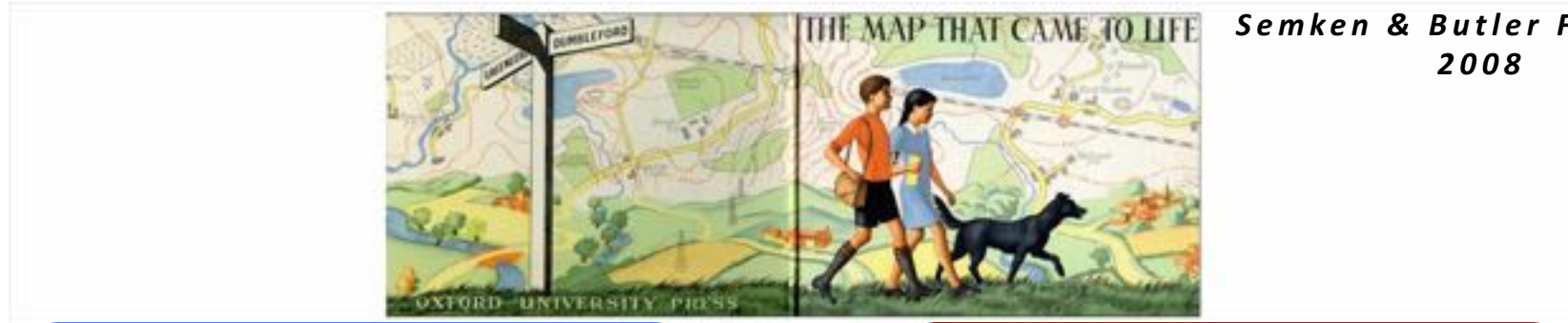
EarthScope Workshop for Interpretive Professionals at Acadia National Park, Maine

As we make meaning in places, we also tend to form emotional **attachments** to meaningful places.



Enchantment: a feeling of being attracted by something interesting, pretty, etc.
Merriam-Webster Dictionary (2017).

People are naturally connected to places.
Sense of place operationalizes this connection in a way
that is useful for research and teaching alike.



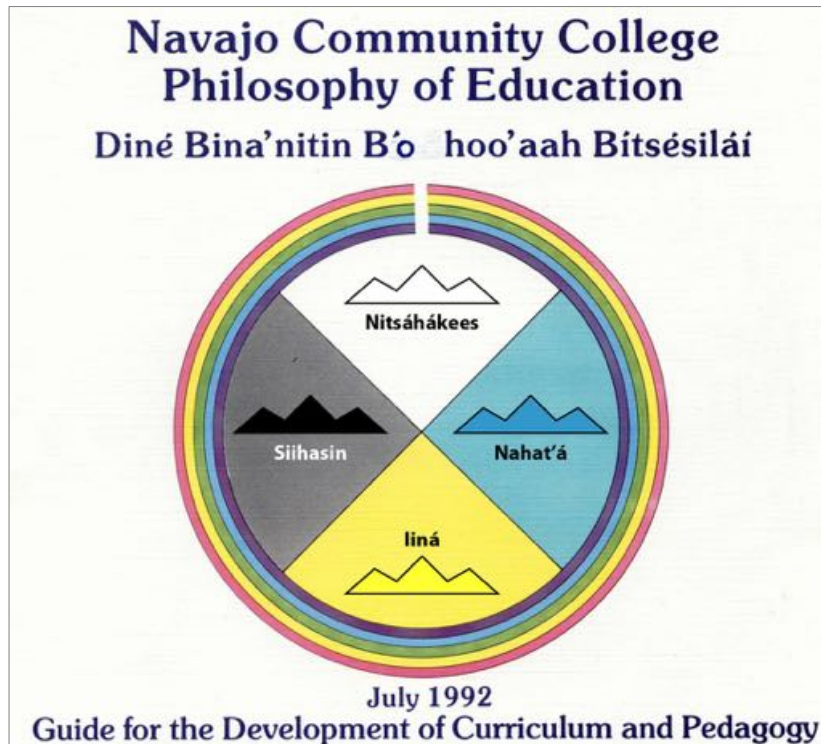
People imbue places
with diverse
meanings

People form
attachments
to meaningful places

Both can be measured, whether *quantitatively* (surveys)
or *qualitatively* (interviews, observations, analyses of artifacts)
e.g., Williams & Vaske, 2003; Williams & Semken, 2011

Sense of place is the set of all meanings and attachments
held by an individual or a group for any given place.

The power of place as an **organizing theme** for contextualized teaching has long been understood and used by some.



Indigenous (e.g., Native American) philosophies of education are **place-based**: prioritizing and transmitting **locally situated knowledge** for long-term sustainability (e.g., *Cajete, 1994*).

John Dewey (1916): Learning should be **experiential and active**, and situated in the learner's **immediate physical and cultural surroundings**.



Río Tanama, Puerto Rico

In the case of students whose cultures and identities are **deeply rooted in place**

(e.g., Native Americans, Native Alaskans, Latinos/Latinas, Native Hawaiians, Pacific Islanders)
science teaching that **contradicts or minimizes their senses of place** can deter them from scientific study and careers.



[Kawagley et al., 1998; Aikenhead & Jegede, 1999; Riggs, 2005; Semken, 2005]

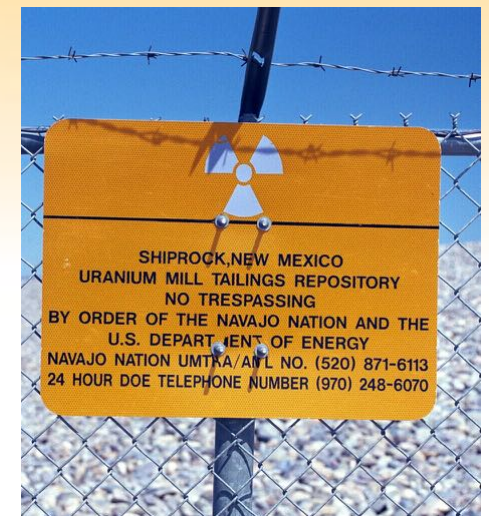
Differing views on land and resource use



Different culturally based metaphors for Earth systems and processes



Earth science linked to environmental damage done to homelands



NEW RESEARCH OPPORTUNITIES IN THE EARTH SCIENCES

Committee on New Research Opportunities in the Earth Sciences at the National Science Foundation
Board on Earth Sciences and Resources
Division on Earth and Life Studies

NATIONAL RESEARCH COUNCIL
OF THE NATIONAL ACADEMIES

THE NATIONAL ACADEMIES PRESS
Washington, D.C.
www.nap.edu

(2012)

“Place-based research that incorporates indigenous landscapes and ways of thinking is one way to attract indigenous students. Indigenous peoples are underrepresented in the Earth sciences despite these cultures having a rich sense of place when it comes to the natural world.

