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Teaching Statement

I believe in being clever, but I dislike the word "trick". Every time I hear a prof say "we use the following trick...", I wince. A trick is something a student feels they must simply memorize; the word implies we probably won't ever understand what's *really* going on in a problem. This is the opposite of what math education should be!

Being clever, on the other hand, means that the problem *can* be conquered – that there is order. We may have to roll up our sleeves and get dirty, we may end up trying a dozen dead ends, and we may need to get lucky. But when we find that approach that works, we'll remember it for a long, long time. A simple shift in vocabulary – "clever" versus "trick" – may seem small. But an hour's worth of little differences like these, class after class, can make the difference between a student gaining confidence in their abilities and a student slowly resigning in frustration. Going that extra inch to change a student's perspective is very important to me, and it's a good entree to my teaching philosophy.

I believe in conversation and group work. Brainteasers and games. Warm-ups and diversions. Students rarely master a foreign subject simply by sitting in lecture and transcribing formulas and rules. A good way to pull students away from regarding math as some Strange Immutable Set of Boxed Formulas is to show them how versatile and natural mathematical thinking is. Discussing the Monty Hall Problem, Colonel Blotto[1], Bridge-It, and other games – none of them containing an ounce of calculus – have been immensely helpful in establishing a lively classroom dynamic.

When I TA or teach for upper-level undergrad courses, I like to start by presenting a solution to a problem. Then I ask the students to read it over and decide how many errors it has (if any). We take a vote. I ask students to explain themselves: is the solution correct, slightly flawed, or super-*duper*-flawed? One well-chosen example problem can yield a dozen distinct opinions, and by hearing so many ideas students are encouraged to justify their internal reasoning.

Whereas students tend to accept everything their professor or TA writes on the board without judgment (and transcribe it into their notes verbatim), they tend to view their classmates' solutions with a healthy dose of skepticism. Every week (teaching or TA-ing) I have a few students write solutions on the board. Then they must explain their work to the class. I encourage all students to present at least once during the quarter, even if they haven't completely solved the problem or can only venture a guess. After a student presents, I ask the class to chime in. Does the solution pass muster? Could anything be said better? Are there other approaches?

[1] see the attached Colonel Blotto handout for the rules!

I use these presentations – discussions may last 5 minutes or longer for one problem – as a chance to gauge the class' understanding of the material, as well as to highlight the most important parts of the solution. (In short: it's almost never the answer, but the unmentioned jumps from one calculation to the next.) This gives me a chance to push the limits of their understanding; often I prod the class: "Why? Why is this true? What if I changed [IMPORTANT CONDITION] to [PROBLEM-DESTROYING ALTERNATIVE] ?"

I believe in the value of working one-on-one with students – that one of the best ways to learn a subject is to try to explain it to your classmate or instructor. I hope to have a chance to work with undergrads on research projects, to let them know what research is really like. I hope to work with high school students (and teachers) to have an impact on the way students in grade school view mathematics. To that end, I will be applying for a Project NExT fellowship for 2009-2010.

I believe in fostering mathematical interest amongst grade schoolers. I volunteer as an instructor at the San Diego Math Circle, and the past few years I have been the coach of the San Diego ARML team[2]. My love for math contests and gifted student programs comes from my own involvement with them from grade school (Mathcounts, AMC, ARML) through college (Putnam). I've taught at MOSP[3] and loved it. I've had the thrill of getting a round of applause from high school students at the end of a lecture – *in the summer*. These are the types of classes and activities that first got me hooked on mathematics. They wouldn't exist without the volunteer instructors and coaches who saw the value in going that extra distance.

My teaching philosophy is pretty simple: pull the class away from "Here: memorize these formulas." Go that extra inch whenever you can, and soon enough students stop asking why we bother studying [TOPIC X]. Understanding the material *makes* it worth studying.

If a student can't remember the Quotient Rule, so what? I get it wrong myself sometimes. But if that student can learn how to re-derive it[4] from the Chain and Power Rules? Success! Likewise, if a student can leave a calc class and have the basic reasoning behind a few concepts down, that's way better than a student who was able to successfully cram a bunch of rules into their head for the final exam.

This is how I approach teaching. Group activities and games; exploring and demystifying concepts; building students' confidence. Teaching students to be tenacious, to explore the problem, to think critically and trust their own reasoning. No tricks – this isn't magic. □

[2] American Regions Math League, an international math competition for high schoolers
[3] the Math Olympiad Summer Program
[4] which is what I usually do!