Philosophy of Teaching and Learning
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During the last several years I have had the privilege of teaching mathematics majors, computer science majors and majors who simply had to satisfy a program requirement by successfully completing my mathematics courses. In this brief exposition, I present how I teach and how I hope students learning from my teaching style. It is my express desire that the longer I teach the more I may effectively adjust my teaching style to match as many learning styles as possible, while still remaining true to the rigor of the content.

My primary goal as a mathematics instructor is to teach mathematical thinking. Now, mathematical thinking is by default critical thinking, and critical thinking is part of the Athens State University Quality Enhancement Plan. In our Mathematics Department we actively support the QEP, and we promoted mathematical thinking far in advance of its implementation. Although Benjamin Bloom's Taxonomy is a foundation component for the QEP (as I perceive it), I find there are other more recent taxonomies specific to mathematical cognition which benefit my teaching and help me to understand more about my students' mathematical learning processes. A few such taxonomies are Avital and Shettleworth (practically the oldest), the SAGM Taxonomy, the National Association of Educational Progress (NAEP) Taxonomy, the Stein Taxonomy and the Porter Taxonomy. When preparing lessons or assessments, I tend to subscribe to Porter's Taxonomy of mathematical thinking. In addition, I partition these stages of thinking into lower-order thinking (LOT) skills and higher-order thinking (HOT). These levels of learning include:

1. Memorization of facts, definitions or routine procedures (LOT)

2. Performance of procedures—such as computations with matrices or completing truth tables in support of a logical proposition (LOT)

3. Demonstration of the comprehension of mathematical ideas—being able to compare and contrast Euclidean and non-Euclidean geometries (LOT/HOT)

4. Solving non-routine problems and making connections—developing relationships between models, such as between vectors in $\mathbb{R}^2$ with vector addition and scalar multiplication and the set of matrices of order 2 with matrix addition and scalar multiplication. I attempt to model meaning making and connection building when possible (HOT).

5. Conjecturing, making generalizations and proving—at the higher levels of mathematics, this is the core of mathematical thinking; being able to develop, investigate and prove mathematical conjectures. My personal job description is to model this behavior in class as often as possible. Mathematical creativity seems to flourish at this level. More recently I have begun to teach students about identifying faulty arguments by having my students view other students from across the country attempt to prove relevant assertions (HOT).

Generally I conform to the Chickering and Gamson model for encouraging active learning. This model was initially published over two decades ago (sometimes ancient for researchers, but this was a classical article) in the 1987 ***Bulletin of the American Association of Higher Education*** and I happened upon it at the Iowa State University Center for Excellence in Teaching website. Now, having attended a national meeting of the AAHE in 2000, I know that this model for encouraging active learning was "cutting-edge" and controversial as late as the eighties and the nineties. Nevertheless, I still apply my interpretation of the seven strategies for encouraging active learning:

1. <u>Encourage contact</u> between the students and myself (or the instructor) and the students and each other—I try to have late afternoon office hours for those who are employed first or late shifts to discuss their problems; I support e-mailing and perhaps at some point I will attempt to "blog" to persuade students to feed off of each other's thoughts; it's a little difficult to answer questions by phone, but I do not discourage this. Contact with students affords me a conduit through which I inform students that I really care about their success while in my class and in the future.

2. <u>Promote active learning</u>—this does not preclude taking notes, but active questioning of the students is absolutely paramount for the instructor to analyze where my students are in the stages of mathematical thinking (See below). I strongly promote writing and demonstrate apt mathematical writing in class. Occasionally, I assign problems either for paired work together in class or as an external assignment that requires establishing connections among content topics previously covered and topics at hand. Furthermore, I support personal reflections with respect to mathematics experiences. My research in this area involves my students watching other students develop proofs and provokes them to critically think about the proof process and to relate to others' encounters.

3. <u>Support cooperative learning</u>—I allow students some time to work together on targeted problems in class; those problems which are typically difficult for some to understand the first time on one's own; for example, proof by contradiction in Discrete Mathematics or solving an eigenvector problem in Linear Algebra. Assessment of these brief, but informative, oral and written activities allows me to peer into the minds of my students for but a brief moment; to get into their zone of proximal development. Consequential learning emerges when I facilitate over small groups rather than act as the purveyor of all the mathematical wisdom. Students gain confidence in their abilities when they discover some ideas for themselves. This is a constructivist philosophy, and I know that I cannot teach constructively all the time, but when I create an exercise that lends itself to it, I make an attempt to incorporate it.

4. <u>Provide prompt and useful feedback</u>—I try to return all work within a week's time and when possible present feedback applicable for solving problems in the future. Applicable feedback may take the form of general praise or describing an error that students might typically make. However, I find this a bit more challenging when teaching blended classes, because of the

asynchronous nature of my courses. Of course, I make extensive use of e-mail and will attempt Wimba when possible to answer questions synchronously.

5. Allocate enough time to complete assignments—Not only did experience help me to determine appropriate time allocation, but to provide a variety of assessments ranging from objective to free-response and a variety of types ranging from short writing assignments or quizzes to projects.

6. Maintain high expectations—To me this is a characterization I would like students to acquire from me and pass on to their students or future fellow employees. If we expect the best from others we might get good, or perhaps, great results. If we do not, we might get no results at all.

7. Appreciate a variety of learning styles—There are a number of basic learning styles ranging from visual to kinetic, but what was not addressed in the seven strategies was students with disabilities. Although I do not have many students requiring accommodations for a physical or learning disability, compliance to the request of the Student Disabilities Office presents no problem when special arrangements are suggested.

Teaching is extremely important and enjoyable to me, but my students' learning is more so. The magnitude of their learning indicates the strength of my teaching. My intention is that my courses are learning-centered (whether asynchronous-blended or traditional), where I have provided the benefit of resources to help students learn more about their mathematics content from me, from each other and independently. Moreover, I am a proponent of lifelong learning exemplified by faculty consultation and collaboration, and by keeping current with trends in my mathematical areas of interest and mathematics education. This clinical part of my position only serves to make me a better student, instructor, advisor, supervisor and fellow colleague.