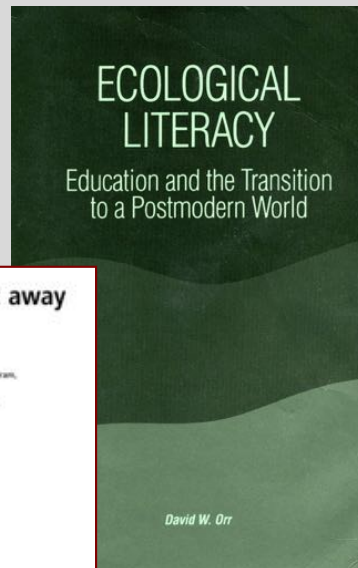
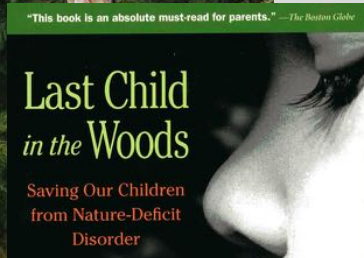
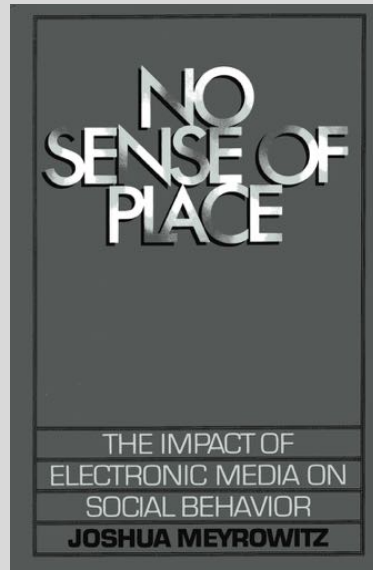
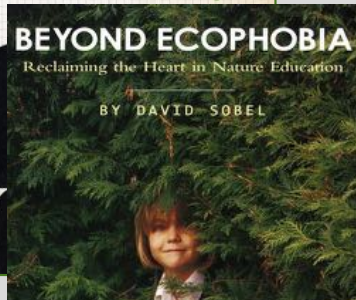
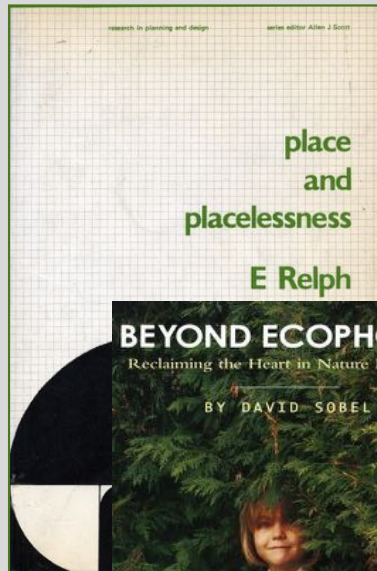
Incorporating concepts like ethnogeology (how geological features are interpreted by cultures) into lessons can increase the accessibility of the Earth sciences.

Presenting the Earth sciences in a way that is commensurate with, rather than in opposition to, native perspectives of Earth systems has had some success and is worthy of EAR education resources.

The lessons learned in developing place-based Earth science education for native cultures may also be transferable to other groups, such as...urban students.”

Finding 3, pp. 84-85.

There are also signs of a much broader **estrangement from place** with serious consequences.



Misunderstanding, fear, avoidance of nature:
Sobel, *Beyond Ecophobia* (1996)

Possible harm to physical and mental health:
Louv, *Last Child in the Woods* (2005)

Obliviousness to the aesthetic, cultural, ecological value of local places and communities:
Orr, *Ecological Literacy* (1992)

Acquiescence in the environmental and social degradation of one's surroundings
Meyrowitz, *No Sense of Place* (1985)

Decreasing popularity of nature-based recreation:
Pergams & Zaradic, *PNAS* (2008)

Disinterest in geoscience and other natural science studies and careers? **Levine et al., *JGE* (2007)**

“Relationship with place is fundamental to our identity as individuals and communities”
de Jong, in *Cultural Ecology* (2013)

Place, Cultural Context, and Geoscience Teaching

Activity

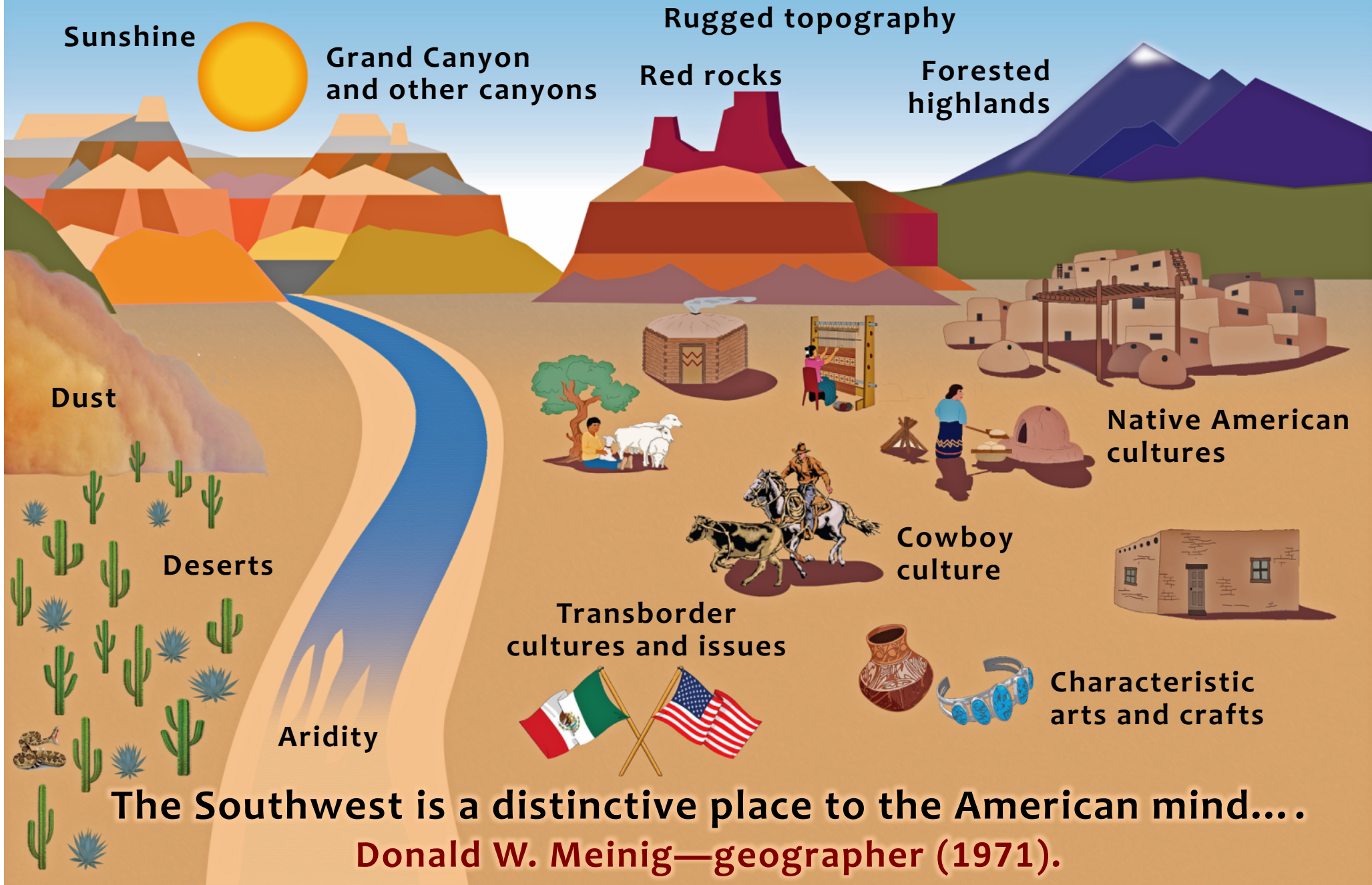
Concept sketching:

