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Math for Everyone | Francis Su

January 27, 2022



The Veritas Forum

This talk is Francis Su's final speech as the president of the Mathematical Association of America (MAA). If you enjoyed this episode, please rate, review, and subscribe. And, if you're interested in more content from Veritas, check out our Beyond the Forum podcast. Visit veritas.org to learn more about the mission of the Veritas Forum and find more resources to explore the ideas that shape our lives.

Transcript

Hi, this is Carly Regal, the assistant producer of Beyond the Forum, a podcast from the Veritas Forum and PRX. The talk you're about to listen to is featured in Beyond the Forum's second season, exploring the intersection between science and God. This talk is Dr. Francis Su's final speech as the president of the Mathematical Association of America.

We interviewed Dr. Francis Su for episode one of our second season, and we talked with him about how math can cultivate the virtues of persistence, joy, and hope. You can listen to our interview with Francis for Beyond the Forum, or, wherever you listen to podcasts, and learn more about the ideas that shape our lives by visiting our website at veritas.org. Thanks for listening and enjoy. Simone Bey said, "Every being cries out silently to be read differently." Christopher is an inmate in a high-security federal prison, not far from an animal.

He's been in trouble with the law. He was 14. He didn't finish high school.

He had an addiction to hard drugs, and at age 21, his involvement and strength of our robberies landed him in prison with a 32-year sentence. Right now, you've probably formed a mental image of who Christopher is, and you might be wondering why I'm opening my speech with his story. When you think about who does mathematics, do you think of Christopher? When you think about who is capable of doing mathematics, and who wants to do mathematics, what do you think of Christopher? And yet he wrote me this letter after seven years in prison, and in it he said, "I've always had a proclivity for

mathematics, but being in a very early stage of youth and also living in some adverse circumstances, I never came to understand the true meaning and benefit of an education.

Over the last three years, I have purchased and studied a multitude of books to give me a profound, concrete understanding of algebra 1, algebra 2, college geometry, trigonometry, chapter 1. And chapter 2. Christopher was writing me for help in furthering his mathematics education. So when you think of who does mathematics, do you think of Christopher? Every being silently cries out to be read differently. Simone Bey is a well-known French religious mystic.

Why the revered is one of the great philosophers of the 20th century. She's probably less well-known as the younger sister of Andre Bey, one of history's most famous number theorists. For Simone Bey to read someone means to interpret or make a judgment about them.

Every being cries out silently to be judged differently. I sometimes wonder if Simone was crying out about herself. For Simone too loved mathematics.

She participated in mathematics, but she was always comparing herself to her brother. She writes this. At 14, I fell into one of those fits of bottles to spare that come without us.

And I seriously thought of dying because of the mediocrity of my natural faculties. The exceptional gifts of my brother, who had a childhood and youth comparable to those of Pascal, brought my own inferiority home to me. I did not mind having no visible successes, but what did breed me was the idea of being excluded from that transcendent kingdom, to which only the truly great have access and wherein true abyses.

I prefer to die rather than live without that truth. We know Simone loved mathematics because she used mathematical examples in her philosophical writings, and you will find her that thought us a more by key with her brother. This is a meeting in 1937.

I often wonder what her relationship to mathematics would be like if she weren't always in Andre's shadow. Every being finds out scientifically to be read differently. As MAA President, you might think that my relationship to mathematics has always been solid.

I don't like the word success, but people look at me and think I'm successful, as if the true measure of mathematical achievement is the grants that I received and the 40 papers that I published. Like Christopher, I've had a publicity from mathematics since youth, and this is me with hair. But I grew up in a small town in south Texas, rural town with limited opportunities.

Most of my high school peers didn't even go to college. I did because my dad was a college professor, but my parents didn't know about the many mathematical

opportunities that I know exist now for young kids. My love for math deepened at the University of Texas, and I managed to get admitted to Harvard for my PhD.

But I felt that a place there since I did not come from an Ivy League school unlike most of my peers. I did not have a whole slate of graduate courses when I entered. I felt like Simone Bey standing next to future undergraduates thinking that I would never be able to flourish mathematics if I were not like them.

