

# The Sense of Place as a Factor in Geoscience Learning



**Steve Semken**



*Round Rock, Navajo Nation, Arizona*

# We teach Earth, environmental, and ecological sciences in and about *places*.

- imbued with diverse **meanings** through human experience,
- and to which people develop strong emotional **attachments**.

*[e.g., Relph 1976, Tuan 1977, Sack 1980, Williams et al. 1992, Ryden 1993]*

The **sense of place** encapsulates our connection to places.



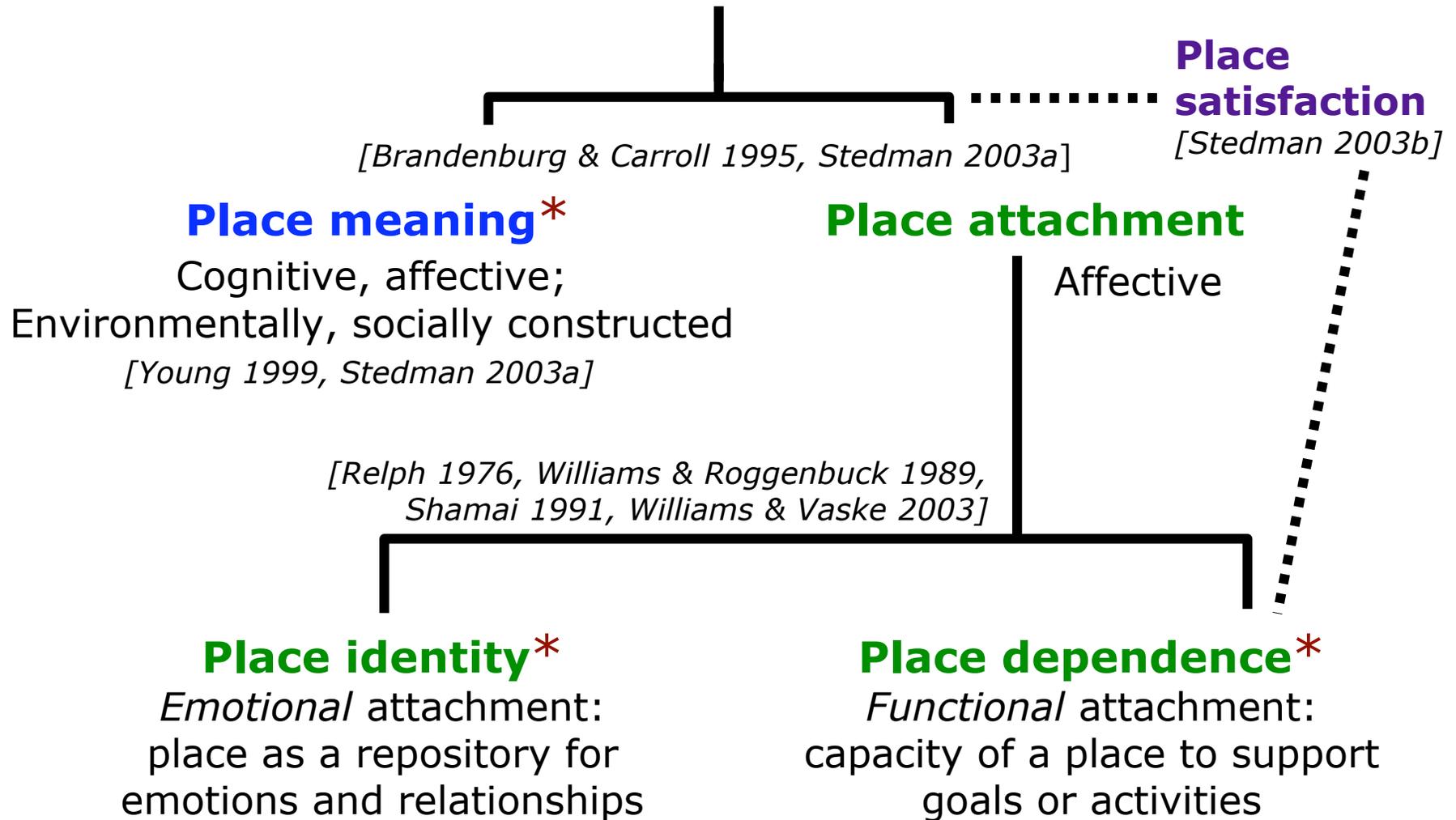
**Sense of place** = the **set of all meanings and attachments**