Senses of the places where we teach

09:00 to 09:20 am

Depict in a sketch a place or region where and by which you teach geoscience, with the objective of evoking a rich sense of that place or region.

The American **Southwest** is a region widely recognized for its distinctive landscapes and cultures.



Place, Cultural Context, and Geoscience Teaching

Discussion of the essential characteristics of
place-based geoscience education,
with practical examples of each characteristic.

09:30 to 10:00 am

Place-based education (PBE) is situated in specific places: regions, landscapes, environments, communities.

John Elder, *Teaching at the Edge* (1998)

Place meanings and attachments **contextualize** ideas.

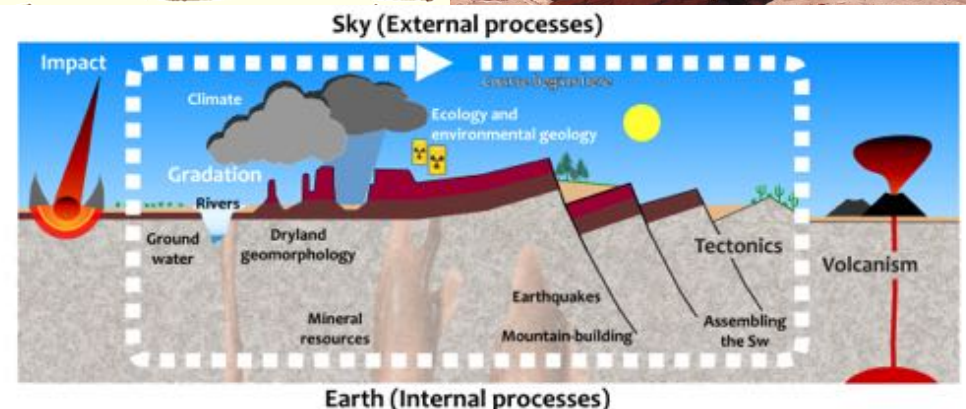
Sense of place is an authentic, assessable **learning outcome**.

Place-based curriculum is a **continuum**:

(Chinn, 2007; Ault, 2008; Endreny, 2010)



“Textbook examples”
from instructive places



Trans-disciplinary, culturally rich,
multilingual: *place is the subject*

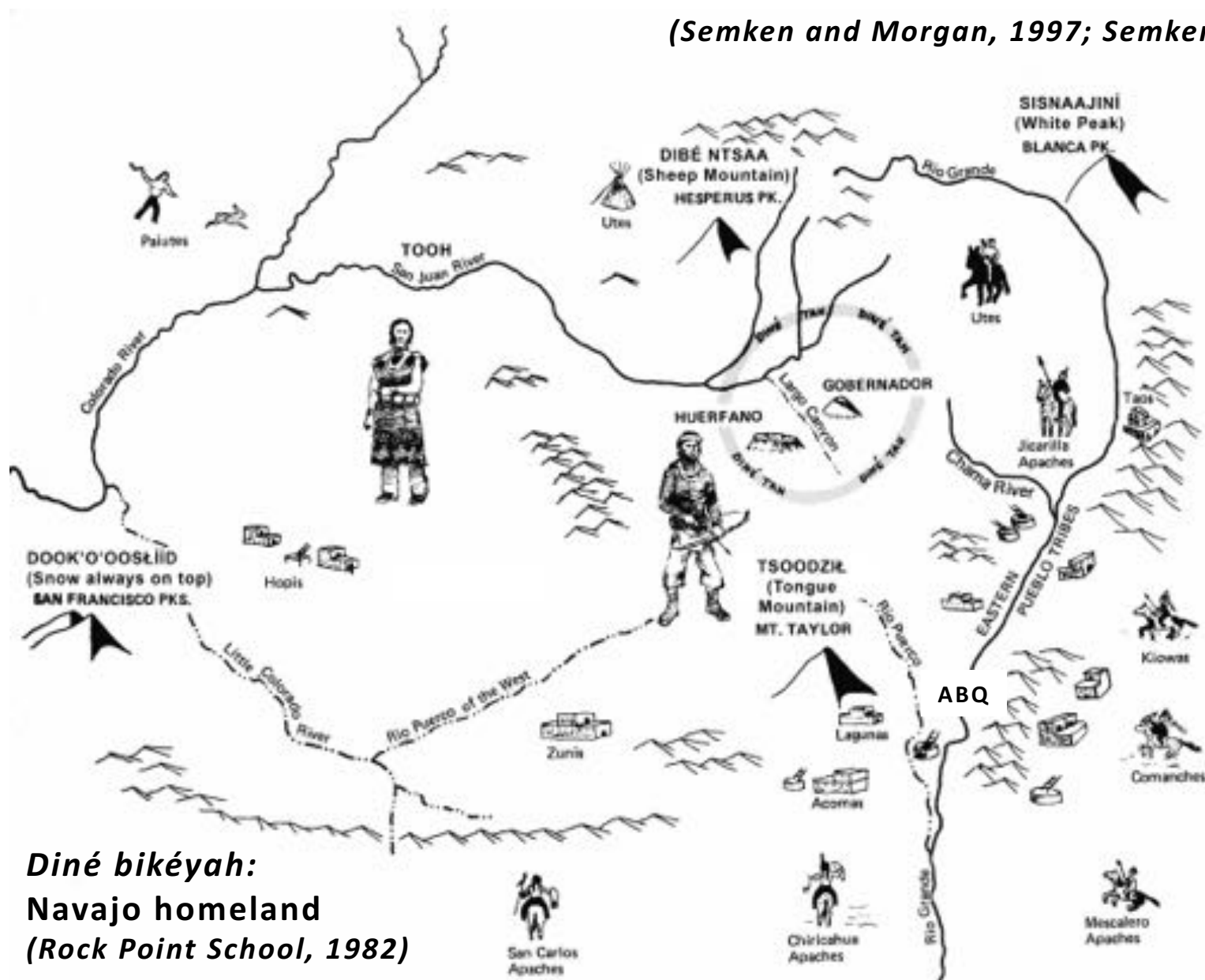
Five essential characteristics of place-based geoscience education