I was told by one professor that I didn't belong in graduate school, and that forced me to consider, among other things, why I wanted to do mathematics. And in fact, that's essentially the one big question I want us to consider today. What do mathematics? This is a simple question for the urban and central rural reflection, because how do you answer what strongly determined who you think should be doing mathematics and how you will teach it? Why is Christopher sitting in a prison cell studying calculus even though we won't be using it as a free minute for another 25 or years? Why was Simone so caffeinated by transcendent mathematical truths? Why should anyone persist in doing mathematics or seeing herself as a mathematical person when others are telling her, in subtle and not so subtle ways, she doesn't belong? And in this present moment, the world is also asking what its relationship to mathematics should be.

Amidst the great societal shifts wrought by the digital revolution and a shift to an information economy, we are witnessing the rapid transformation of the way that we work and live. And yet we hear voices in the public sphere saying, "High school students don't need geometry," or "Let's leave a hands-on math for the math petitions." And some mathematicians won't admit it, but they signal the exact same thing by refusing to teach lower level math courses or viewing the math major as a means to weed out those they don't think are fit for graduates. Our profession is threatened by voices like this from within and without and who are undermining how society use mathematics and mathematicians.

And this view of our profession is dismal. The 2012 report from PCAST, that's the Presidential Council of Advisors and Sciences Technology, pegged introductory math courses as a major obstacle in keeping students from pursuing standard ideas. We are not educating our students as we should, and as well as we should.

And like most injustices, this hurts those who are most vulnerable. I want us as a mathematical community to move forward in a different way. It may require us to change our view of who should be doing mathematics and how we should teach it.

But this way will be no less rigorous and no less demanding of our students. Paradoxically, it will draw more people to mathematics because they will see how mathematics connects to their deepest human desires. So if you ask me, why do mathematics? I would say, mathematics helps people flourish.

Mathematics is for human flourishing. The well-lived life is a life of human flourishing. The ancient Greeks had a word for human flourishing, *eudaimonia*, which they view as the good composed of all goodness, the well-lived life.

There's a similar word in Hebrew, *shalom*, which is used as a greeting. *Shalom* is sometimes translated "peace," but the word has a far richer context to say *shalom* to someone as to which they would flourish and live well. And Arabic has related word, "salam." A basic question taken up by Aristotle is, "Have a view achieved human flourishing?" What is the good life? What is the well-lived life? Aristotle would say, "Flourishing comes from the exercise of virtue." The Greek concept of virtue is something like excellence of character that leads to excellence of conduct.

So it includes more than just moral virtue, for instance, courage and excellence are also virtues. What I hope to convince you of today is that the practice of mathematics cultivates virtues that help people flourish. The practice of mathematics cultivates virtues that help people flourish.

These virtues will serve you well no matter what profession you choose. And this is a message to students. And the movement towards virtue happens through basic human desires.

I'm going to talk about five basic human desires, and the first desire is play. Play is a basic human desire. Think of how babies play.

Play is hard to define, but since we're mathematicians, we should at least try. We can think of a few things that characterize it. For instance, play should be fun, otherwise it wouldn't be bad.

It should be voluntary. There's usually some structure. Even babies know that peekaboo follows a certain pattern.

But there's also lots of freedom within that structure. That freedom leads to investigation of some sort of life. Where will you appear? We think that we want more time.

And there is usually not any great stake in the outcome. I mean, it doesn't actually win or lose, right? That's the nature of play. And the investigation can often lead to some sort of surprise, like appearing in a different place in a peekaboo.

Of course, animals play too, but what characterizes human play is the enlarged role of the mind and of the imagination. Think of Rubik's Cube or the game's status. There's an interplay between structure and freedom, and there's no great stake in the outcome.

But there's an investigation that leads to delight in solving the puzzle or finding sets of matched cards. Mathematics makes for mind its playground. We play with patterns and within the structure of certain axioms, we exercise our freedom in exploring their

consequences.

Join me with the truth that we find. We even have a whole area of mathematics known as recreational mathematics. Do you know another discipline that has a recreational subfield? Is there a recreational physics or recreational philosophy? I showed that your afternoon has talked to a friend who's a chemist, and he said, "Jokingly." Well, you know, there is an actual thing that people can do recreational chemistry.

[Laughter] And that powerful play builds virtues that enable us to flourish in every area of our lives. For instance, Matt Play builds hopefulness. When you sit with a puzzle long enough, you are exercising hope that you will eventually solve it.

Matt Play builds community. When you share and delight in working on a problem with another human being. And Matt Play builds perseverance.

Just as weekly soccer practices build up the muscles and make it stronger for the next game, weekly math investigations make us more fit for the next problem, whatever that is, even if we don't solve the current problem. It's why the NAA supports competition programs, like the AMC department. We help kids flourish through building hopefulness, perseverance, mathematical community.

