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Statement of Teaching Philosophy

My vocation to education has two inextricably linked parts: *learning*, gaining depth in my subject area and breadth across the whole spectrum of intellectual life; and *teaching*, leading students into a life in which they learn with disciplined creativity and have a taste for the pleasure of asking and answering important questions about the world. Accordingly, my philosophy of *teaching* follows my ideas about how people *learn*. From my experiences, I can point to six basic observations about how people learn that shape my teaching. These observations have held true in my experiences not only as a college professor, but also in other teaching environments (such as my past work as a tutor for middle school children with ADD/ADHD and as a literacy tutor for adult learners with brain injuries) and even as I teach the ABC's to my preschool-aged daughters.

1. We learn because we have questions. Before any person can learn something, that person must have some reason for learning – some honest, significant question which renders the subject worthy of attention. Sometimes such questions are practical, sometimes purely aesthetic or asked out of mere curiosity. But learning does not begin unless, and until, those questions are formed.

How does this translate into teaching? Before a new item of content is covered in my classes, students first come to terms the questions that make that content necessary. For example, at the beginning of a calculus lesson on rates of change, we first examine two related quantities, such as the price of oil and the price of gas, and a graph relating them. Then we ask: *How fast is the price of gas changing when oil costs $120 per barrel?* As students try to answer this question with precision, the fact that the slope of a tangent line measure this rate emerges, and the need for a way to measure it becomes clear and sensible.

2. We learn by interacting with the world around us. No learning takes place by observation alone but by observation together with disciplined work with the concept under study, experimenting and conjecturing on how the concepts operate. This is true no less in mathematics than it is in music or athletics, where practice is essential for mastery. Each concept must be made concrete through interacting with it, leading to an internalized and deep understanding of the concept's meaning and function.

How does this translate into teaching? Active learning is essential to master a subject, and therefore active learning is a core element of my teaching. For example, students in my Quantitative Reasoning course use a real estate web site to gather data which they then use to calculate mortgage payments. Students in my Topics in Geometry course use dynamic geometry software to investigate constructions and formulate conjectures which they then prove. Students in my Differential Equations class use computer algebra systems and spreadsheets to solve dynamical systems in finance and biology. These activities are often done in groups, where students can learn from each other, and using computer technology as a tool for interaction.

3. We learn best when we are challenged. Students always work to the level of expectation that is set for them. Low expectations and unchallenging work will yield languid and uninspired work, even among "good students". But when students are challenged and held to high standards, their work will rise to the challenge and often surprise us with its quality. All students deserve challenges to which they can rise.

How does this translate into teaching? I design the goals and assessments in my courses – the "low-level" ones just as much as the upper-division ones – with a high view of student abilities. Assessed work pushes students not only to master the basic content but also to use it in creative and challenging ways. For example, one problem set in calculus asks students not only to calculate a derivative but to do so in multiple ways using a model that they have created with a spreadsheet, compare the results, interpret the meaning of the results in context, and argue which derivative calculation is the most realistic. My upper-level courses also feature a significant amount of creative work. For example, my Modern Algebra course relies on students working out proofs at the board daily for class discussion.

4. We learn for life when we are taught how to learn. If a student is taught only content, learning takes place no faster than the rate at which the professor teaches. But if a student is taught not only content

but process (the methodologies by which new knowledge is generated) and how to solve problems in general, then the student can learn on his or her own and therefore continue to learn for the rest of his or her life.

How does this translate into teaching? Since my classes feature work that asks much of students, I build in instruction on the process and psychology of problem-solving with a view towards making students confident, self-sufficient learners. I designed and teach a course (Methods of Problem Solving) for mathematics majors which trains students on strategies for solving problems, particularly those involving proof. I include excerpts from this course elsewhere, especially in and below calculus, where students often struggle with solving problems. I give students many opportunities to interact with me one-on-one or in small groups, for example through office hours or instant messaging, where this instruction can be better personalized.

5. We learn at least as much outside the classroom as we do inside. The life of learning truly takes hold in a person's life when learning is seen as part of the fabric of everyday life. The learning experience for students should include numerous, inviting venues for learning outside the classroom. Every moment and location should be seen as a time and a place for learning.

How does this translate into teaching? I create "back-channel" conversations on mathematics and the life of the mind in several ways. Through my blog and through microblogging, I am able to initiate conversations involving not only my students and me but also interested readers from all over the world. (Links to my blog and other web activities can be found at my website, `www.roberttalbert.net`.) I have helped develop off-campus and after-hours opportunities for students to interact with mathematics and technical professionals. Also, I like to let my personal life be accessible to students – through sharing homemade food or kid stories – to let students know that being a lifelong learner need not come at the expense of a fruitful personal life.

6. We enjoy learning things. When we set out to answer a question we believe is important, and when through hard work and perseverance we arrives at an answer and a host of related questions, it *feels good*. When we learn, we have accessed that which makes us truly human: the ability to combine our thoughts and memories together with what we learn from the world around us to create something new.

How does this translate into teaching? In the end, my level of enthusiasm makes or breaks the learning experience for students. I am genuinely enthusiastic about learning and about mathematics, and I believe I have a responsibility to model a life of the mind that takes genuine pleasure in learning things and shares that pleasure unabashedly with my students. I try to transmit that pleasure and enthusiasm in each class.

Teaching is not only a great pleasure but also an awesome and exacting responsibility. I continue to improve myself as an educator through professional development programs such as the MAA's Project NExT (of which I am a fellow), through workshops and conferences, and through independent reading and writing. I also shape my scholarly activities with a view towards improving my teaching. For example, my research in cryptography has led to curricular units in Modern Algebra and the design of an interdisciplinary course called "Cryptography, Privacy, and Leadership"; and my work in using Web 2.0 technologies has helped in designing online group course projects. For more information about my scholarship and how I try to make it accessible and interesting to students, please see my *Statement of Scholarship*.