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Teaching Statement

Classroom Philosophy: Do more than Lecture

"Never let schooling get in the way of your education" is a saying attributed to Mark Twain. Much research has been done on why students leave undergraduate schooling in science. The emphasis on memorization, the mechanics of the "how" instead of the "why", and technique over discussion are major turn-offs (1). I have been a student all my life; I can confirm this. I struggle at math, and math teachers do not understand students who "don't get math" since they always got it themselves. How can teachers do better? Instructors need to anticipate common misconceptions, explain the relevance of the subject in a different scenarios, and use other methods than a chalkboard to accomplish the same end goal (2). This can include hands on work, software, lab, experiments, outdoor field methods, or project based learning. In other words, exclusive lecturing is not how students learn. Perhaps if Mark Twain had considered this, he would have had second thoughts.

Some specific examples of learning outside of lecture and class discussion:

- I struggled to learn the finite element method in the classroom. We were trying to model flux, an example of a classical "flow" problem. To a math teacher, writing a one dimensional case on the chalkboard is the simplest way to explain it. To a non-math person, modelling flux in the x direction is abstract, and has no meaningful physical basis. Working in three dimensions can actually be simpler as the concept can be imagined in real life. For my case, it was software that taught me finite elements. After jumping into 3D scenarios, I feel very comfortable with the mathematical model. This was something that conventional classroom methods was not able to teach me.

- Stepping outside to sketch an outcrop or concept will force you to organize and think about what is in front of you. Looking at a picture in a powerpoint that was taken with a camera does not force you to put the item in context with its surroundings. It's okay that my drawing does not look like the Sistine Chapel ceiling.

- When measuring anything in the laboratory, such as the wave velocity of a rock plug, it is easy to get ten different measurements on the same sample. This is still scientifically valid! Now, when I read other reports that include similar measurements, I put error bars in context for such complex measurements.

It is important to modernize lessons as time passes. There are too many scenarios where students are still required to do tedious work such as solving matrices by hand, when everybody in industry or academia uses a computer. Professors seem to think it builds character to use the same method they did, even if it is outdated. Students no longer need to carry trigonometry flashcards as hand calculators have replaced them, so why must they be trained to solve equations in a power outage? This type of teaching method is viewed as a symptom of "weed-out" mentality, that has become systemic in some departments (3). At best, it is lazy teaching; at worst it can be considered academic hazing.

Teaching Philosophy: Scientific Literacy

In a world of fake news, it has become difficult to know what is true anymore. Have you ever noticed that when you read or watch the news, if it is a subject that you are intimately familiar with, it is often filled with mistakes? I wonder about how much is incorrect when it comes to subjects I am less familiar with. There is a misconception that the scientific method allows us to ignore research we disagree with under the guise of skepticism, but this is incorrect. It is important to get science (and news) from different outlets, and discuss it critically. This is my teaching philosophy: learn from multiple sources, and remain skeptical. Thinking back myself, it is hard to remember the specific facts I memorized in my classes, but I did learn to become scientifically literate.

I believe that scientific literacy cannot exist without an open mind to fields outside of your own. New technology in someone else's field has the potential to revolutionize mine. For example, the use of remote sensing to count trees has become useful for porphyry copper exploration; video games have led to cheap scientific work stations; oil exploration has advanced seismology and the study of the evolution of the continents. Being broadly aware of other fields allows me to incorporate interests of a variety of students in class. Not everyone will find my favourite

subjects as enjoyable as I do. Students will learn well when they regard the subject as relevant to their own lives (4). A good teacher can incorporate the favourite subjects or hobbies of their students. In field as broad as geoscience, finding an aspect to make relatable to others has yet to be a challenge.

Experience

It has been a privilege to have the opportunities I have had engaging students to date. I have been working with GeoFORCE, a program to help local high school students from disadvantaged backgrounds go to university. The program relies heavily on mentorship, and showing students that college leads to more than debt and unemployment. This is a time when I can help students remain skeptical, and not believe everything they hear the first time without further analysis. A main goal of the program is to impart what inspires us, as students, as well as how we live day to day on campus. This is when it is important to be aware of fields outside your own, as I can tie in the interests and hobbies of students to geoscience. My role has been as an educational coach (similar to a teaching assistant) for GeoFORCE summer academies, mentoring students during the year, and assisting in design of the curriculum and pedagogy for future summer academies (see pedagogy work I have co-authored in a push for project based learning: 5; 6). I can draw on academic teaching experience as a teaching assistant since 2013 for courses of engineering, mining, geology, geophysics, and field camp. I am comfortable teaching a broad array of courses relating to these subjects. I have also enjoyed non academic teaching as a ski instructor and sailing instructor.Hopefully it is evident from my long history of teaching that I have been signing up to educate because I want to, and not because I have to.

Conclusion

It is unfortunate, but true, that many undergraduate professors hate teaching, but show up as a required part of their research program. This type of professor can do a disservice to the entire field. They may not show enthusiasm, learn the names of students, or update lectures with advances in the science. Their class consists of lectures each week, and their grading is done with multiple choice scantrons for an exam that was written ten years ago. I have made it a goal to be as different as I can from this type of professor. I do not see teaching as a required chore. I enjoy watching students become motivated, diversifying their education, and fostering critical discussion in a subject that I am passionate about myself.

References

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[5] K. Ellins, D. Thomas, D. Campos, S. W. George, **Eric Goldfarb**, A. Kotowski, L. McCall, N. Soltis, E. Stocks, and V. Wright, "Using the star legacy cycle to promote student-centered field learning in geoforce and stemforce 12th grade summer academies," in *GSA Annual Meeting Abstracts*, Geological Society of America, 2018.

[6] D. Thomas, K. Ellins, D. Campos, S. W. George, **Eric Goldfarb**, W. Kim, A. Kotowski, L. McCall, and V. Wright, "Student exploration of geoscience careers through challenge-based field learning in geoforce and stemforce 12th grade summer academies," in *GSA Annual Meeting Abstracts*, Geological Society of America, 2018.