

“The eye seldom sees what the mind does not anticipate”

Teaching and Learning Philosophy

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Teaching and learning are intertwined and inseparable. The interconnection between these two activities is present in my work as both a student and a teacher. I work to let my teaching reflect my beliefs about learning.

Learning is best facilitated when there is a willing student, relevant content, and interaction with peers and an instructor. For any subject to be meaningful to a student, she or he will need to create meaning from interactions with the content and others. For this reason, I believe that learning is best facilitated by constructivist principles such as working with ill-structured, authentic problems, working with others to see and comprehend multiple perspectives, and by making time to reflect on learning. Interaction with peers is an opportunity to socially negotiate a student's understanding in concert with others. As students learn about a topic and are allowed to discuss it with others, that interaction allows them to develop their own understanding, see others' perspectives, and to use those perspectives to deepen their own comprehension (Driscoll, 2000). Allowing them to then to develop their own ideas and defend them using what evidence they can marshal permits them to think more deeply about the topic than they could have on their own.

I have taught various Earth science courses for the past seven years in both online and traditional face-to-face modalities. All of my teaching experience has been at the post-secondary level with both traditional and non-traditional students. In particular, my experiences with non-traditional students have informed my approach to teaching. Non-traditional students often have different, additional obligations compared to traditional-age students. They generally want what they learn to be clearly relevant to their lives or work (Ross-Gordon, 2011). With the subject matter I currently teach, the relevancy of geology to their lives is not always readily apparent. But I believe that everyone can gain a greater understanding of the Earth's processes and how

their lives interact with these processes. I believe a constructivist approach works well with non-traditional students because of the focus on real-world situations.

Because of this desire for relevancy, I teach Earth science courses with a focus on geological and meteorological hazards and I emphasize recent and/or local events. Every state in the United States has had at least one natural disaster with damages exceeding \$1 billion since 1980 (National Oceanic and Atmospheric Administration, 2014). Because everyone must decide where they are willing to live, it is valuable to understand the natural hazards present in any given area, the processes that create those hazards, and how people can best live with and mitigate those hazards. For example, we discuss the unique earthquake hazards posed by the Wasatch Front and because most of Utah's population is located near that fault, residents then have to make informed decisions about how to live with the earthquakes that will eventually occur.

I use Earth science as a way to help students learn to think critically. Often students have had science courses in the past that seemed to them to be a mere memorization of facts or processes with no chance to relate those facts or processes to their lives. In my courses, I want them to move beyond the recall of facts and to see the geologically-influenced problems we have through a variety of lenses. An example is the increased seismic activity in the past five years in Oklahoma - a topic we might examine in a geology or natural hazards course. Oklahoma averaged 1.6 earthquakes of magnitude 3.0 or higher annually until 2009 when the number started to increase rapidly (United States Geological Survey, 2013). In 2013, there were over 100 earthquakes of magnitude 3.0 or above in Oklahoma and there is ongoing research showing links between these earthquakes and waste-water injection related to hydrocarbon extraction (USGS, 2013). Oklahoma's recent seismic activity is then an opportunity to discuss hydrocarbon

formation in the geologic past, humanity's present reliance on hydrocarbons for energy, the processes we use to extract those hydrocarbons, and the consequences of those processes. By looking at current issues in Earth science and discussing them with their peers, students can develop the ability to understand the interaction of scientific and social issues. A well-designed science course can equip them with the tools they need to critically evaluate the vast amount of scientific information and misinformation they are presented with.

In the Earth sciences, the ultimate teacher is the Earth and I work with my students so they can interact with the Earth physically, where feasible, and virtually, when physical interaction is not feasible. One maxim repeated in geology and credited to Eldridge Moores is that "the eye seldom sees what the mind does not anticipate" (McPhee, p. 488). For the students' eyes to see what is happening in the real world while on a field trip, she or he is going to have to bring to the field a mind that is trained in the possibilities that might be seen. Field trips are an instantiation of one level of Dale's Cone of Experience and are a way to have what he calls "direct, purposeful experiences" (Dale, 1946). I often allow students to wander while on a field trip, alone or in small groups, and so they can direct their attention to the geologic features that interest them most. I then ask them about what they are observing and what initial conclusions they may be drawing about the processes at work in a given location. They have the opportunity to use evidence they have gathered to support their ideas and contemplate the views of others who are observing the same features. They can then retain their initial conclusions or alter them in the face of new evidence from their peers. The complexity of the Earth cannot be simplified so in the field, students interact with a messy, real-world situation and apply their understanding to it.

Lastly, I believe the constructivist principle of “reflexivity” is an attitude that can be fostered through careful instruction. As we discuss the principles of Earth science virtually or in person, each student can learn not only about the processes of the Earth but also about the processes of learning. He or she can learn to make observations, draw conclusions from those observations and by sharing them with others, strengthen his or her understanding. Each student can learn to think about the assumptions she or he makes about the world and by working with others, see the world from other perspectives. With careful coaching and guidance, I can help them to reflect on their learning and how they can think critically in situations outside the classroom.

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