- 1. It focuses explicitly on the geological and other natural attributes of a place.**
- 2. It integrates or at least acknowledges the diverse meanings that place holds for the instructor, the students, and the community.**
- 3. It teaches by authentic experiences in that place or in an environment that strongly evokes that place.**
- 4. It promotes and supports environmental and cultural sustainability in that place.**
- 5. It enriches the senses of place of students and instructors alike.**

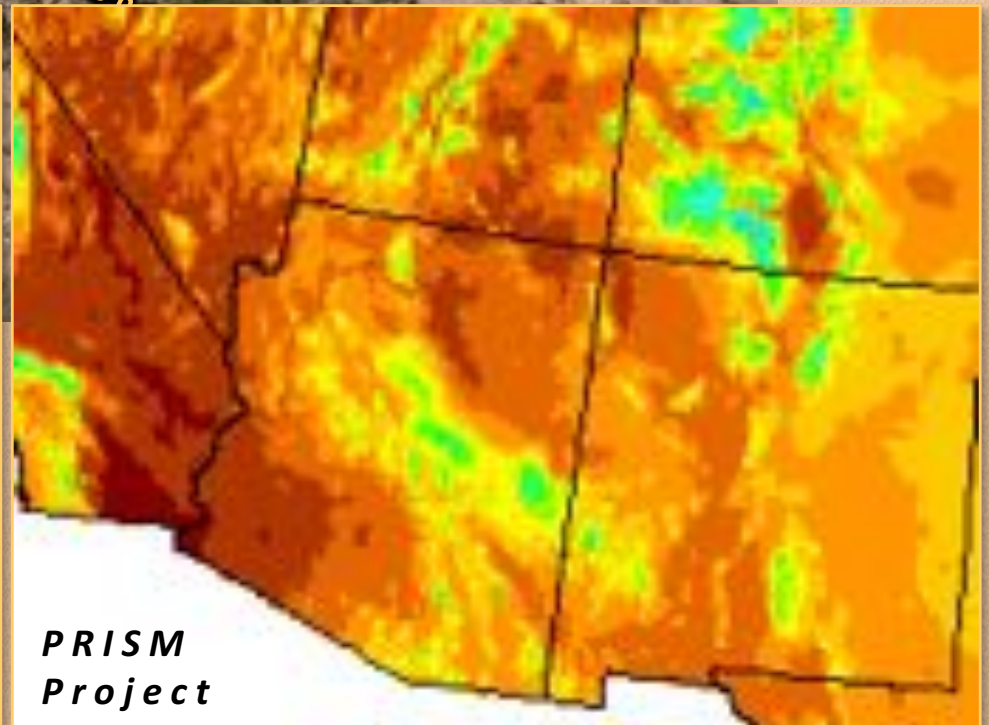
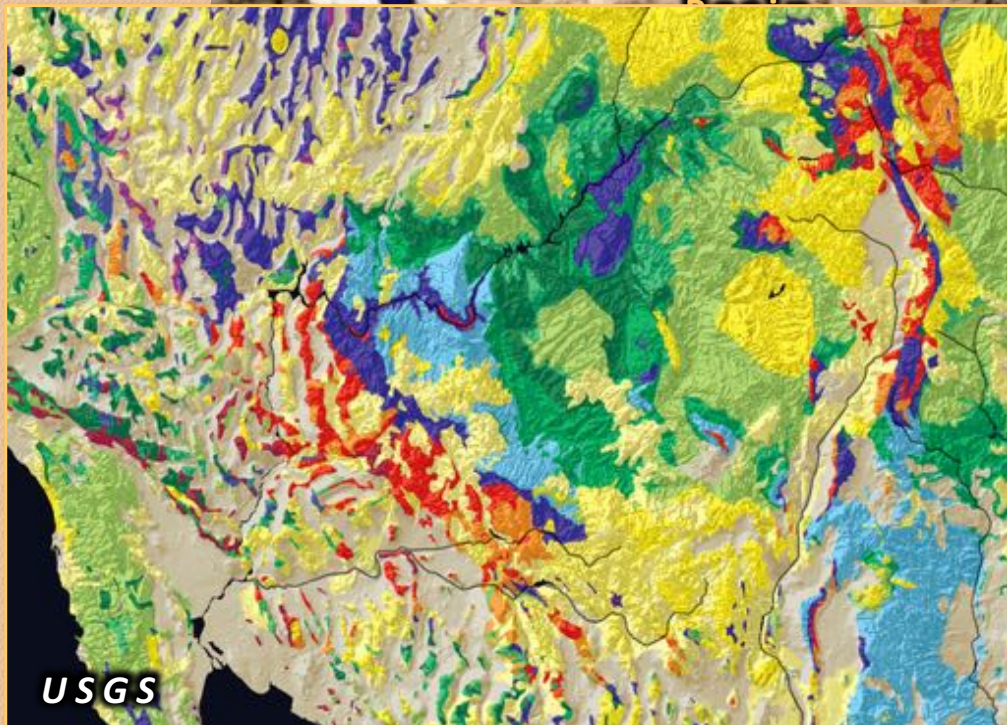
(Lieberman & Hoody, 1998; Kawagley & Barnhardt, 1999; Cajete, 2000; Woodhouse & Knapp, 2000; Gruenewald, 2003; Semken, 2005; Semken et al., in press.)

1. Place-based geoscience education focuses explicitly on the **geological and other natural attributes of a place.**

(Semken and Morgan, 1997; Semken, 2005)