This year, you may have heard that the US team that NAA trained won the international math of the year for the second time in a row. What you might not have heard of is a coach in love who coached our team, invited teams from other countries to train with them, to prepare for the other. You see, our priority was community, hope for competition.

This was so impressive to the Singaporean prime minister that he publicly thanked Obama for this remarkable collaboration. Thanks Obama. This was true play.

Team and friendly competition. Play is part of human flourishing. You cannot flourish without play.

And if mathematics is for human flourishing, we should play up the role of play in how we teach and who we teach. Everyone can play. Everyone enjoys play.

Everyone can have a meaningful experience in mathematical play. And teaching play is harder. It's actually harder than lecturing because you have to be ready for almost anything to happen in a classroom, but it's also more fun.

Play is part of what makes inquiry based learning and other forms of active learning so effective. And there's overwhelming evidence that students learn better with active learning. This year the conference board and the mathematical scientists, which I set off of the other presidents of the mathematical societies, signed a statement in your same active learning.

You could find it on the CBMS website. If you want to see the evidence for active learning, we've included some background information in this statement. So teach play.

Another basic human desire is beauty. It's impossible to be a mathematician without being a poet and soul. It's this song that come on us now.

Who among us does not enjoy beautiful things? A beautiful sunset, a sublime sonata, a profound poem, an elegant proof. Mathematicians and scientists are awed by the simplicity, regularity, and order the laws of the universe. We call them beautiful.

They feel transcendence. Why should mathematics be as powerful as it is to explain the world? This is what the Nobel Prize winner physicist Eugene Vigner said called the unreasonable effectiveness of mathematics in the natural sciences. And Einstein asked, how can it be that mathematics, being after all a product of human thought and a tentative experience, is so admirably adapted to the objects of reality? And that petition we are not satisfied with the proof of just the proof, just many proof of the theorem.

We often look for the best proofs, the simplest or the most pleasing. Mathematicians had a special word for this. We say a proof is, elegant.

Paul Erdisch often spoke of the book that God keeps in which all the most elegant proofs of theory are kept. Presently mathematics in this way cultivates the virtues of transcendence and joy. By joy, I refer to the wonder or the awe of delight in the beauty of the created order.

But transcendence, I mean the ability to embrace the mystery of it all. There's a transcendence delight in the to experience the beauty of mathematics. I think we've all felt that.

So if mathematics is for human flourishing, we should help others see its beauty. There are many notions of beauty. So the way you motivate mathematics through beauty must necessarily be diverse through arts, through music, through patterns, through rigorous arguments, through the elegance and symbol of profound ideas, through the wondrous applicability of these ideas to the real world in many different fields.

Third basic desire is truth. We're just very close. We're very close, I suppose.

What is truth? What is truth? Now this is an important question especially today. Each day seems to bring more discussion about how fake news may have influenced the presidential election. How do we know what is truth? Here's some people asking me, "Well, you can't know anything is truth." Really? The quest for truth is at the heart of the scientific enterprise.

I say quest because we don't do science to confirm simple declarative statements that are easily buried like my copy is hot. Rather, the such a dirt of our investigation are

questions for which the answer is not so clear. Do gravity waves exist? And if so, how would we detect it? So there is a quest for truth.

And we formulate a hypothesis, gravity waves a this, and we design experiments to test our hypotheses. We look for evidence. And if we find something we ask, could there have been any other explanation? A mathematician might try to prove or disprove a statement through logical deductions from first principles.

Or she might construct them at an adequate model to answer the question. These approaches cultivate in us the virtue of rigorous thinking. The ability to handle ideas well, to craft clear arguments with those ideas.

This virtue serves us well in every area of our life. Rigor gives us the ability to reason in the public square as many of our community have done. Look at these opinion pieces that were offered by mathematicians recently.

Paul Ritten for papers. I would love to see more of us in our community exercise rigorous thinking in the writing of public art of ours. We should be shaping public perceptions about mathematics and other things.

And on side notes, if you want to see how math is being portrayed in the news, as you mentioned, I have built an app. It's a math news algorithm called math feed. It's free.

It's available for iPad and in a few weeks and joy. It leaks major newspapers, brings together articles about mathematics, how math is being used, as well as math blogs and publications at NAA, AMS, and ASIS. So it's a central place.

