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Mathematical Justice?

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Mathematical Justice?

Abstract

"I'd like to suggest the possibility of guiding students toward more just ways of seeing and being in the world in mathematics class."

Posting about human flourishing through mathematical study from *In All Things* - an online journal for critical reflection on faith, culture, art, and every ordinary-yet-graced square inch of God's creation.

<http://inallthings.org/mathematical-justice/>

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Disciplines

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Comments

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Mathematical Justice?

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Valorie Zonnefeld

Mathematician Francis Su, in his [closing MAA address](#), stated that justice is a basic human desire that is necessary for flourishing. In the talk, he addressed the challenges that under-represented populations experience in mathematics education. This is an important point, as minorities and females are under-represented at the highest levels of mathematics. As a mathematics major in college, one of the issues I faced was not having other students with whom I could do mathematics homework late at night. There were many males in the male dorms, but my options in the female dorm after curfew were quite limited. In no way am I saying that this was intentional discrimination; rather, it was just a unique challenge for me as a member of an under-represented group.

Unfortunately, this pattern plays out across all levels of mathematics as large achievement gaps exist in mathematics for [ethnic minorities](#), [women](#), and those rising from [poverty](#). Despite numerous studies showing achievement differences are not a result of nature, but of nurture, Western culture continues to subtly “nurture” some students towards mathematics success and turn its back on others. While you might think “it’s only mathematics,” take note that success in mathematics predicts success in other academic areas. Mathematics has earned the title “[gatekeeper for high school graduation and post-secondary success](#)” with numerous studies noting the importance of successfully completing Algebra I by the end of ninth grade for high school and even college achievement. The National Council of Teachers of Mathematics has recognized these injustices, making *Access and Equity* one of its six [Guiding Principles](#).

As a math lover, it pains me to learn of the large number of students who are taught mathematics by under-qualified teachers. I ache every time I meet someone new who, upon learning of my occupation as a math professor, feels the need to confess his or her mathematics background, unload negative mathematics baggage, or relive a traumatic experience in mathematics. **Every student deserves highly qualified teachers of mathematics**, from kindergarten through college. Unfortunately, students in poverty suffer even greater from these injustices, as [schools with high poverty rates are 48 percent more likely to have a teacher not trained in mathematics](#) than low-poverty schools. The opportunity to help train the next generation of mathematics teachers is what pulled me away from K-12 teaching in order to equip future teachers. I want to be a part of training the next generation of mathematics teachers to address the injustices that far too many students have of not seeing play, beauty, truth, justice, and love in mathematics.

Thus far, I have discussed the injustice of access to high quality mathematics education. Now, I’d like to take a different perspective and examine how the topics in mathematics classes can be vehicles for justice. No, not in the justice sense of using calculations to detect things like tax evasion, but social justice. Parker Palmer describes education as guiding students “on an inner journey toward more truthful ways of seeing and being in the world.”¹ I’d like to suggest the possibility of guiding students toward more just ways of seeing and being in the world in mathematics class.

Unfortunately, many mathematics textbooks provide a steady flow of problems focused solely on personal gain. This sends an unspoken message to students that mathematics is not a tool for justice, but for personal advancement. For example, a typical lesson teaching about percentages will include topics such as shopping, real estate, and taxes. What would happen if we changed the topic’s content and used census data to calculate the percentage of people in our town who are under the poverty level? This could be followed by calculating the percentage of a

budget devoted to food for a family of four at the poverty line, compared to the percentage for that same family of four if their income was the median household income for your town. In Sioux Center, Iowa, a family of four at the poverty level consuming a [low-cost food plan](#) would spend approximately \$191 per week on food, while earning at most \$466.35 per week, representing just over 40% of their budget. That same family of four earning the median income of [\\$1,148.31](#) per week would devote less than 16% of their budget to food. I argue that this application is more generative than the typical content used to teach percent. In addition, we should stress teaching how to calculate percentages for tax and real estate, because these can be important aspects of stewardship. I suggest that we do a mix of the typical applications along with generative topics, topics fertile with potential, so that students learn about mathematics and gain a more just way of seeing and being in the world.

In lower elementary, generative topics might include how to share a pizza with friends when learning about fractions or division. As students mature, their sense of justice should also mature to accommodate how to justly share a resource amongst individuals in different levels of need. For example, if 1000 pencils were donated to your school of 100 children, how many pencils should each child receive? Does their answer change if some children already have pencils? What if some children do not have the resources to purchase pencils? What if there is a local after-school program that is under-funded? It would be interesting to observe how the answer to the original question changes as students' understanding of justice expands.

Generative topics in mathematics have the potential to be a vehicle for raising awareness of justice issues and fulfilling Dr. Mark Fakkema's desire that "Instead of our doing something to the [math], the [math] should do something to us,"² I envision mathematics classrooms that will "do something" to the students, guiding students "toward more truthful ways of seeing and being in the world" which would include not only justice, but also play, beauty, truth, and love.

Footnotes

1. Parker J. Palmer, *The Courage to Teach: Exploring the Inner Landscape of a Teacher's Life*. (San Francisco: Jossey-Bass, 1998), 6. [↩](#)
2. Larry L. Zimmerman, *Truth & the Transcendent: The Origin, Nature, and Purpose of Mathematics*. (Petersburg, KY: Answers in Genesis, 2006), 67. [↩](#)