

Sense of Place and Place-Based Geoscience Learning: Assessment in the Cognitive and Affective Domains



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We teach geoscience in and by means of *places*: localities given meaning by human experiences in them.

People and cultures view and understand places in diverse ways.

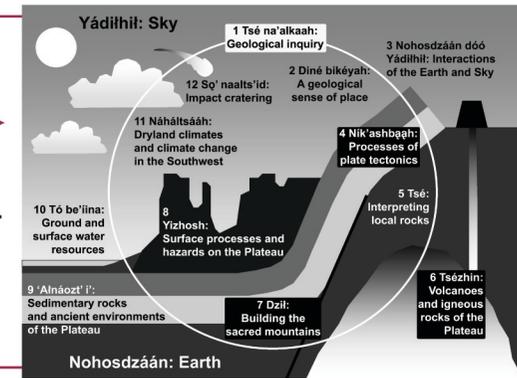
Geological or other scientific knowledge of a place may be only one component of a spectrum of local **meaning** that encompasses aesthetics, art, ceremony, economics, history, mythology, recreation, and so on. People also tend to develop emotional **attachments** to meaningful places.



The set of meanings of and attachments to places, held by individuals or groups, is referred to as *sense of place*.

The physical environment influences development of sense of place [1, 2]; if sense of place influences the ways people observe and interpret nature, it must influence geoscience learning, and merits study by educators. Among some students (e.g., American Indians), interest in geoscience may be marginalized by teaching that conflicts directly with sense of place [3].

Place-based learning emphasizes local inquiry, integrates or acknowledges diverse meanings of places, teaches by authentic experiences, promotes ecological and cultural sustainability, and enriches the sense of place of students and teachers; e.g., this Colorado Plateau-based course for Navajo students that integrates indigenous knowledge [3]. Place-based teaching occurs mostly in K-12 schools; the effectiveness of the approach for college geoscience has not been well assessed. **Characterization and measurement of sense of place** are prerequisite to informed design, implementation, and assessment of place-based geoscience curricula, particularly those intended to serve ethnically-, culturally-, and geographically-diverse student populations.



$$\text{Sense of Place (SoP)} = \text{Place Meaning (PM)} + \text{Place Attachment (PA)}$$

PM is a rich set of locally-constructed and culturally-moderated knowledge and skills that may incorporate geoscientific understanding of places.

Active research seeks to characterize PM qualitatively (dimensions of meaning obtained from subject interviews and semiotic analyses of textual and graphic representations of places) and quantitatively (focused surveys and factor analyses); e.g., [4].

PA has two dimensions [6, 7]: *place dependence* (capacity of a place to support activities or goals) and *place identity* (emotional attachment to a place).

Experimental **Place Attachment Inventory** [8] used at ASU to compare attachment to different places relevant to geoscience courses, and by race and ethnicity.

Students' SoP for "home" and Arizona (if not home) are compared. It may also be instructive to compare SoP among geologically- and pedagogically-relevant places that are nested geographically [9], e.g.:

- North American continent
- American Southwest
- Basin and Range Colorado Plateau
- Arizona
- Valley of the Sun Navajo Nation
- Grand Canyon

Tsé na'alkaah 101-Geology 101, Indigenous Physical Geology

PRE-COURSE QUESTIONNAIRE
This is intended for diagnostic purposes only. It will not affect your grade in any way.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I am a fluent speaker of the Diné language.	1	2	3	4	5
2. I am very familiar with traditional Diné cultural knowledge.	1	2	3	4	5
3. I am very interested in geology.	1	2	3	4	5
4. I chose this course because of its title: Indigenous Physical Geology.	1	2	3	4	5
5. Knowledge of the Earth is an important part of Diné culture.	1	2	3	4	5
6. Diné bikéyah is one of the most geologically-interesting places in the whole world.	1	2	3	4	5
7. I am very familiar with the geology of the local region.	1	2	3	4	5
8. It is appropriate to use the Diné language in a college science course.	1	2	3	4	5
9. The use of Diné terms and concepts in this geology course will make it more interesting to me.	1	2	3	4	5
10. The use of Diné terms and concepts in this geology course will make it more useful to me.	1	2	3	4	5
11. The use of Diné terms and concepts will better enable me to learn science.	1	2	3	4	5
12. The Diné term <i>Ník'ashbágh</i> refers to natural processes that occur where?	In the Earth	In the Sky	In either place		
13. The majority of the rocks that are seen across the Navajo Nation were formed in what way?	Molten lava cooled and hardened	Rocks in the cores of high mountains were exposed	Beds of sand and mud were buried and cemented		
14. In the Diné way, which of these geologic processes would be seen as most "female-like"?	Wearing away of rocks	Growth of a mountain range	Impact of a large meteorite		

Part of a culturally-based pre-test [3].

For each of the terms below, please indicate the degree to which you believe the term describes the Grand Canyon for you:

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
18. Ecologically important	1	2	3	4	5
19. Important to preserve	1	2	3	4	5
20. Educational	1	2	3	4	5
21. Unique	1	2	3	4	5
22. Scientifically important	1	2	3	4	5
23. Fragile	1	2	3	4	5
24. Interesting	1	2	3	4	5
25. Privilege to visit	1	2	3	4	5
26. Tranquil	1	2	3	4	5
27. Scenic	1	2	3	4	5
28. Relaxing	1	2	3	4	5
29. Wilderness	1	2	3	4	5
30. Beautiful	1	2	3	4	5
31. Exotic	1	2	3	4	5
32. Remote	1	2	3	4	5
33. Unspoiled	1	2	3	4	5
34. Authentic	1	2	3	4	5
35. Adventurous	1	2	3	4	5
36. Unusual	1	2	3	4	5
37. Important for Native American culture	1	2	3	4	5
38. Historical	1	2	3	4	5
39. Ancient	1	2	3	4	5
40. Spiritually valuable	1	2	3	4	5
41. Overdeveloped	1	2	3	4	5
42. Dangerous	1	2	3	4	5
43. Crowded	1	2	3	4	5
44. Threatened	1	2	3	4	5

Pilot Place Meaning Survey (after [4]) adapted for comparative studies of place-based and conventional introductory geology labs at ASU [5].

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What is the place that you now consider your home, no matter where you are actually living now?

Each of these statements refers to the state of Arizona.	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I feel that this place is a part of me.	1	2	3	4	5
This place is the best place for what I like to do.	1	2	3	4	5
This place is very special to me.	1	2	3	4	5
No other place can compare to this place.	1	2	3	4	5
I identify strongly with this place.	1	2	3	4	5
I get more satisfaction out of being at this place than at any other.	1	2	3	4	5
I am very attached to this place.	1	2	3	4	5
Doing what I do at this place is more important to me than doing it in any other place.	1	2	3	4	5
Being at this place says a lot about who I am.	1	2	3	4	5
I wouldn't substitute any other area for doing the types of things I do at this place.	1	2	3	4	5
This place means a lot to me.	1	2	3	4	5
The things I do at this place I would enjoy doing just as much at a similar site.	1	2	3	4	5

What is your race? (Please circle the appropriate response or responses.)

American Indian or Alaska Native	Asian	Black or African American	Native Hawaiian or other Pacific Islander	White	I do not wish to say.
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What is your ethnicity? (Please circle the appropriate response or responses.)

Hispanic or Latino	Not Hispanic or Latino	I do not wish to say.
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What is your gender? (Please circle the appropriate response or responses.)

Female	Male	I do not wish to say.
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Odd-numbered items measure place identity and even-numbered items place dependence. These are positive for subscores above 18; PA is positive for total score above 36.