a person or a group invests in a place

*[Brandenburg & Carroll 1995, Williams & Stewart 1998]*

**Round Rock, Navajo Nation, Arizona**

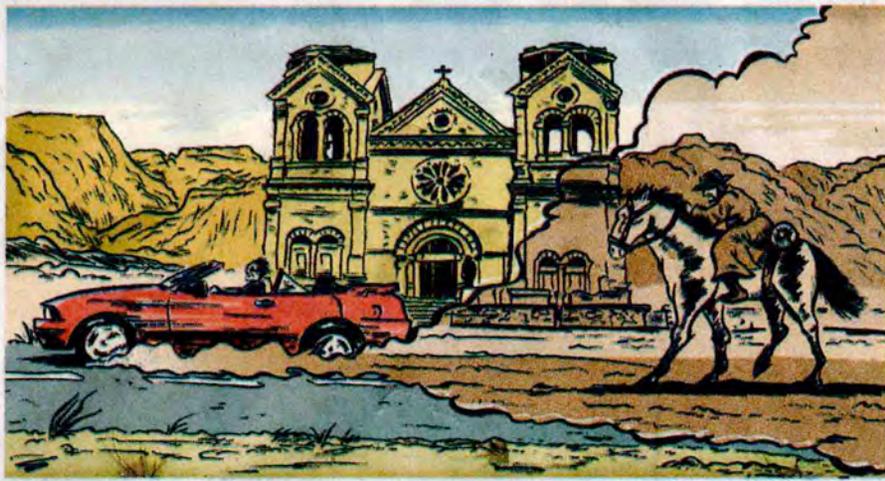
**Sense of place has been well-characterized  
in environmental psychology and cultural geography.**



**\*Validated *psychometric instruments* exist for these components, allowing for their characterization and measurement in different groups**

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

[Basso 1996; Cajete 1997, 2000; Alarcón 2002]



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

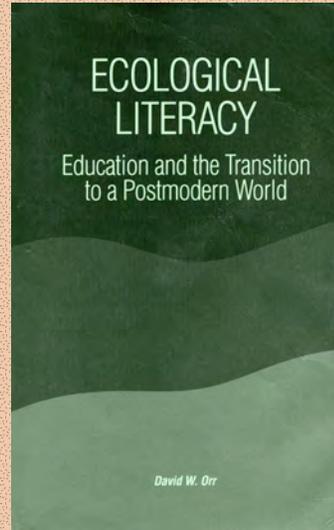
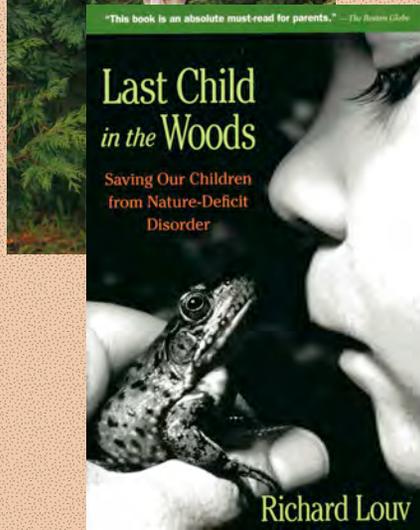
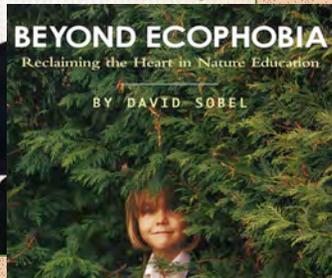
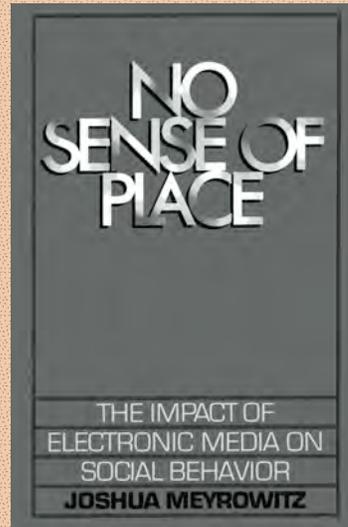
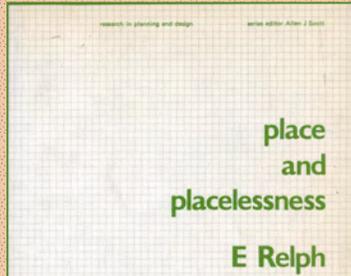
[e.g., Riggs & Semken 2001, NSF 2006]

