

My Personal Journey into the Methods of Geoscience

Jennifer L. B. Anderson
Geoscience, Winona State University

It has been so interesting to plan for this workshop because over the last year I've really started reflecting on how the methods of geoscience differ from the other more "traditional" sciences. Perhaps the methods I use are too ingrained and I have never tried to tease them out and clearly identify them before. Perhaps it is because I started as a physicist and so I am familiar with the "scientific method" as it is "supposed" to be. Perhaps it is because my primary method used for my PhD is experimentation and so I didn't veer so far from the "traditional scientific methods." Preparing for this workshop has given me the opportunity to reflect on my own journey. It has been interesting to realize how I struggled with the "methods of geoscience" as a student and professor myself. Even more interesting will be how I decide to reflect my journey and my new understanding in my courses.

I started my college life as an astrophysics/physics major where I loved lectures filled with equations and tidy problem sets. As a sophomore, I realized that my passion in astrophysics was really for the planets and so I was pointed toward the Geology and Geophysics department. I took my first introductory geology course and was completely hooked. And so I became a geophysics major.

I remember sitting in my first geology-major course and listening to the professor. She was talking about really interesting things as she leaned against the front table. I thought – "Wow! This is so neat! I wonder when she will start to lecture?" And then I looked around at my classmates who were scribbling furiously as she spoke and I realized that geologists didn't write equations on the board, that I would have to learn from "stories" and the spoken word (not to belittle the field – I believe that my principal job as a geologist is to "tell stories about the Earth"). I bought a geology dictionary to help me with the vocabulary I needed in this new field. Indeed, I felt lost many times that first semester, as though I had entered a foreign country where I didn't speak the language or know the customs. This was my first indication that geology was different than my physics and math courses, my introduction to the "methods of geoscience." Today I can look back and realize that I was not prepared by any of my K-12 or physics background to recognize the science methods behind geology. I didn't even know how to take notes!

But my fascination with geoscience topics pulled me through this first difficult semester and I became indoctrinated into the methods of geoscience through my courses, professors, fellow students, field work, and research projects. I went to graduate school to become a planetary geologist and specialized in experimental impact cratering. While I still used the “typical” methods of experimentation, mathematical models, and data analysis, I was also learning how to interpret planetary surfaces from orbit, how to use what we know of the Earth to inform our understanding of other bodies in our solar system, and how to “do science” and “figure stuff out” from millions of miles of away. Again, looking back at it, I feel that I was quietly indoctrinated and that the new methods were never explicitly explained or defended.

After graduation, I took a position in a small Geoscience department at Winona State University, a primarily undergraduate institution. The Geoscience department and its classes were very field-based and then in I walk – an experimental planetary geologist. While I had excellent field courses and experiences in both college and graduate school, I did not have direct research experience in the field and so I again experienced some of the differences inherent in the methods of geoscience. But this time, I was trying to convince Geology majors that experiments (and mathematics) were applicable to geoscience research. The majority of geoscience undergraduates at all levels, in my experience, primarily want to go outside and do field work. I had already noticed that geoscience was considered somewhat of a “less scientific” field by other scientists and the general public. Suddenly I was dealing with science majors who did not want to “do math,” who seemed confused by a geoscientist who principally did experiments. In the other direction, I have been working hard to adapt my research to be more field-oriented and so I found myself again learning about the methods of geoscience as I work with my students and colleagues in the field to interpret local impact-crater related deposits.

Finally, I also work with pre-service elementary education majors, teaching in their inquiry-based, interdisciplinary science content courses. As a geophysicist, I teach in both courses physics/chemistry and Earth/life science. Over the past year I have been thinking more and more about the differences between the methods of science. In these science content courses, we talk extensively about how experiments are done in the physics & chemistry course. But we don’t cover the methods of geoscience in the second semester Earth & life science course. Upon reflection, it is obvious to me that we need to be more explicit in our discussions of this in both classes (also because I think that biologists share some of our methods).

I currently feel at a cross-road in how I teach the methods of geoscience in many of my classes. I look forward to learning more from all of the participants at this workshop about the methods of geoscience and how I can help my students experience and understand these methods more fully. As I have reflected upon my own journey into geoscience, I will be able to share my experiences with my students as I help them to become familiar with these methods. I think that the content of this workshop will affect most of my courses. I will bring back these ideas to my Geoscience colleagues and my colleagues in the Science Education courses. I look forward to helping illuminate the methods of geoscience with general-education students, geoscience majors, Earth science teaching majors, and elementary education majors.