A Philosophy of the Teaching of Mathematics

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"Awe is the beginning of wisdom," it has been said by someone who was very wise.

I will never forget the time, while working as a summer park "interpreter" (ranger) at Seashore State Park in Virginia Beach and learning to lead an interpretive beach walk, I opened the egg case of a channel whelk (a type of marine snail) for the first time. When I was growing up, our family had traveled to the beach for vacation nearly every summer. I had seen hundreds of such egg cases. But never before had I opened one of the leathery pouches. From that one pouch on a strand of twenty or thirty pouches, spilled out about two dozen or so "eggs," each egg a fully formed channel whelk in miniature, about 1 mm in length. The sense of wonder in that totally unexpected discovery crystallized something for me that lies at the core, I believe, of many teachable moments—the awakening of a sense of wonder. Fundamentally then, I believe that the greatest gift any teacher can bestow is to nurture or awaken in the student a sense of awe in the face of the mystery of the universe, because a healthy sense of wonder, more than anything else, will motivate a lifetime of learning.

I have chosen to study and teach mathematics principally because mathematics is a deep vein of awe. Discovering the fractal pattern in the bifurcation diagram of the logistic map is as awe-inspiring as opening an egg pouch of a channel whelk. Where does mathematics come from? Why does it so precisely describe the orbits of the planets, the breaking of a wave, or the rich timbre of an oboe? How would our world be different without mathematics? Some pretty deep thinkers, including Einstein, have pondered these questions, and they remain essentially unanswered.

In all mathematics courses, I attempt to foster certain generic types of learning: 1) appreciation for the beauty, power, and versatility of mathematics, 2) complex thinking processes such as those involved in non-trivial problem solving, 3) clear, concise, and logical argument, such as that involved in constructing proofs, 4) awareness of and proficiency in the practical applications of mathematics, 5) and a sense of the place and contribution of mathematics in history and culture.

No two persons are alike, and no two students learn in exactly the same way. Consequently, insofar as possible, I try to present new concepts in a variety of ways, so that each student will encounter new material in a form most compatible with his/her primary learning style: verbally, geometrically, analytically, and numerically. I also try to incorporate a variety of teaching methods including lectures, discussions, group work, assignments of routine problems for developing and enhancing manipulative skills, and assignments of challenging problems for developing complex-thinking skills. Believing education to be more a process of "drawing out" rather than "filling up" (as its Latin root *educare=to draw out* would suggest), I try to use Socratic questioning as much as possible when lecturing so that mathematical development flows as naturally as possible.

Because no two students learn in exactly the same way, in evaluating student performance, I incorporate a variety of assessment tools: hour tests and final exam, quizzes, projects, computer laboratory assignments, the sampling of homework, self-evaluation activities, and brief writing assignments. In upper-level courses, reports and/or presentations are required and scored according to pre-disclosed rubrics.