Does teaching that **contradicts or minimizes their senses of place** help deter these students from scientific study and careers?

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



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



**...with consequences** [Relph 1976]

Misunderstanding, fear, avoidance of nature [Sobel 1996]

Possible harm to physical and mental health [Louv 2005]

Obliviousness to the aesthetic, cultural, ecological value of the local [e.g., Orr 1992]

Acquiescence in environmental and social degradation of surroundings [Orr 1992, Meyrowitz 1985]

**Disinterest in geoscience** and other natural science studies and careers? [Levine et al. 2007]

**Place offers context *and* theme for meaningful teaching and learning.**

***Wisdom sits in places....You must remember everything about them.***

***You must learn their names.***

***You must remember what happened at them long ago.***

***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 (in press), *Achieving Querencia*



***Goldfield and Superstition Mountains,  
Sonoran Desert, Arizona***

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

**Local:** focused on surrounding natural and cultural environments

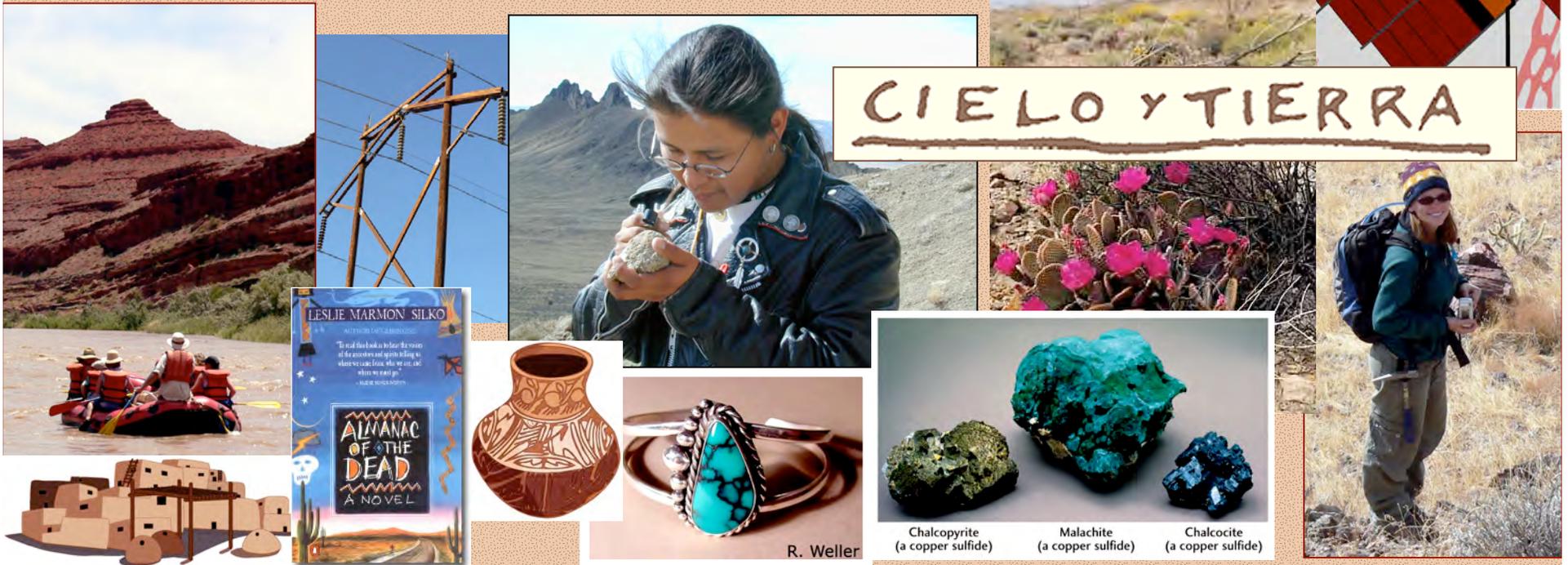
**Experiential:** inquiry in field and lab with local features and materials