I plan to encourage my students to be looking here for ideas, for projects, for seeing how math is used to the news. I would like to encourage all our institutions to start valuing public writing that exactly we do. More people often will read these pieces than will read any of our papers.

Public writing is a scholarly activity. It involves rigorous arguments. It's subject to review processes by editors.

And to borrow the NSF phrase, it has broader impact. And that impact can be measured in a digital age. Public writing should be valued by our tenured students.

And the quest for truth predisposes the heart to the value of humility. Isaac Newton said, "I do not know what I may appear to the world, but to myself I seem to have been only like a boy playing on a seashell, and diverting myself in now and then to find any smoother pebble or prettier shell than ordinary." Whilst the great ocean of truth lay all undiscovered before me. What he's saying is what we feel often, right? The more we know, the more we realize how much we do not yet know.

Mathematicians know how to accept being wrong. If a counter-example shows our conjecture was false. In fact, I'll go so far to say that counter-exemplism and mechanics have a special place.

We celebrate. We had counter-exemplism topology and counter-exemplism analysis as titles of books. Do you know any of the deals with titles like these? Counter-exemplism? Chemistry? You see, we actually like to admit what we're all.

So when a student embraces the quest for truth, she begins to assume a certain kind of humility. She learns to handle ideas rigorously with honesty and integrity. She values truthfulness and clarification and distinctions.

This is the virtue of intellectual humility and its fraud and it's something we should be teaching and something we should be explaining to our students that we are teaching them as a skill for their entire life. And a lack of humility, I think, had characterized the political discourse in 2016 on both sides. I wish we had more intellectual humility in the public square.

When we teach mathematics, we must help our students see that we are helping them with useful skills to handle ideas that care, to embrace humility and acknowledging when they're wrong. We have to model these virtues in our own teaching. One of the most important skills we must teach our students is to know when their arguments are wrong.

Have they seen that ever give a super hard question on exam? We've got answers that look like the students just say stuff up hoping for extra credit. Well, I've asked, was it least thing that I would give you extra credit on incomplete proofs where you acknowledge the gaps? It's one of my colleagues that recently we should really think about what we're actually assessing on these exams. If I value intellectual humility, am I testing that as well? And so I do this and I get much more thoughtful answers now on these examiners.

Mathematics builds in us the virtue of circumspection. We know the limits of our arguments and we don't have our generalize. I like what my friend Rachel 12 said.

She said, I think math helps me make fewer sweeping generalizations about people. For example, I wouldn't assume a person is say an educated just because she is poor, just as I can't assume a number is say positive because it's an energy. I can't even assume it's positive and I know it's not a negative.

Even if probably wise it's probably positive. So I don't leave to automatic associations as much. I'm sure I can't say a number to them.

A four basic human desire is justice. A Kenny was a student of mine who did research with me as an undergraduate. She wrote an innovative paper in the A.D. theory and phylogenetics who was published a highly regarded mathematical biology journal and of

all my research students she within the course of 10 weeks had actually not just done research with real estate.

So she went to a top research university for her PhD. So I was surprised to learn a Kenny quit after one year. She told me she had many negative experiences.

Her advisor was never willing to meet with her and she faced uncomfortable experiences as a woman. She told me one example. This is what she said.

At the beginning of the course I consistently got 10 out of 10 on my own assignments which were all graded by the TA. One day Jeff, a mutual prayer, told me that he was hanging out with our TA and someone asked the TA how the analysis class was doing. He went on and on about some guy named him and how perfect his homework score and how clearly they were with me.

Jeff told him I was a girl and the TA was shocked. Jeff told me the story because he thought it was funny but someone didn't know my sex for my name and reacted to dramatic evidence of finding out. After that I never remotely got close to 10 out of 10 on my assignments and my exam kept evenly garbished.

Most of the reasons for Doc points of revenge with comments like "give more detail." I didn't feel like my understanding of the material diminished that quick rate more dramatically but I suppose it's possible that this happened just as a turquoise and a chaser. No, I can't. It's not you.

I help you all agree that there's something wrong with this picture. If a certain kind of anger wells up in you, you are experiencing a talent-tale sign of flourishing, the desire for justice. Justice means setting things right and justice is a powerful motivator to ask.

Justice is required for human flourishing. We flourish. We experience Shalom when we treat each other as justly and when we are treated justly.

Simone Vay realized that correcting justice must involve changing how we view others. She said next, "To be ever justice. To be ever ready to admit that another person is something quite different than what we read when he is there or when we think about it.