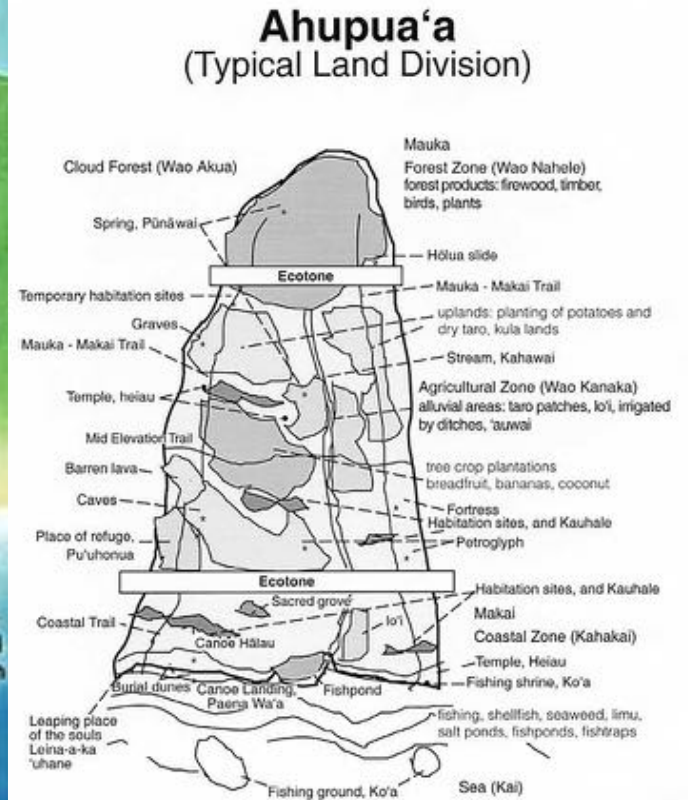
1. Place-based geoscience education focuses explicitly on the **geological and other natural attributes of a place.**



1. Place-based geoscience education focuses explicitly on the geological and other natural attributes of a place.

(Chinn, 2006; 2011)

***Ahupua'a*: traditional Hawaiian geological, climatic, and socioeconomic subdivision of land for sustainable community**



Typical Ahupua'a

(HawaiiHistory.com, 2017)

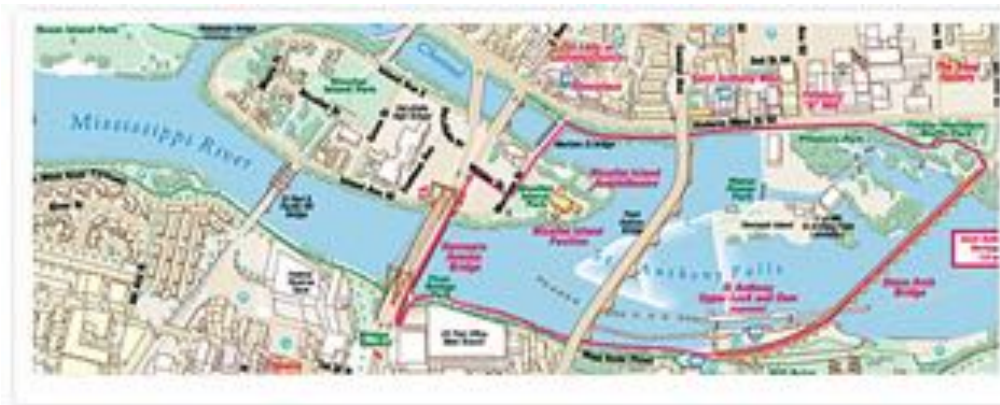
1. Place-based geoscience education focuses explicitly on the **geological and other natural attributes of a place.**

(Kirkby, 2014)

St. Anthony Falls, Mississippi River: important to local communities from indigenous Dakota people to modern multicultural Minneapolis.



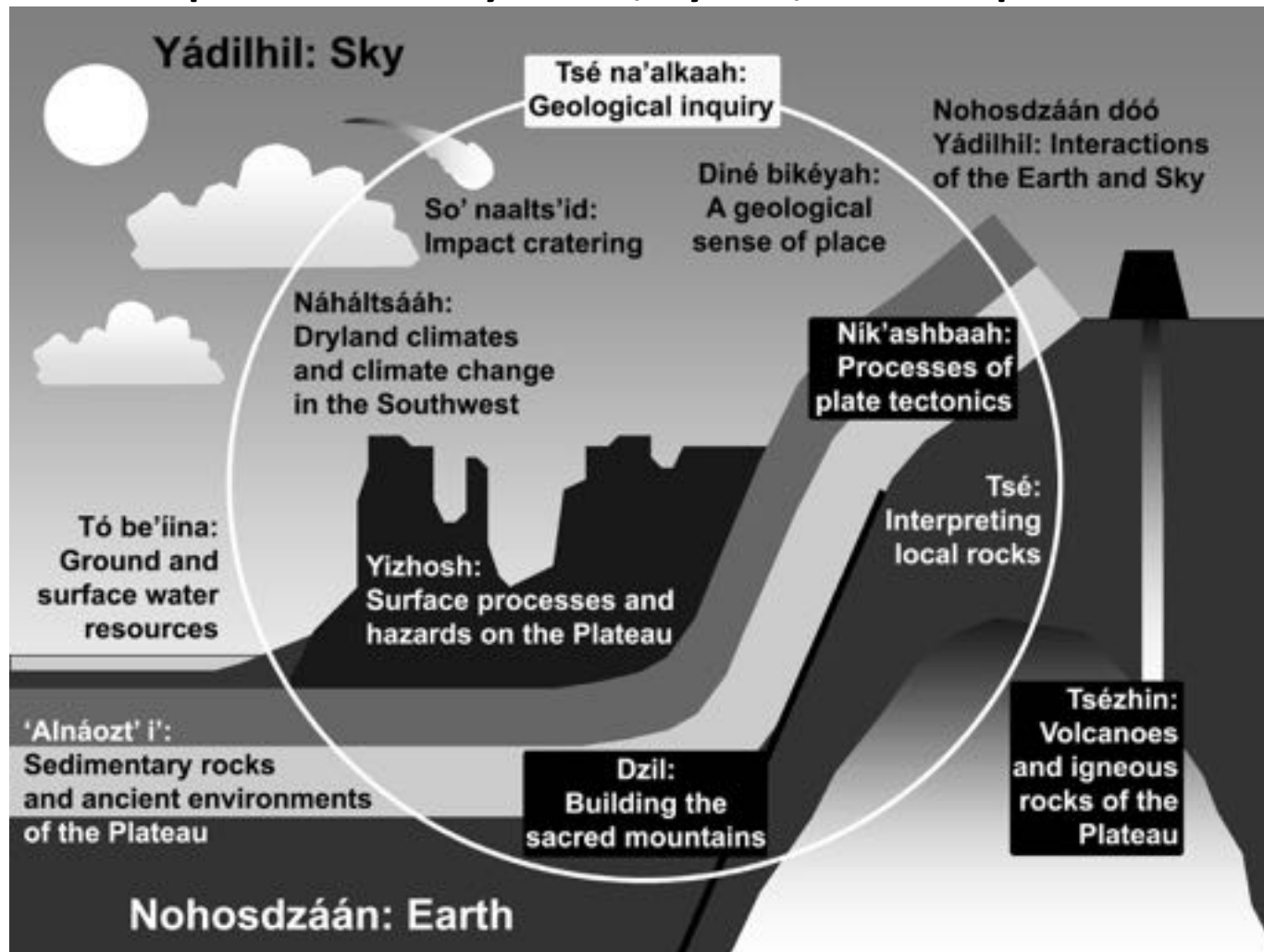
(U.S. Army Corps of Engineers, 2017)



(MN Historical Society, 2011)

2. Place-based geoscience education **integrates or acknowledges the diverse meanings that place holds** for the instructor, the students, and the community.