**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**

*[Gruenewald 2003; Sobel 2004; Semken 2005]*



R. Weller

Chalcopyrite (a copper sulfide) Malachite (a copper sulfide) Chalcocite (a copper sulfide)

*[Grotzinger et al. 2007]*

# Authentically place-based teaching is **experiential** and **trans-disciplinary**.

It needs access to the outdoors and the community,  
and enough time for synthesis of ideas.

Classical **natural history** = model for P-B science  
*[Gruenewald 2003]*

Places are (by definition) **human** as well as natural.

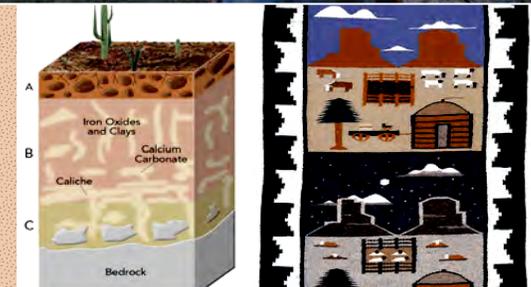
Infuse scientific and **humanistic** meanings  
and **inquiry** into the curriculum

**Students of all backgrounds** must be empowered  
to find meanings and form attachments.

Nobody should be marginalized by choice of place

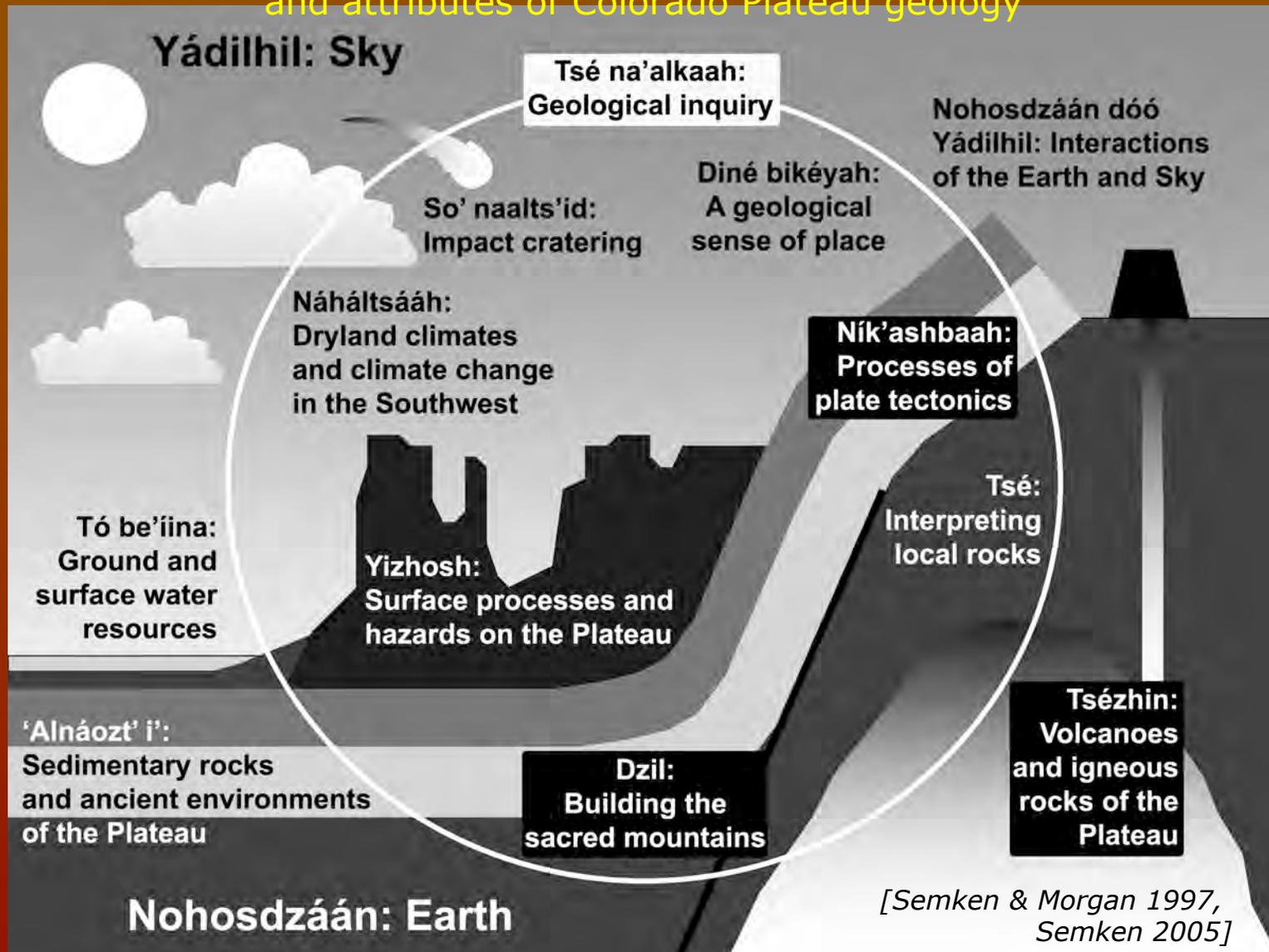
**Enrichment of the senses of place** of students  
and teachers should be a **learning outcome**  
along with enriched content knowledge and skills.

*[Semken 2005, Semken & Butler Freeman 2008]*



# Tsé na'alkaah 101: Indigenous place-based geology

Bilingual; organized according to concepts of **Diné ethnogeology** and attributes of Colorado Plateau geology

