

Teaching Statement

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I always envision teaching and learning to be highly interactive and complementary. Teaching is not a one-way path where instructors infuse knowledge into students' brains. Instead, it is an interactive process between instructors and students. Active communication plays a crucial role in effective teaching and learning. While students are learning new knowledge, instructors are also learning from the students about communication and education. My teaching approach has always focused on how to engage my students and how to help them understand.

Interaction and Involvement with Students

I was the instructor for GEOG 365, *Introduction to GIS Programming*, a mandatory course involving programming and statistical analysis; and GEOG 160 WEB, *Mapping Our Changing World*, a broad perspective course on geographic information science and related technologies.

Students do not usually come to classes full of curiosity and passion. Some of them were not confident at statistics, and others were new to programming in geography. I believe it was my responsibility to encourage them and facilitate their learning.

To better guide them throughout the course, in GEOG 365, I categorized key concepts from the class into three zones, namely the comfort zone, the learning zone, and the panic zone, based on the difficulty. If a student is having a hard time understanding a concept in the comfort zone, for example, geographic coordinates, this is an alarm for me. I would help the student identify possibly missing background knowledge and advise them to fill the knowledge gap before moving onto the next task. Concepts in the learning zone are essential to the class and should be mastered. For instance, students generally understand map projections but fail at using a programming language to carry out map re-projection. Since this was an essential component of the class, I included it in the learning zone indicating that students should spend a fair amount of time understanding both the theory and the practical details. Finally, I classified implementing a function into the panic zone. Concepts in the panic zones usually take longer to master and even to appreciate their importance. Students usually panic when asked to write functions from scratch. When errors occur, I still encourage them to persist and not give up on the task. Meanwhile, since it is beyond the scope of the class, I hope to alleviate their worry by being clear on the expectation.

I found these practices extremely useful when communicating with students. However, these practices become less effective with a larger class because students might come from different departments, and their backgrounds can be vastly different. Some students might already be familiar with the content and feel under-challenged while others are struggling. To address this issue, I usually give an entry quiz during the first week. I believe quizzes are effective in showing course expectations and requirements. They also reflect students' capabilities and their general interests. This information can be helpful for instructors to adapt the lectures to a specific group. Although quizzes during the first week can spread a sense of anxiety among students, I believe it is better earlier, rather than later, to expose potential problems so that students can choose accordingly and instructors can act promptly.

Visualizing Knowledge

I value students' feedback, and I often use it to measure how effective my teaching is. However, my teaching will not be effective if the knowledge I am presenting is unclear or if students do not know the learning objectives from the beginning. Therefore, besides simply demonstrating knowledge, I also tend to *visualize* knowledge and show students the exact path to building understanding.

In GEOG 160 WEB, one of the topics is map projection. Map projections are designed with different purposes to preserve angles, sizes, or distances. Instead of merely memorizing definitions, I encourage students to compare various projections and identify as many differences as possible. I encourage students to discuss projections and the applications with peers to fact check their understanding. A network of knowledge, contrary to isolated information, usually indicates a deeper understanding of the subject and offers useful insight when making a decision.

In a programming course like GEOG 365, students usually do well at recalling the definition for a data structure but would then struggle at choosing the correct data structure to solve a specific problem. I call this situation *the isolation of information*. Students, at this stage, can memorize the information, but pieces of information are stored as “islands”. They need help to build connections between “islands” and construct a mental knowledge map. Mind maps, in this case, help to convey such information and show how it should be organized. For example, students usually know what a matrix and a data frame are in the R programming language. But to answer such a question, “which data structure is used to read a CSV file”, students need to see the connection that data frames are more powerful than matrices in that data frames can have columns in different types. This is exactly the case in CSV files since we might have a name column in characters and an age column in numbers. In this case, a Venn diagram is a good technique to visualize the similarities and distinctions of different concepts. Seeing the connections between knowledge is the key to this problem, and I hope to demonstrate how they can build their connections by visualizing knowledge.

Instructors should not stop at simply demonstrating knowledge. In my opinion, instructors should *visualize* knowledge. This idea originates from the book of Ambrose et al. (2010) titled, *How learning works* and I have found it effective in practice. While students are unique in their own way and have different learning approaches, instructors can develop these mental knowledge maps together with students and demonstrate the path to understanding.

Mentoring

I have mentored three undergraduate students and one master student during my doctoral study. I have been actively working with one undergraduate student for two years now, and our collaborative work has led to a research manuscript that is to be submitted. We established a professional relationship based on mutual respect and good communication, and I have found engagement of the student the key to achieving valuable progress.

David Lynch once wrote, “*a path is formed by laying one stone at a time*”. I keep my students involved so that they do not lose track, and I show them how to organize information to distill knowledge. Being a student, I was always overwhelmed by the amount of knowledge to learn and the sheer number of tasks to complete. Now, as an instructor, I am passionate about guiding students and helping them place “one stone at a time”. I will be learning together with my students.