Tsé naalkaah, Indigenous Physical Geology: incorporates Navajo ethnogeological concepts of Earth systems, cycles, natural processes.



2. Place-based geoscience education **integrates or acknowledges the diverse meanings that place holds** for the instructor, the students, and the community.

RESTORING A LOST SENSE OF PLACE

An Interdisciplinary Course in the Anthracite Coal Region of Pennsylvania

Place-based education is a methodology used in the Earth sciences, humanities, and social sciences. Its central premise is that people understand their surroundings by conceptualizing them as distinct places. Each physical locality acquires meaning by being experienced, whether through scientific investigation or through inhabiting or visiting the locality. The meanings people associate with a location and whether they are attracted, indifferent or adverse to it, constitute their sense of place (Semken, 2011). This article describes an upper-level, interdisciplinary American studies course on the geology and history of the Pennsylvania Anthracite Region near the Penn State Schuylkill Campus in central Pennsylvania. The primary goal of this course was to recreate in the students a sense of place, so that they understand how the local physical environment and cultural heritage are interconnected and continue to affect lives today. The course was interdisciplinary and was taught by an Earth scientist and a historian. We did not share the exact same interests, which was a challenge, but, in the end, meant that we presented material to the students in ways that all could understand.

Educators can take advantage of a sense of place by using as examples locations that students already care about and by building on that relationship.

D. M. VICE (dhr1@psu.edu) is a senior instructor in Earth and mineral sciences at Penn State Hazleton, and HAROLD AURAND, JR. (haa10@psu.edu) is an assistant professor of history in the Arts and Humanities Department at Penn State Schuylkill.



Figure 1. Photograph of anthracite coal miners in Schuylkill County, Pennsylvania, circa 1938. [Photo by WPA-Federal Art Project photographer Jack Delano, courtesy of the Library of Congress Prints and Photographs Division Washington, D.C.]

ship. For example, familiar locations can be used to demonstrate Earth system processes or to illustrate nationwide historic trends. Using material from places students already care about has been associated with better student retention and interest in learning, particularly in general education courses, where a student might not be particularly interested in the subject (Semken 2011).

2 — NATIONAL ASSOCIATION OF GEOSCIENCE TEACHERS



(Scranton Times, 2016)



(Oxford U Press, 2012)



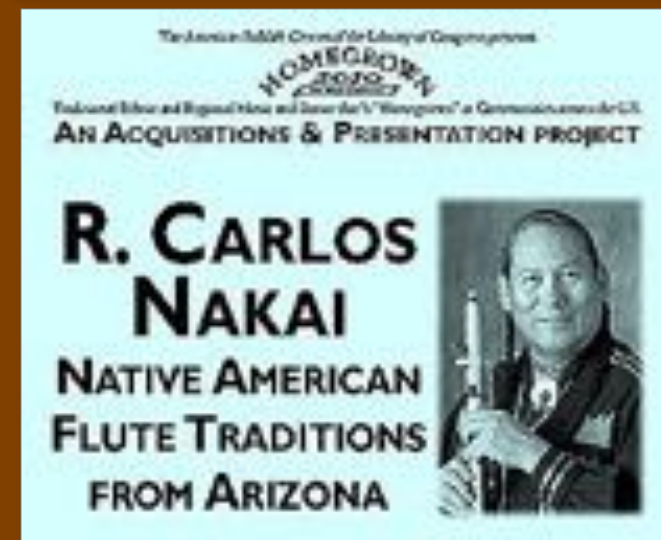
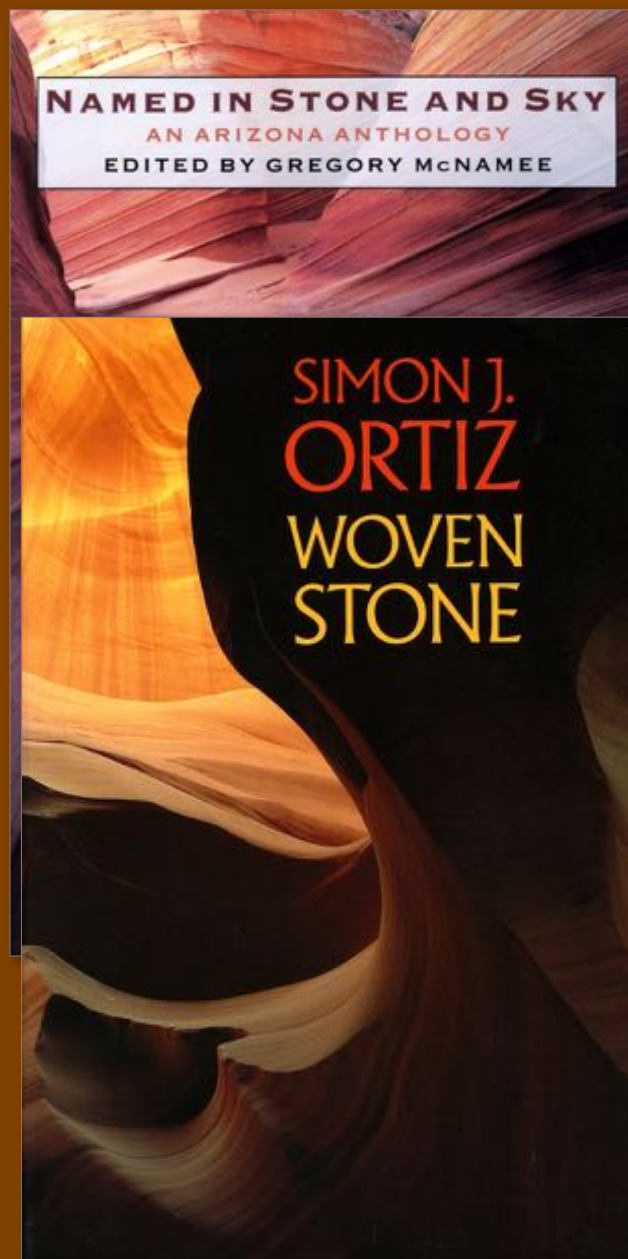
(Pottsville Herald, 2011)



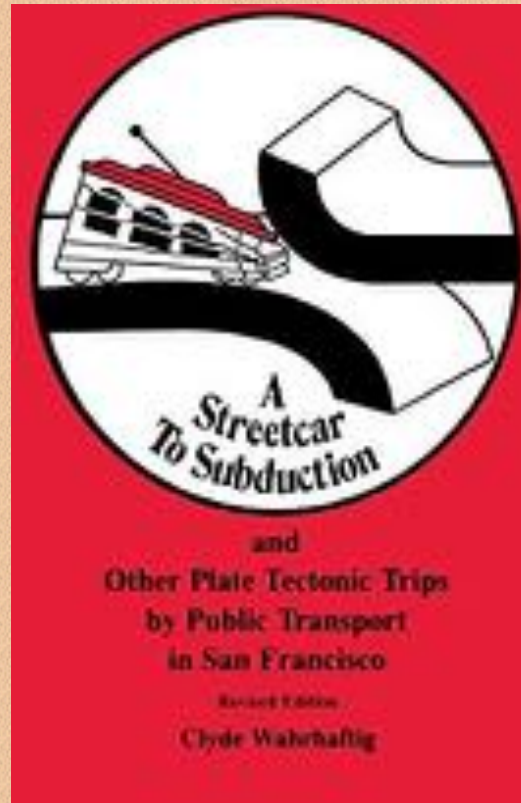
Pennsylvania anthracite region: blend of immigrant cultures and place knowledge, with modern environmental and socioeconomic sustainability issues.
(Vice and Aurand, 2014).