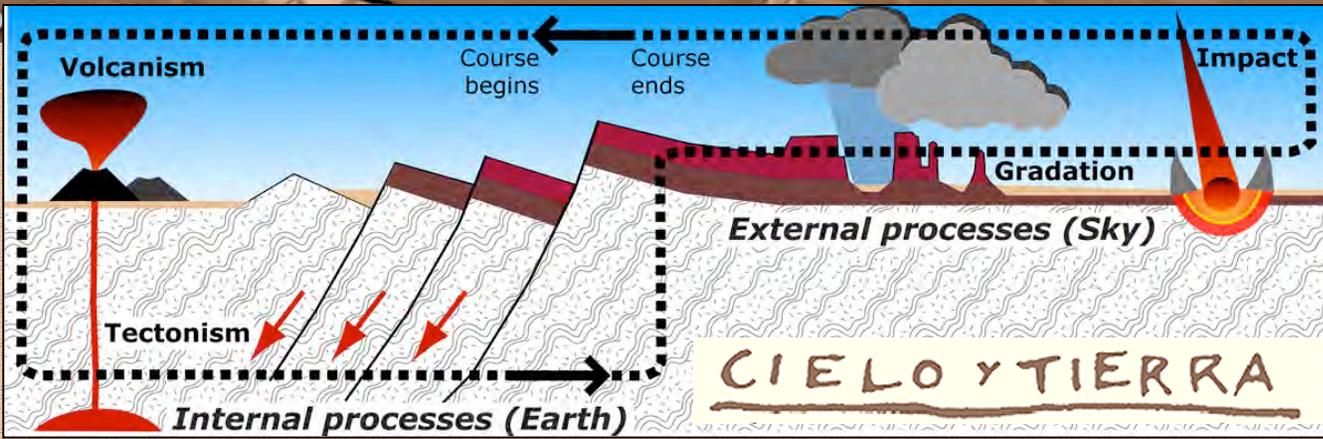


# Toward Arizona and Southwest-based (geo)science teaching



To engage a **larger** and **more diverse** student population

Phoenix Basin and Range Pro

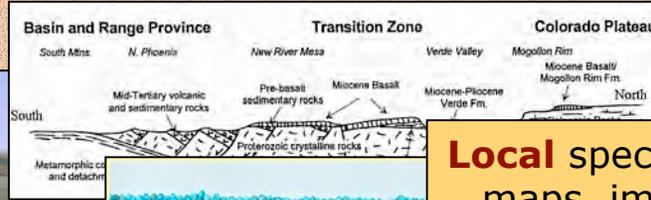


**Arizona:** not presented as a politically defined state, but a complexly evolved and ruggedly beautiful desert-mountain **physical landscape** and a multicultural, historic, rapidly urbanizing **cultural landscape** in the midst of the Southwest USA.

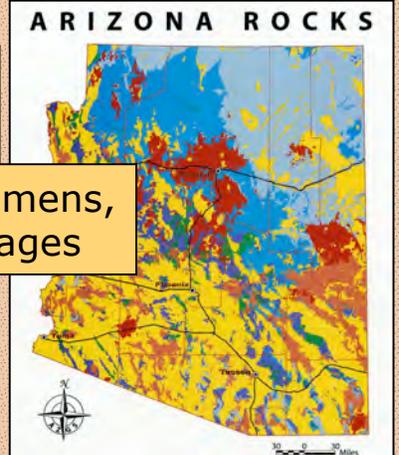
CIELO Y TIERRA



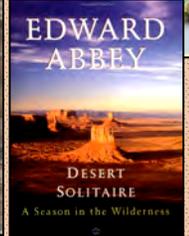
**Field work** when possible when not, **Google Earth**



**Local** specimens, maps, images



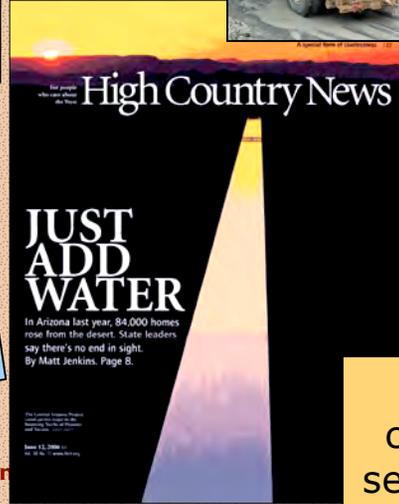
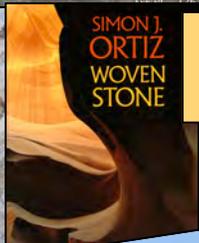
Geology and **SW arts**



**Environmental and economic** exercises and case studies



**Southwestern** writings



**Capstone** curriculum or service projects



of Place as a Factor in Geoscience Learning

# Quantitative assessment of place-based learning

Responses on Likert scale = place attachment and meaning **scores**

## 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).

Also content knowledge instrument:  
**Geoscience Content Inventory (GCI)** [Libarkin & Anderson 2005]