Or rather to read him that he is certainly something different, perhaps something completely different from what we read ahead of. Every being cries out silently to be read differently." Now before we are too quick to center a chemist TA, we have to realize the problem of reading others differently begins with ourselves. The teacher may not even have realized if he was doing this.

This is the problem of what is called implicit bias. Unconscious stereotypes that subtly affect our decisions. One of the best experiences I had in MAA leadership was attending a workshop on implicit bias in which I realized in a powerful way how I advise, even

though I try not to do it.

We all do it without realizing it. Numerous experiments confirm results of the following comment. "When given two nearly identical resonates, except that one has a positively stereotyped name and one has a negatively stereotyped name, which is whatever if you want, women, minority, etc.

Judges will rate the positively stereotyped resonated highly." And this happens even if the judges come from the negatively stereotyped group. This is why good practices are important. MAA now has a document for selection committees called avoiding implicit bias that lists a number of practices that have been shown in research to mitigate the effects of implicit bias, such as taking time to make decisions, appointing diverse selective entities, generating a large candidate pool.

And it's what, these are good practices even if you don't believe bias exists. So there should be no argument for non-implementing these practices that we know mitigate implicit bias. We see if we have to recognize that even if people are just, even if people have a desire to be just, a society may not be just if its structures and practices are not also just.

And the only way a whole society can flourish is if the society is a just society. It's often said that the mark of a just society is how it treats its most vulnerable members. So I asked, with great humility, are we just community? If you believe that mathematics is for human flourishing and we teach mathematics to help them flourish, you will see if you look around the room that we aren't helping all our students flourish.

The demographics of the math community do not look like the demographics of America. We have left whole segments out of the benefits of the flourishing available in our profession. So we have to talk about ranks and that's hard.

It can bring out complicated emotions even more so with all that's taken place in the past year in our nation. In our community, we have to become comfortable talking about listening to each other's experiences, being welcome, willing to recognize it's there. If you want to treat someone with dignity and their hurt, you don't ignore their pain.

You ask, what are you going through? What are you going through? It's not up to say, I don't think about this because in a community, how one member is doing affects the whole. And for those of us not in the dominant racial group, we don't have the luxury of saying, I don't think about ranks because racial issues affect us on a daily basis. So let me encourage all of us to try to have these conversations be quick to listen, slow to speak, and quick to forgive each other when we say something stupid.

Because I don't have to start having conversations, right? We'll say stop. We just have to have a great for each other who make mistakes, better than not talking. So we're going

to start our conversation.

How'll start? I grew up in Texas and a wife in Latino part of the state and I realized that early that my family had different customs than my friends. My clothes were different, the food in my lunch box is different, and these things were causing me to not fit in. I wanted to be white, not Latino because white people got no respect.

And as an Asian, I was getting picked on all the time. I had no role models for being Asian and American. So I tried hard to act quite, even if I couldn't look quite.

On the other hand, in Chinese communities, I don't fit in. I don't speak Chinese. I don't act Chinese.

A Chinese restaurant on view is white. Did you know a Chinese restaurant at authentic Chinese restaurant was a special menu, a secret menu that they give, only give Chinese people? It has all the good stuff. Like the stuff I got in my lunch box growing up.

And I don't get that menu unless I ask her. In fact, they often discourage me from taking it, saying, "You won't like the stuff on that menu." As mathematicians, who gets to see our secret menu? Who can do we shepherd towards taking warm-up courses and who do we discourage from looking at that menu? Don't let me sound like I've been complaining about my ricks. There are other ways in which I've benefited from being Asian.

People expected me to be better at math and science. And I'm sure that's part of why I did it, because I now know there's a whole literature on expectancy effects. The teacher expectations do affect student performance.

First time I didn't feel like a minority is when I moved to California. There are so many Asian Americans here. In Texas, I commonly get the question, "Hey, your English is so good.

Where's it from?" I take Texas and they say, "No, where are you really from?" I never get that account. And it wasn't until I moved here that I felt the freedom of it. Like, I was like, "Oh my gosh, I never had to answer that question here." I never had to assume that the... So here's what happened in Texas often is whenever I made a big person, I would try to compress them with my English because I knew that they would assume that I was otherwise from China.

I don't have to do that now. Now, these days I'm used to being a man of power to this and seeing a sea of white faces. So even I was a little bit surprised that when I was elected and a president, a prominent blogger, a racist, and a raised American, wrote a blog post about it.

