



TERRAPIN TEACHERS

AMTE 26th Annual Conference

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Feb. 12, 2022

Bringing Humanity to the Forefront in our Mathematics Courses: Incorporating *Mathematics for Human Flourishing*

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Presentation Overview (9:30-10:30 PST)

9:30-9:35	Goal of the session
9:35-9:45	Introduction to <i>Mathematics for Human Flourishing</i> by Francis Su
9:45-9:55	How we used the text in Terrapin Teachers
9:55-10:00	Student Reflections
10:00-10:30	Group Discussion



Goal of this Session

To discuss:

- how *Mathematics for Human Flourishing* by Francis Su has been incorporated into one Mathematics course at the University of Maryland
- the ways in which others might be able to incorporate it into current teacher preparation coursework



Why this session?

Twitter feedback!

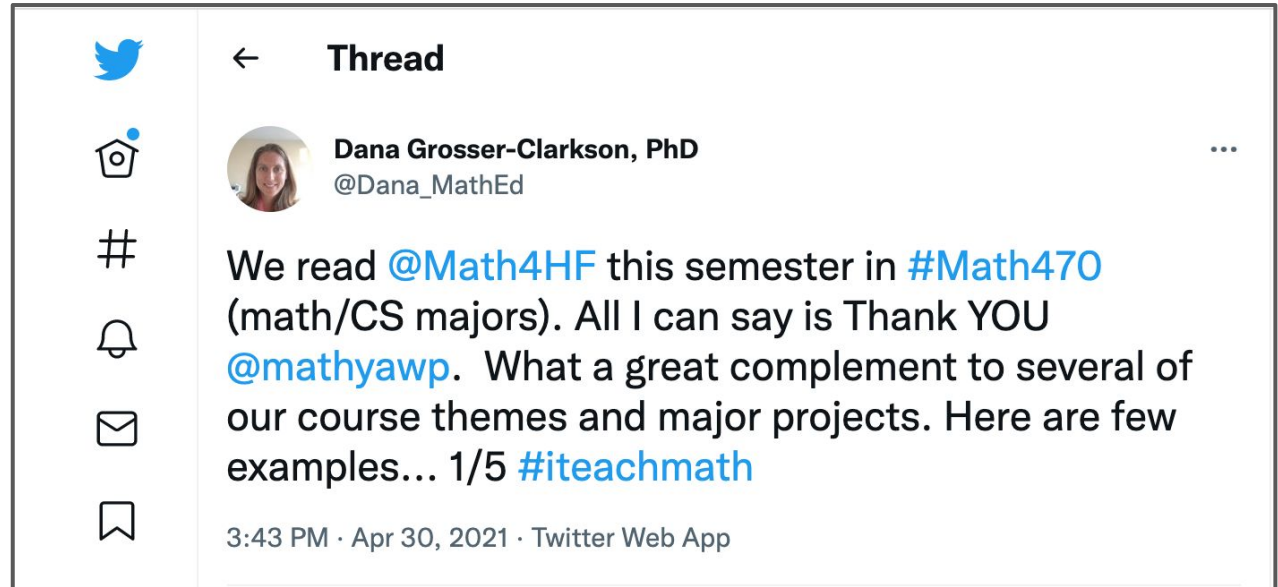
@Dana_MathEd

@mathyawp

@Math4HF

#mfhf

#AMTE2022





MTE Goals

To support our future teachers to be able to create mathematics classroom that allow students to “experience wonder, joy, and beauty” (NCTM, 2018, p. 12) of mathematics.