## Young's Place Meaning Survey (YPMS)

[Young 1999,  
Semken & Butler Freeman 2008]

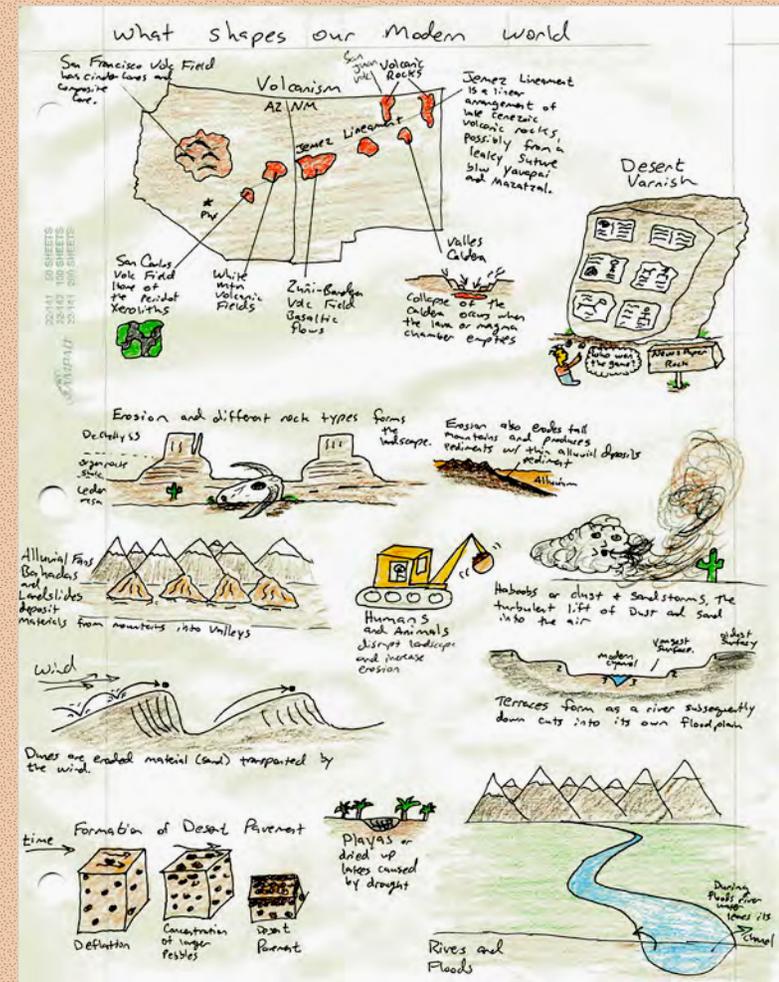
Ecologically important	Exotic
Important to preserve	Remote
Educational	Unspoiled
Unique	Authentic
Scientifically important	Adventurous
Fragile	Unusual
Interesting	Important for Native culture
A privilege to visit	Historical
A privilege to live here	Ancient
Tranquil	Spiritually valuable
Scenic	Overdeveloped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

