Teaching philosophy

As an instructor, I want my students to develop three essential learning skills. These skills include establishing a strong foundation of the subject, fostering critical thinking skills, and gaining transferable skills to apply to future industrial and academic pursuits. A comfortable, inclusive, and supportive environment for students is the fundamental key to cultivate this natural trajectory of the learning process. My broader goals are to encourage students to know about surface processes, quantify at what rate they shape our environment, and conserve natural resources for future generations. I want to achieve these goals by stimulating a critical thought process that includes introducing arguments and counterarguments. In playing this mind game with my students, I see my students grow in synthesizing information and analyzing it critically. As a graduate student in a thought stimulating learning environment, I have gained these skills. Ultimately, these skills help me evolve as an instructor on an international platform, and I am very excited to transfer these experiences to future generations.

To address the first learning objective, I would like to design geology courses that are more interactive and immersive, typically more integrated/active learning experiences. The aim is to develop a strong foundation for the subject matter based on real-life experiences that students can easily relate to in their lives. For example, I plan to incorporate virtual reality (VR) and drone-based structure from motion (SfM) photogrammetry as part of my teaching. These technological innovations are inexpensive, interactive, intuitive, and give a sense of the 3D scale of real-world geology. Recent studies on pedagogy further support the benefits to the *Virtual Reality Learning Environments* (*VRLEs*) in the classrooms [1]. I therefore plan to make geology courses more exciting, meaningful, and technologically innovative by synthesizing Dalgarno and Lee's framework [2] of *3D VRLEs* and Mayes and Fowler's framework [3] of pedagogical immersion. With the growing number of useful geoscience apps (e.g., Meteo VR), platforms (e.g., Google VR), and 360° cameras, designing pedagogically sound 3D *VRLE* courses is possible and affordable. At the advanced level, I plan to introduce coding using Python, R, and MATLAB to improve students' quantitative modeling capabilities and enhance student research.

In addition, I aim to promote a student-oriented research program to improve the quality of student learning within the department. I will consider my student body's diversity and encourage my students, specifically minority, female, and first-generation students, to actively participate in field and laboratory research and training. At the UCLA-Geochronology lab, I have mentored three undergraduate and two graduate students and helped them prepare and succeed in their future professional pursuits.

Additionally, since geology is a field-intensive discipline that requires a rigorous understanding of real-world geology beyond the classrooms, field trips are essential and complementary part of my teaching. As an instructor and TA, I already lead undergraduate students on several field trips, nationally and internationally, and thereby exposing them to the natural laboratory of physical processes. I plan to organize several field trips as part of my courses. However, if my student body includes any student with disabilities, I would like to restructure my field trips to make them accessible to all (e.g., project www.TheIAGD.org).

In my undergraduate courses, e.g., GLY 110: *The Face of the Earth with Lab* and GLY 120: *This Dangerous Earth* at Northern Kentucky University, my learning objective was to simplify and reduce the entire lecture into small segments. My teaching framework includes a blended learning strategy, i.e., access to short (5–10 mins) online videos about the topic a few days before the class. Integrated with these video lectures are 15 to 20 short reading quizzes, which are due at the beginning of the class. This framework lays the groundwork and motivates students to read the chapter(s) for the upcoming lecture. This strategy also allows me to have more active learning, i.e., discussions, recitations, and group activities, in the class. In addition, I use apps like *Kahoot* to encourage students to participate in class discussions. This method also

enables me to keep track of the student's attendance. I found this active learning strategy much helpful to my students. Introducing 3D *VRLEs* to this dynamic learning framework would likely improve my teaching skills and help my students obtain a solid understanding of earth sciences and the physics behind the controlling factors.

The second essential learning objective that is to foster critical thinking skills, builds on the first objective. According to my understanding, this is the most crucial skill to develop as a student to apply their knowledge beyond small claims to examine larger scientific mores. This is particularly true for the underserved student population's success, which often incorporates African Americans, Latinx, and Native Americans. Introducing a topic to students logically during my short lectures is the first aim of my teaching. A counter-logical argument usually follows this. It is a thought-provocative process and attracts student's attention immediately to discuss the issue. Often, I look for opportunities when students' opinions differ from each other. This is always the most exciting time for the entire class when students are involved in a mind game, often in inclusive groups. They try to beat their opponents based on logic and previous discussions. Instead of opposing or modifying their arguments, I like to provide additional counterarguments to a point to push them to think critically about the problem. For example, the usage of graphics is a very effective method to attract students to the discussion. During the *'GEOL 1002: Surface Processes'* course at the University of Cincinnati on erosion, I started the conversation by showing an advertisement for steakburgers by the nearby restaurant of the UC campus, popular among students. Students quickly jumped into the discussion about how much they like the food of the restaurant. Immediately followed by that discussion, a graphic from South America's Amazon forest where burgers are eating trees, an accelerated deforestation process, was introduced. This graphic was so impactful that the students started thinking critically about increased cattle cultivation, employment, and economic demand vs. deforestation, enhanced CO_2 emission, changes in hydrological cycles, and increased soil erosion, which we had explored in the previous classes. The students realized that everything ends up integrated with the ongoing accelerated soil erosion and desertification in many areas of the world and is not sustainable. This whole discussion process with graphics was very encouraging and satisfying.

The third learning objective of my teaching philosophy is to prepare students to acquire transferable skills relevant to day-to-day applications and their future research endeavors. My motto is to *help me to help you.* I like to challenge my students. Therefore, my course structure includes continuous critical assessments using reading materials, collaborative laboratory exercises, writing, and quantitative assignments, using modern technologies to collect data, and a detailed presentable group project in the format of a poster, a PowerPoint, and a video. This active learning strategy expands student's vocabulary, writing/publishing, and other soft skills and is crucial to their long-term success.

As an instructor, I make a conscious effort to cultivate students' curiosity and keep the subject matter exciting and engaging. I welcome my students to help them feel comfortable, inclusive and supported inside and outside the classrooms. I believe that my teaching approach, research, and emphasis on these three learning objectives will guide me to develop and improve introductory and upper-level Geology and Environmental Science courses designed for future generations and help achieve your institute's mission.

References:

[1] Huang, H., Rauch, U., Liaw, S. 2010. Investigating learners' attitudes toward virtual reality learning environments: Based on a constructivist approach. *Comp. & edu. 55*, 1171–1182.

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[3] Fowler, C. 2014. Virtual reality and learning: Where is the pedagogy? *Brit. J. of Edu. Tech. 46,* 412–422.