MTE Goals

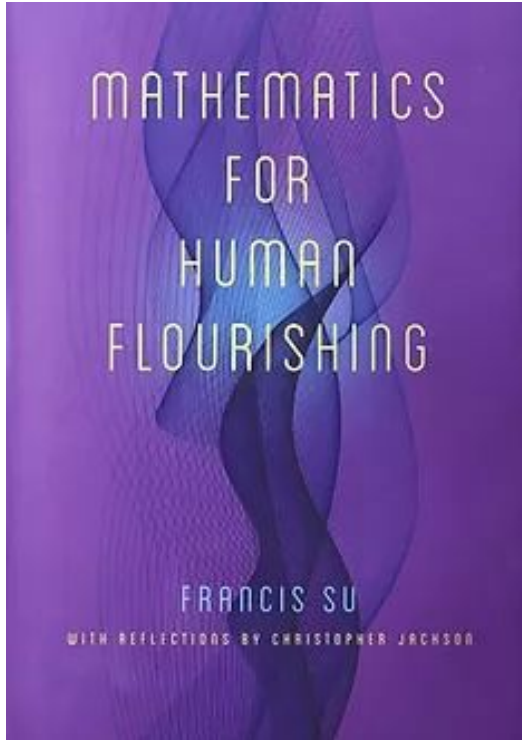
To support our future teachers to be able to create mathematics classroom that allow students to “experience wonder, joy, and beauty” (NCTM, 2018, p. 12) of mathematics.

Mathematics teacher educators need to:

- provide opportunities for PST to experience the wonder, joy and beauty of mathematics as students of mathematics, specifically in their pure mathematics courses
- continue to cultivate positive mathematical identities



Mathematics for Human Flourishing by Francis Su



**Winner of the Mathematics Association of America's
2021 Euler Book Prize**

<https://www.francissu.com/flourishing>



Table of Contents

Carl Olsen design these chapter icons. Click to navigate quickly to chapter headings.



Chapter 1: Flourishing

Chapter 2: Exploration

Chapter 3: Meaning

Chapter 4: Play

Chapter 5: Beauty

Chapter 6: Permanence

Chapter 7: Truth

Chapter 8: Struggle

Chapter 9: Power

Chapter 10: Justice

Chapter 11: Freedom

Chapter 12: Community

Chapter 13: Love

Epilogue



Alignment with Math Education

Productive Struggle (p. 120)

Growth Mindset (p. 121)

Modeling (p. 136)

Multiple Representations (p. 137)

Active Learning / Inquiry-based learning (p. 171)

Group-worthy tasks (p. 193)

Scholars from the field mentioned or cited:

Fawn Nguyen

Rochelle Gutiérrez

bell Hooks

Bob Moses

Jo Boaler

Illani Horn



Alignment with Math Education

“At every opportunity we need to counter the idea that math is memorization, and replace it with the idea that math is exploration” (p. 26)

“I would struggle with a concept, because even though it had a definition, it had no meaning—no connection to a larger narrative” (p. 39)

“Functions are relationships; functions tell a story” (p. 29)

“Mathematics is the science of patterns *and the art of engaging the meaning of those patterns*” (p. 44)

“As math explorers, you and I will make math mistakes, just like everyone else” (p. 105)

“Mathematics is about comprehension, not calculation” (p. 132)



Alignment with Math Education and Issues of Equity

“Mathematical spaces—in the home and in the classroom—can be like this restaurant. Whom do we allow a peek at the secret mathematical menu? With whom do we share mathematical delights—puzzles, games, toys? Whom do we let into our information circle about mathematics—news, videos, social media posts? Whom do we shepard toward doing more mathematics, and whom do we discourage? What conscious or unconscious assumptions are we making?” (p. 148)

Implicit Bias (p. 150)

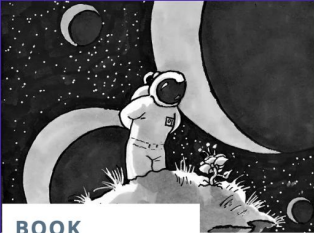
“Rectifying justice is spotting something wrong and trying to make it right” (p. 150)

“To rectify injustices, we have to talk about hard things that might separate us, like race, gender, sexual orientation, social class, the rural-urban divide, and the related ways in which some are marginalized in mathematics” (p. 152)



Mathematics for Human Flourishing by Francis Su


Ways you can go deeper.



**BOOK
ENDNOTES**
[Links to References](#)

Notes with live hyperlinks to the bibliographic references in each chapter.