2. Place-based geoscience education **integrates or acknowledges the diverse meanings that place holds** for the instructor, the students, and the community.

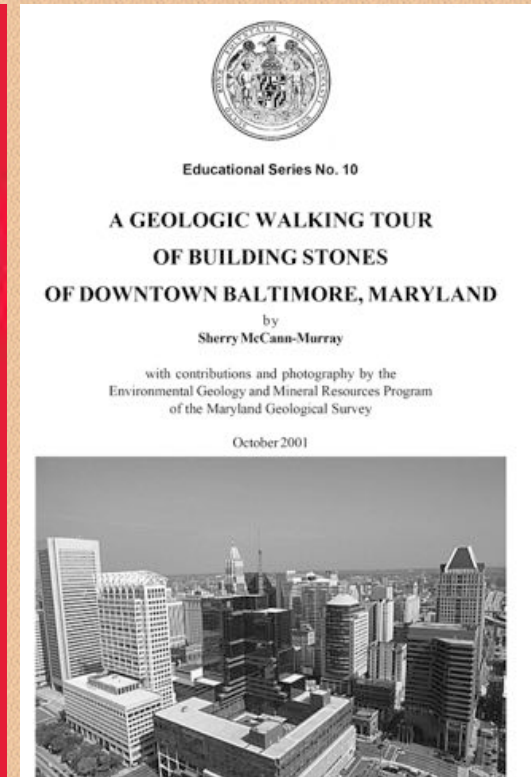
Study of **artistic** and other **humanistic** representations of place provides engaging **context** for the scientific ideas presented in a place-based course.



3. Place-based geoscience education teaches by
authentic experiences in that place
or in an environment that strongly evokes that place.



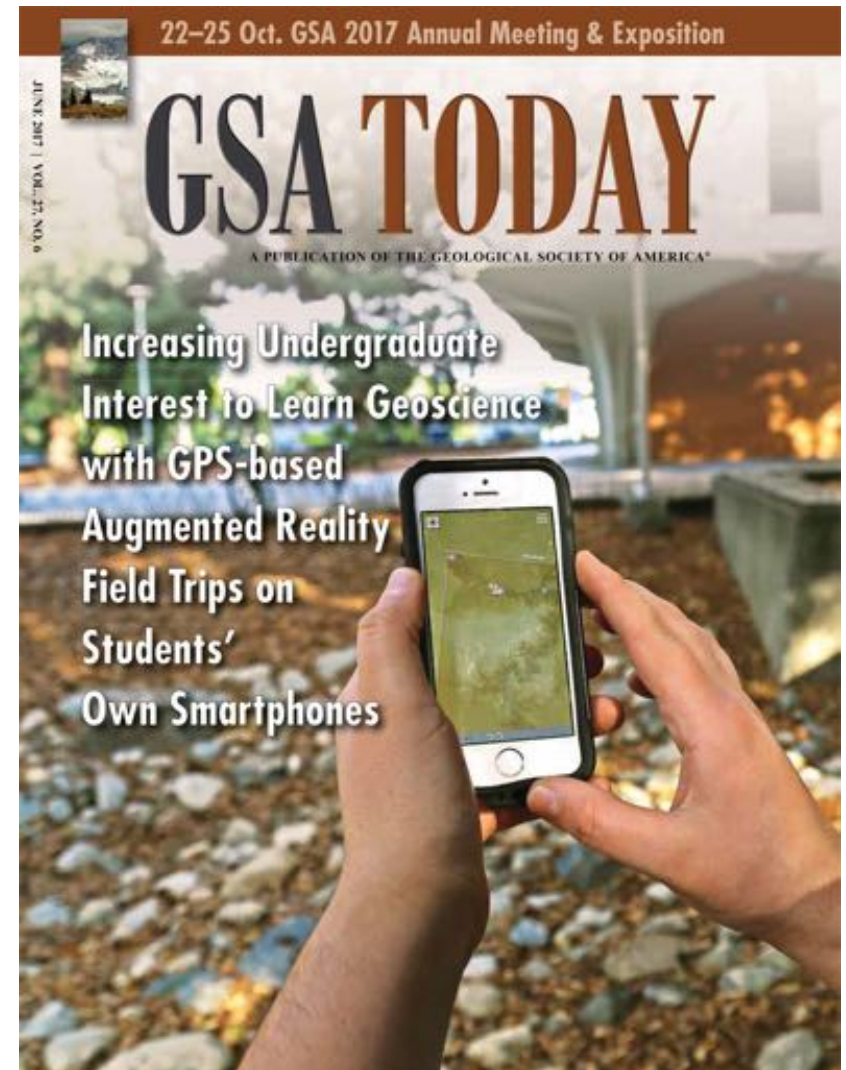
(Wahrhaftig, 1984)



(McCann-Murray, 2001)



3. Place-based geoscience education teaches by authentic experiences in that place
or in an environment that strongly evokes that place.



(Bursztyn et al., 2017)

4. Place-based geoscience education promotes and supports environmental and cultural sustainability in that place (by actively engaging with local sustainability issues).

New climate report holds dire predictions for the Southwest

Temps could rise 9 degrees this century, cutting water supply, boosting fire risks.

Brandon Loomis
The Republic • azcentral.com

Global climate change is baking Southwestern cities, intensifying wildfires and straining water supplies, and the worst is yet to come, scientists say in the latest National Climate Assessment released Tuesday.

The Earth is heating unevenly, and in recent decades, the Southwest has warmed by an average of 2 degrees Fahrenheit, said Gregg Garfin, a

ARIZONA
REPUBLIC

University of Arizona geoscientist who was a lead author of the report's Southwest section.

The region will heat up an additional 2.5 to 5.5 degrees by midcentury under the current trajectory of greenhouse-gas emissions, according to the report, and by up to 9.5 degrees at century's end.



Drying creek beds, such as the Little Colorado River's on the Navajo Reservation, will become more prevalent if climate forecasts hold true. THE REPUBLIC



Call for Public Comment

DAKOTA ACCESS PIPELINE ENVIRONMENTAL IMPACT STUDY

Public scoping meetings announced soon!