# Qualitative assessment of place-based learning

**Video-** and **audio-recorded** classroom and field activities

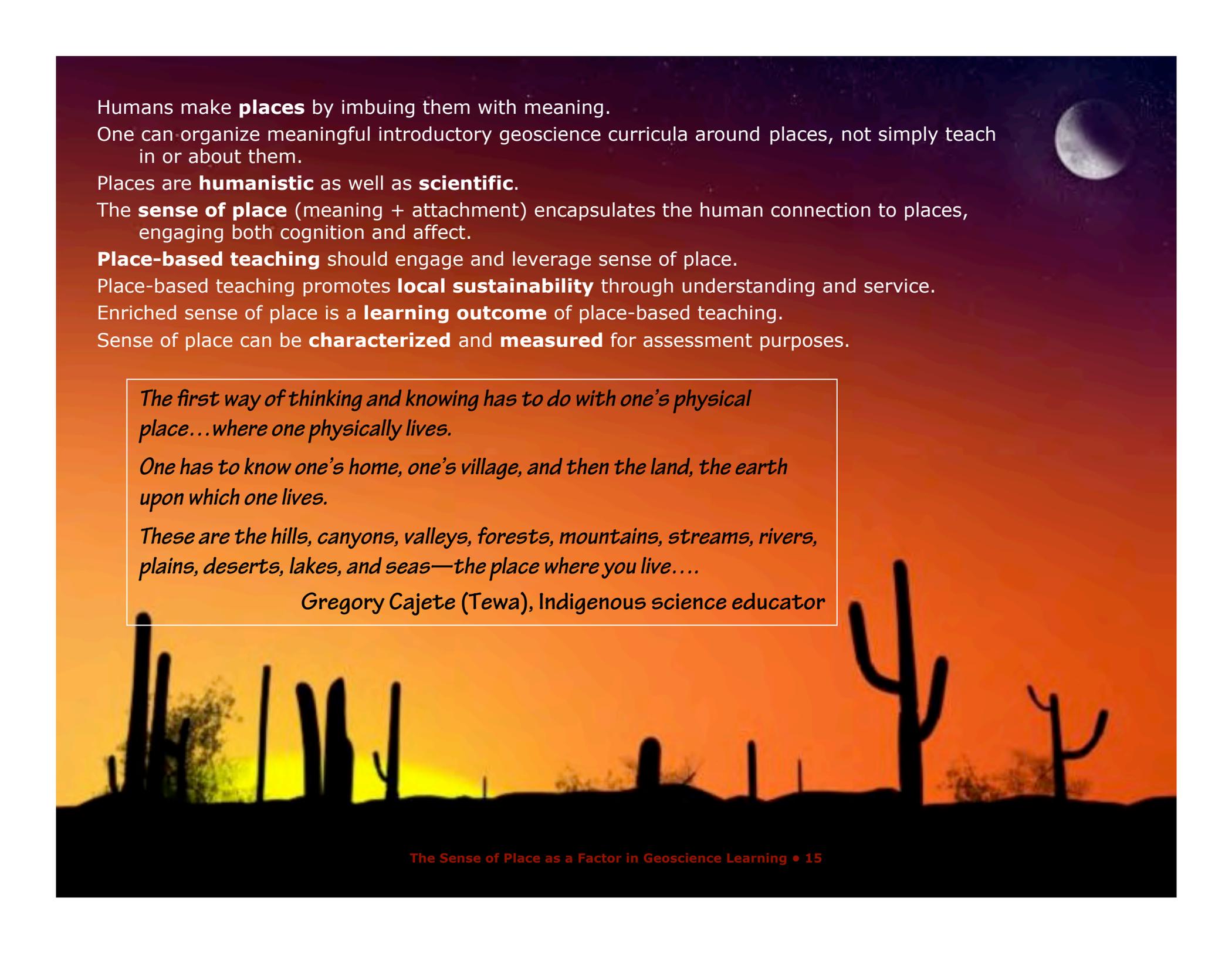


Artifacts such as assignments, essays, and **concept sketches**  
[Johnson & Reynolds 2005]



Semi-structured **exit interviews**





Humans make **places** by imbuing them with meaning.

One can organize meaningful introductory geoscience curricula around places, not simply teach in or about them.

Places are **humanistic** as well as **scientific**.

The **sense of place** (meaning + attachment) encapsulates the human connection to places, engaging both cognition and affect.

**Place-based teaching** should engage and leverage sense of place.

Place-based teaching promotes **local sustainability** through understanding and service.

Enriched sense of place is a **learning outcome** of place-based teaching.

Sense of place can be **characterized** and **measured** for assessment purposes.

*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....*

*Gregory Cajete (Tewa), Indigenous science educator*