[Go](#)



**DISCUSS WITH
FRIENDS**
[Starting Conversation](#)

100 questions for reflection. Gather friends, read the book, discuss. #Math4HF

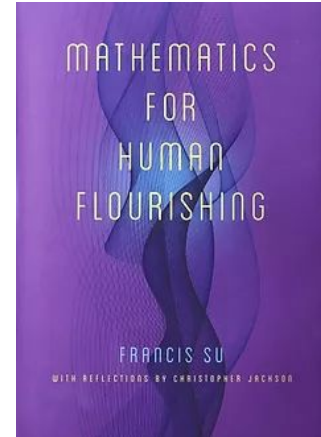
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**READ OTHERS
DIFFERENTLY**
[In Math and in Life](#)

People and organizations that could flourish with your assistance.

[Coming Soon](#)



Example of Discussion Questions

1 flourishing



FOR REFLECTION & DISCUSSION

These first three questions are ones you may wish to think about before reading the book, and then return to after you finish it, to see how your answers compare.

1. What is mathematics? How would you describe it to a friend, in a sentence or two? What do you feel is the purpose of learning mathematics, for yourself or others?
2. What connections do you see between doing mathematics and being human?
3. Describe any virtues you have acquired as a result of doing mathematics. (Think of virtues as aspects of character that mathematics might build, such as habits of mind, that shape the way you approach life.)
4. Have you ever compared yourself to others mathematically? Describe how that made you feel. Was it motivating or discouraging?
5. Should mathematical opportunities be available for all who want them? Are they available for all who want them? Discuss.
6. What value is there in studying math if you'll never use what you're learning?



Example of Notes



10 justice

9. Rochelle Gutiérrez, "Enabling the Practice of Mathematics Teachers in Context: Toward a New Equity Research Agenda," *Mathematical Thinking and Learning* 4, nos. 2–3 (2002): 147.

10. See, for instance, National Council of Teachers of Mathematics, *Catalyzing Change in High School Mathematics: Initiating Critical Conversations* (Reston, VA : The National Council of Teachers of Mathematics, 2018); Jo Boaler, "Changing Students' Lives through the De-tracking of Urban Mathematics Classrooms," *Journal of Urban Mathematics Education* 4, no. 1 (July 2011): 7–14.

11. William F. Tate, "Race, Retrenchment, and the Reform of School Mathematics," *Phi Delta Kappan* 75, no. 6 (February 1994): 477–84.



Math 470

Mathematics for Secondary Education



Math 470

Population

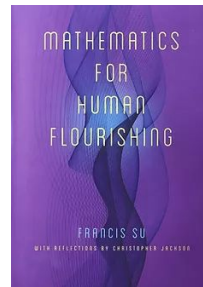
Course Structure

Rubrics



Book Club for Math 470

Virtual Version 2021





Complement to our course themes and major projects



Chapter 9: Power



Chapter 10: Justice



Chapter 11: Freedom



Chapter 9: Power

- What is a mathematician?
- Do you see yourself as a mathematician?
- Who gets to be seen as a mathematician?





Chapter 9: Power

The Mathematicians Project: created by Annie Perkins:

[@anniek_p](#)

<https://arbitrarilyclose.com/mathematician-project/>



#MathGals created by Chrissy Newell@MrsNewell22

<https://mathgals.com/>





Chapter 9: Power



Ethics of AI-

Coded Bias: [https://www.codedbias.com/Algorithmic Justice League](https://www.codedbias.com/AlgorithmicJusticeLeague)

Dr. Joy Buolamwini@jovialjoy





Chapter 10: Justice

Offered a space for students to discuss inequalities in math spaces.



Reading/hearing the personal reflections of many of my student is upsetting. Asking ourselves actions we can take to be welcoming as a math community at the University of Maryland

<http://gtm.math.umd.edu> (e.g., [@girlstalkmath](https://twitter.com/girlstalkmath))

Chapter 11: Freedom

1. Problems to Ponder: Select 1

- Dividing Brownies (from NPR's Car Talk)
- Toggling Light Switches (Opening Lockers/dorm doors)
- Overlapping Rectangles
- Ants on a Log

2. “What if Not” question posing

3. Math Art : Select 2 art challenges

- a. [@anniek_p #mathartchallenge https://arbitrarilyclose.com/home/](https://arbitrarilyclose.com/home/)

