Panel Presentation
"Challenges in Undergraduate Education"
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Outline:
nationwide problems and long-term goals
local manifestations of problems and what we can do and accomplish now
creating a more inclusive and diverse community of math students

"The cognitive skills required to have a successful life in today's and tomorrow's society are immeasurably higher than they were in the past, and our public education is not currently good enough for the job." (Philippe Tondeur, former Division Director, NSF-DMS, personal interview)

When we as a nation choose to inadequately invest in education, we send our children a strong message: We don't highly value your education.

When we as a nation choose to inadequately invest in pure research, we send our children and the world a strong message: We don't highly value the pursuit of knowledge and understanding.

We see these choices reflected in the attitudes of our students. Not only are they coming to college less prepared than "back in the good ol' days," they have little love of learning.

"It takes a culture of learning to be a learner." (Brangwyn Foote, former AVC, CU-Boulder, personal interview)

As a kid, I was lucky; I grew up in what I call the aftermath of the Kennedy years, when our country publicly stated its commitment to education and knowledge, and it correspondingly invested public funds in education and research. I was fortunate enough to participate in a state-funded enhancement program for "smart" kids. Not all my classmates loved school, but they accepted the assertion that education is fundamentally important. Even if they didn't do what they should to get that education, they still knew it was a valued commodity.

What can we do to reinstate our nation's understanding that an educated population is critical for a healthy, productive society?

As something of an aside: I once heard the playwright Wendy Wasserstein say that when a country stops supporting art, it loses its soul. I believe that when a country stops adequately investing in education, it loses more than its soul.

So let me ask this again: How do we address the question I've posed?

The lazy answer is that we must change the politicians – either who they are or what they represent. But it is difficult for a politician to support educational funding when that person's constituents oppose this.

The problem of our nation's attitude toward education is deep, and a solution will not come overnight. Coasting on previous economic ease, I believe we have become a nation of apathy, where laziness of thought is too often tolerated, even expected, and sometimes applauded.

What can we do?

What opportunities do each of us have to address our concerns?

I'm a firm believer in grass-roots movements.

We need to create and use existing venues to preach to those outside the choir.

So let's dream for a moment... Suppose that each of us in the math community should spend one hour each month seriously discussing with people the fundamental importance of education. I don't care whether this hour comes in dribs and drabs; I'm simply asking each of you to devote one hour each month to this. Not only would we learn a lot from these other people, we would create a nationwide conversation about education. Further, simply by engaging our country in such an inclusive discussion, we are quite likely to raise our country's veneration of education.

Math/education activist homework assignment: Pretend Bill had asked YOU to be on this panel. What would you say? What discussions would you initiate? Who would you interview?

All of us need to be activists for math and for education. Each of us should decide for ourselves the way we can be effective activists for this, even when it requires stretching our comfort zones. One does not need to join an activist organization; one can be free-lance.

Let me now convey some thoughts on our first-year math courses.

I've talked to some people who question calculus being the first course for people who might be quite interested in math. These people suggest that at this stage of their education, calculus is too subtle for most of our students, and that these students don't see through calculus the breadth and beauty of mathematics.

There are perhaps more enticing courses we could offer for first-year students, for instance a course exploring some combinatorics, elementary number theory, and perhaps some linear algebra.

However this is often difficult to impose on those who are currently science majors and are expected to take certain math courses at certain times. While we don't want to lose students who are talented in math, we also need to allow, even facilitate, these students in finding their passions.

"The world would likely benefit if some mathematicians spent some of their time thinking about/studying/teaching/concerning themselves with the most important ecological and social issues of our time." (Marty Walter, Professor of Mathematics, CU-Boulder, personal correspondence)

We also have to care for those students who simply want to meet our university's Quantitative Reasoning and Mathematical Skills requirement (which some of us call QRMS, pronounced to rhyme with worms). We need to make this last experience in math valuable to the students, and at the very least, tolerable for us.

One way of meeting these criteria is by teaching a course that reflects other passions we have beyond mathematics.

I have a colleague, Marty Walter, who is an environmentalist. He introduced a course (I call it EarthQRMS) that leads the students to various mathematical constructs and through various reasoning, while considering environmental issues. So this course resonates with the instructor's passion. In fact, at the end of my interview with Marty, he summarized his years of arduous work developing and teaching this course by saying, "I love it!"

As well, he believes he's making a difference. I agree.

What course based on your passion could you teach? And lest you think this is a job for someone other than you, let me remind you that this is our community, and our students are our future, regardless of their prior preparation.

"If you've never seen a good time, how would you recognize one? How would you even find one?" (Sinead O'Connor, singer/songwriter)

Finally, I've collected a lot of information about diversity, much of which I have no time to pass on in this presentation. (Anticipate more preaching from me at another time.)

I'm concerned about kids who come to us underprepared, despite unrealized talent and passion. We need to provide these kids the opportunity to catch up, to keep up, and most importantly, to excel. But what is really tricky is identifying talented kids in spite of poor

prior training, especially since these kids typically do not have the confidence to select themselves to be math or science majors, much less go to graduate school.

So how do we identify these kids? We absolutely need to do this, for otherwise we are essentially throwing these kids away, and actively avoiding an opportunity to enrich not just their lives but our mathematics community, and arguably the world.

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