His name is angry Asian man. Angry Asian man. And he had heard about this somehow, I'm not sure how.

But you know, in minority communities, you pay attention to this like this, right? Because it's so rare to see that kind of thing happen. Like my mom always called me in the TV whenever there was anybody in China, it's on. And angry Asian man looked at the photos of an A.A. president on our website and given how many Asians he expected to be a man, noted that they were all white, except me.

So he wrote a sarcastic post entitled, "Finally an Asian guy who's good at math." [laughter] I am my first president of color of either A.A. or A.A. Minorities, including Asians, are easy to overlook when you think about who they could leave. This may not be intentional, but when you're asked to think about who is fit for this role or that role, you often think of people who are just like the people in office. And so it's very easy for implicit bias to free them.

Now I want to say I raise this discussion at a deep affection for the math medical community. I want us to flourish. And there are ways we can do better.

In 2015, I had the great pleasure of running MSRI, a summer research program for students from underrepresented backgrounds at MSRI. And these are first-generation college students with TINA and African-American kids. I asked them to help me prepare this talk, to tell me about obstacles they faced during math facts.

And way more responses than I could include in this talk, and I'll just give you a sample. One of them who did wonderful work during that summer, told me about her experience in the analysis course, analysis course after she got back. She said, "Even though the class was really hard, it was more difficult to receive the emollations of the professors." He made us feel that we were not good enough to study math.

He even told us to change to another easier profession. And as a result of this and other experiences, she switched her major to engineering. Now let me be clear, there is no good reason to tell a student that they shouldn't be in math.

That's the student's decision. It's not your decision. You see the snapshot, but you don't see the trajectory.

You can't know how she will grow and flourish in the future, but you can help her get them. Of course, we should give forthright counsel to students about skills they might need to develop further. They want to go on in math facts.

But if you see math in the mix of needs to help them flourish, why wouldn't you encourage them to take more math? Another student, Oscar, told me about an experience of the math age who unlike his peers and because of his background, did not enter college with any advanced placement credit. He said, "I noticed how different my trajectory was, however, when I was in a complex analysis course. A student was presenting a solution on the board which required a bit of complicated error mission

halfway through.

They skipped over a number of steps saying, "I don't think I need to go through the algebra. We all test out a calculus here anyways with the professor nodding an agreement and some students laughing." Not quietly commented that calculus was my first course. My professor was genuinely surprised.

He said, "Wow, I don't even know that. That's interesting." And I wasn't sure whether to be proud or embarrassed by the fact that I was not a typical master. I felt a sense of pride in knowing that I was pursuing an at degree despite my starting point, which by the way is the regular starting point.

It was even starting to move me back. But I could not help but feel as though I did not belong in that classroom to begin with. The reason Oscar was in that class to begin with was actually because of the active support of another professor.

Oscar said, "She presented me with my first research opportunity, always encouraged me to study higher math. I was also able to combine her about a lot of the internal struggles I had with my normal because as a female she had similar experiences." And my complex analysis professor became one of my mentors as well. I think it was just an interesting moment because she didn't realize how her reaction to the situation could have hurt her.

And I don't think she's necessarily a fault. It was more than her reaction piled on to the insecurity I had in regards to dig my knowing with the weak background of the math. Once again, it wasn't a weak background.

It wasn't a standard track. I'm pleased to say that Oscar and his team from that time are just published a paper in the Anastronum and he's now in graduate school. You hear from Oscar's story the importance of how they can advocate a faculty member who says, "I see you and I think you have a future in that." This could be especially important for underrepresented groups and women who already have so many voices telling them they can't.

Can you be an advocate? And if we teach mathematics to help our students flourish then we should not set up structures that disadvantage smart students with weaker backgrounds or make them feel out of place. And I don't think it happened in a work way among students but we as faculty have responsibility to shepherd the culture in our department. When I was a grad student at Harvard they had a regular calculus class and an honors calculus class and then on top of that a super honors class.

Map 25 and active, I think they were called. And ironically I regularly encountered students as I was doing a tutor in them. I regularly encountered students in the honors track who felt they didn't belong in that because they didn't play into the super honors

track.

I had to keep reassuring them. Background is not the same as ability. I sometimes wish graduates to admissions to remember the student.

Background is not the same as ability. As my friend Bill Bellas says, "If you want your PhD program to have more students of color then you have to stop admitting students on the basis of background. You start admitting students by their ability like creativity, initiative.