DEADLINE: FEB. 20, 2017

www.drcinfo.org/DAPLstudy



(Pacific Island Times, 2017)

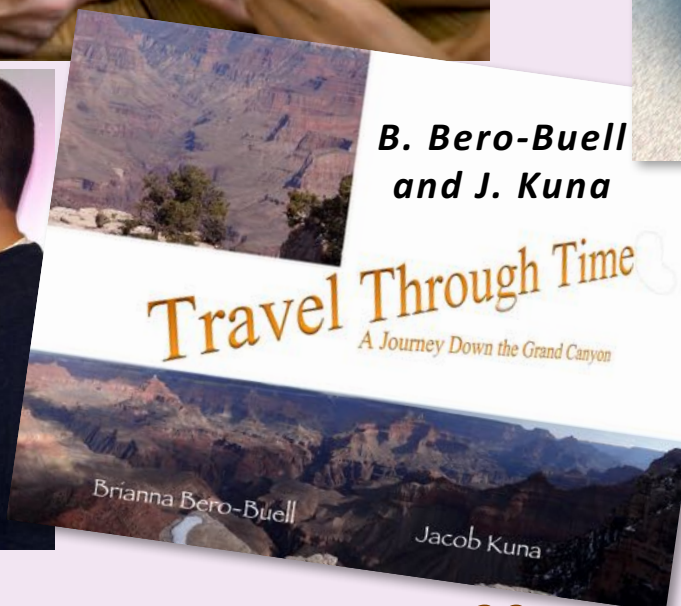
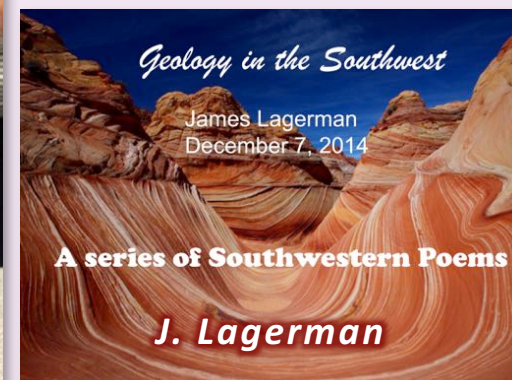


(WXshift, 2015)

5. Place-based geoscience education enriches the senses of place of students and instructors alike (fostering interest in and concern for the places they study).



Encourage students to express their senses of place **creatively**, or to **share their knowledge** with the local community through **service learning**.



Sense of place functions as an authentic and assessable **learning outcome** for place-based education.

Quantitative: Likert-scale psychometric survey instruments

Place Attachment Inventory (PAI)

(Williams & Vaske, 2003; Semken & Butler Freeman, 2008)

| |
|--|
| This place is a part of me. |
| This place is the best place for what I like to do. |
| This place is very special to me. |
| No other place can compare to this place. |
| I identify strongly with this place. |
| I get more satisfaction out of being at this place than at any other. |
| I am very attached to this place. |
| Doing what I do at this place is more important to me than doing it in any other place. |
| Being at this place says a lot about who I am. |
| I wouldn't substitute any area for doing the types of things I do at this place. |
| This place means a lot to me. |
| The things I do at this place I would enjoy doing just as much at a similar site (reverse scored). |

Young's Place Meaning Survey (YPMS)

(Young, 1999; Semken & Butler Freeman, 2008)

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

Sense of place functions as an authentic and assessable learning outcome for place-based education.

Qualitative: Application of **ethnographic** techniques.

Behavioral observations in learning environments and recreational settings

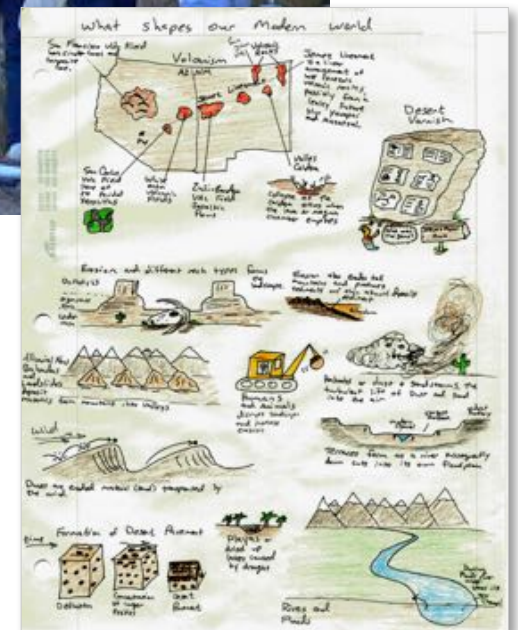


Interviews
and **focus groups**
(including *Delphi groups*)

(Williams and Semken, 2011;
Ward et al., 2014)



Artifact analyses
(of student or participant
products, such as
concept sketches)



Geoscience **knowledge and skills assessments** for place-based teaching should also be place-based, and **culturally valid**.

- Many geoscience assessments are written to accommodate a **mainstream** cultural perspective and experience.
- Such items may not be valid for use with under-represented-minority and cultural-minority students.
- Assessments should be **culturally validated**
 - Maximize **local** relevance and interest
 - Use—and **name**—local examples whenever possible
 - Be aware of applicable cultural norms and potential conflicts
 - Seek input and review from **cultural experts**, including culturally expert educators

(Ward et al., 2014)

Place, Cultural Context, and Geoscience Teaching

Activity:

Teaching and assessing in place-based ways

10:10 to 11:00 am

Think about applying one or more of the **5 essential characteristics** of place-based geoscience education to one of your own courses, activities, assessments, or scholarship—and prepare digital demonstrations or summaries that can be posted to the group workspace.

Break

In there somewhere

Five essential characteristics of place-based geoscience education

- 1. It focuses explicitly on the geological and other natural attributes of a place.**
- 2. It integrates or at least acknowledges the diverse meanings that place holds for the instructor, the students, and the community.**
- 3. It teaches by authentic experiences in that place or in an environment that strongly evokes that place.**
- 4. It promotes and supports environmental and cultural sustainability in that place.**
- 5. It enriches the senses of place of students and instructors alike.**

(Lieberman & Hoody, 1998; Kawagley & Barnhardt, 1999; Cajete, 2000; Woodhouse & Knapp, 2000; Gruenewald, 2003; Semken, 2005; Semken et al., in press.)

Place, Cultural Context, and Geoscience Teaching

Discussion and lead-in to second day

11:00 to 11:30 am

Place, Cultural Context, and Geoscience Teaching

NSF, NASA, and U.S. DOE provided support of foundational research
by the Semken research groups at ASU and Diné College
from 1991 to present (see 2017 *JGE* preprint).

Don't miss Dr. Greg Cajete's talk at 4:30 today!

Hasta mañana!