4. Further Exploration





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Student Reflections



From Virtual Version 2021

“Overall, I value reading this book because it showed me what math could be, and what we should strive to make it. We should strive to make it welcoming, inclusive, creative, non-dogmatic, and make it a place of exploration rather than memorization.” (Student 13)

“Having been a part of the math team in high school, I worry that its existence was a deterrent to the people not a part of it. The math team at my high school was not something any student could be a part of; it was a group of students handpicked by the teacher to participate in math competitions. Because of this, I worry that people see themselves not being selected to be a part of this team and believe that this is a sign that they cannot do high-level math when that is not actually the case!” (Student 6)



From Virtual Version 2021

“With each chapter, I was able to view mathematics through a new lens. And with each chapter, I challenged myself to consider how I could incorporate these values and practices in my future classroom.” (Student 12)

“I knew that I had always felt looked down upon being a female in mathematics and that I was always scared to ask questions...So thanks to reading this book I have decided to take more of an initiative and those who want to have their opinions about a female in mathematics can have it and I think it says more about them than it does about me.” (Student 1)



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Group Discussion



Group Discussion Questions

1. How have others used this text?

2. In what ways could you implement this into existing coursework?
 - a. Math courses?
 - b. Methods courses?
 - c. Induction?

3. If we don't have time/space to use the entire book, are there certain chapters that seem more relevant to our work as Teacher Educators?
 - a. What potential benefits do we see?
 - b. What challenges might we face?



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Exploring Classic Problems

Dividing Brownies: You make some delicious brownie batter, pour it to fill a rectangular pan, and then bake it. The brownie is cooling on the counter when a mischievous kid walks in and cuts out a rectangular piece of cake somewhere in the pan and eats it. Later, you want to fairly divide the remaining cake between two people, using only a single straight cut. Is this possible? If so, how?

Toggling Light Switches (Opening Lockers/Dorm Doors): Imagine 100 doors numbered 1 to 100 with 100 students lined up in front of those 100 doors:

The first student opens every door. The second student closes every 2nd door. The 3rd student changes every 3rd door; if it's closed, she opens it; if it's open, she closes it. The 4th student changes every fourth door. The 5th student changes every 5th door. That same pattern continues for all 100 students. Here's the question: "Which doors are left open after all 100 students have walked the dorm hallway?"

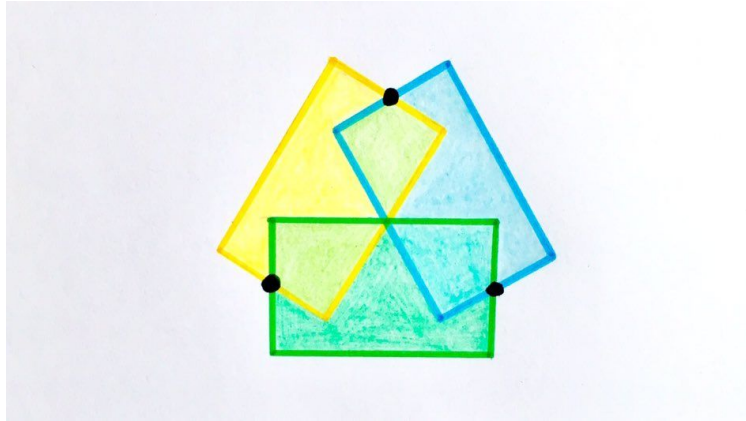


Exploring Classic Problems

Ants on a log: One hundred ants are dropped at random places on a log, each ant facing one end or the other. The log is 1 meter long, extending left to right. Each ant travels toward either the left or the right end with constant speed 1 meter per minutes. When two ants meet, they bounce off each other and reverse direction, keeping their speed intact. When an ant reaches an end of the log it falls off. At some point all the ants will have fallen off. Question: Over all the possible initial configurations, what is the longest amount of time you would need to wait to guarantee that the log had no more ants?

Exploring Classic Problems

Overlapping rectangles: The three rectangles below are congruent (they have the same size and shape), each with area 4. The black dots mark the midpoints of the shortest sides. The three rectangle borders meet at one point in the middle. What total area is covered by this design?



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