And then you have to support them. Be an advocate. They already have so many voices telling them they don't belong.

I know our community wants to be just to set things right. And if you were at the Hidden Figures panel on Thursday, if you saw the turnout, there were so many people we had to open a second room and even then it was standing room only. So I know our community wants to be better.

So if you are looking to start some conversations with students or colleagues about some of these issues but don't know where to start, sometimes they can help to have a third part. And I'm willing to be that third part. I've read the number of articles on these topics and then they focus and they're all posted on my webpage now.

You could ask your students to read them and then start a discussion. I assure you it will be time well spent because we are not mathematic machines. We live, we breathe, we feel, we bleed.

If your students are struggling and you don't acknowledge it, why should they care about their education? Their education has just become disconnected and irrelevant. Why should anyone care about mathematics if it doesn't connect deeply to some human desire, to play, to pursue beauty, to pursue truth, to fight for justice? You can be that connection. So I want to challenge each of you today.

Find one student whom you know is struggling facing some challenges, whatever they may be. Become their long-term advocate. One way to do that is to sign up to be a mentor with National Alliance, which is an organization that supports underrepresented groups who have a talent and addition and want to go to doctoral programs like the scientists, this is a director of the CUSCO, I think it's out of for do right now.

They're looking for mentors. But whether it be through this or somebody on your own campus, find somebody who's struggling, being their advocate. I know what I'm asking you to do is hard.

It takes time. But we're mathematicians. We're mathematicians.

We know how to tackle hard problems. We have the perseverance to see it through. We have the humility to admit when we make mistakes and learn from them.

We have the hopefulness that our labor is not in vain. We have the transcendent hope that our work will bear fruit in the flourishing of our students. Because what I'm asking you to do is something you already know is of the heart of the teacher and student relationship.

And that is a supreme human desire that pushes us towards virtue. And that is love. Love is a great human desire.

And to love and to be loved is a supreme mark of human flourishing. Frick serves the other desires, play, truth, beauty, and justice. And it is served by them.

Everything cries out silently to be read differently. Everything cries out silently to be loved. Christopher and prison wasn't looking only for mathematical advice.

He was looking for connection. Someone to reach out to him. It is mathematical space and say, "I see you." And I shared the same transcendent passion that you do.

And you belong here. And when I was in the depths of despair and graduate school struggling over many non-academic things with an advisor who said, "I didn't belong." Already you're interviewing for jobs because I was sure I was going to quit. One professor reached out to me.

He came out to me. He said, "I would rather see you work with me." He was my advocate. And I stand before you to ask you, "Find a struggling student.

Love them. Be their advocate." I'll end with his reflection by Simone Vey. When I think it gathers a lot of the strands that I've been wrestling with in my talk, after she wrestled with her own insecurity in mathematics, she saw that there was a path to virtue through her struggle.

And that it could help people. She wrote this, "The love of our neighbor in all its bonus simply means being able to say to him, 'What are you going through?'" "What are you going through?" "Is a recognition that the sufferer exists not only at the unit in a collection or a specimen in a social category labeled "unportrait of it," but as a man exactly like us who is one day stand for the special mark by the function. For this reason it is enough, but it is indispensable to know how to look at him in a certain way.

The way of looking is first of all, attentive. The soul empties itself of all its own contents in order to receive into itself the being it is looking at, just as he is in all his truth. Only he who is capable of attention can do this.

So it comes about that paradoxical as if they see a Latin prose or a geometry problem,

even though they are done wrong, may be of great service one day, provided we devote the right kind of effort to them. Should the occasion arise they can one day make us better able to give someone an affliction exactly the health that is required to save them at the supreme moment of his need? For an adolescent capable of grasping this truth, a generous enough to desire this fruit above all others, studies could have their fullest spiritual effects, quite apart from any religious belief. Academic work is one of those fields which contains a pearl so precious that it is worthwhile to sell all our possessions, keeping nothing for ourselves in order to be able to acquire it.

He sees she has found a path through struggle to virtue. She understood that mathematics is for human person. The mathematical experience cannot be separated from love, the love between friends who play with the mathematics of problems, the love between teacher and student working to help each other flourish.

The love of a community like the Mathematic Association of America working with each other towards a common goal through the knowledge and virtues brought by mathematics to help everybody flourish. Thank you for the opportunity to serve you these last two years. Shalom, salaam, great to be here.

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