Confronting Eurocentrism in Math History Education

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UTeach STEM Educators Conference

21 June 2021

Where did math come from?

*It's a **system of power** that is always deciding in the name of humanity **who deserves to be remembered** and who deserves to be forgotten...We are much more than we are told. We are much more beautiful.*

- Eduardo Galeano via Bettina Love in *We Want to Do More Than Survive: Abolitionist Teaching and the Pursuit of Educational Freedom*

Where did math come from?

*I heard the statement '**our struggle is also a struggle of memory against forgetting**'; the politicization of memory that distinguishes nostalgia, that longing for something to be as once it was, a kind of useless act, from that **remembering that serves to illuminate and transform the present**.*

- bell hooks in *Yearning: race, gender, and cultural politics*

Session Objectives

1. **Explore** the historical origins and applications of concepts like measurement, zero, arithmetic, algebra, and geometry
2. **Familiarize** UTeachers with the online resource Mathematicians of the African Diaspora (MAD) (Williams, 1997)
3. **Demonstrate** how MAD can be used in the classroom
4. **Contextualize** the suggested activities within the framework of Abolitionist Teaching (Love, 2018)

Session Schedule

1. **Introduce** importance of math history and state objectives ✓
2. Participants will **model** a (very) condensed version of a MAD 5E Lesson Plan (available on the conference platform)
3. Ms. Leah will provide **examples** of (standards-aligned) ways to incorporate the MAD resource into STEM classrooms
4. Participants will **discuss** STEM education with respect to the Abolitionist Teaching framework

Mathematicians of the African Diaspora

- **M**athematicians of the **A**frican **D**iaspora (MAD or MATHAD) is a web textbook created by **Dr. Scott W. Williams** in 1997
  - Dr. Williams is an award-winning mathematician and Professor Emeritus at SUNY Buffalo
  - He is also an activist and a poet

- The MAD textbook contains historical and contemporary information about mathematicians of African descent
- A new version is under construction (National Association of Mathematicians + Educational Advancement Foundation)

Read & Annotate (Think // Pair // Share)

Most histories of mathematics devote only a few pages to Ancient Egypt and to northern Africa. **G**enerally they ignore the history of mathematics in Africa south of the Sahara and give the impression that this history either did not exist, or is not knowable or traceable. **I**n history, to Europeans, even the Africanity of Egyptian mathematics is often denied or suffers Eurocentric views of conceptions of both 'history' and of 'mathematics.'

Purely Eurocentric origins of mathematics can no longer be upheld. The oldest mathematical object (35,000 BC) was found in Swaziland. The oldest example of arithmetic (6000 BC) was found in Zaire. The 4000-year-old Moscow papyrus from the Middle Kingdom of Egypt contains geometry. Egypt was the cradle of mathematics (astronomy and surveying too). The earliest great Greek mathematicians all learned much of their mathematics from Egypt (Mesopotamia, and possibly India)—even the concept of zero.

→ According to Dr. Williams, what is the problem with math history?

→ What do you think the word "Eurocentric" means?

Sample MAD 5E Overview (2-day version)

- **Engage (25 min):** Where did math come from? Who invented it? Students discuss; teacher facilitates and introduces historical context, addresses misconceptions (full-class, small groups, total participation, or mix)
- **Explore (45 min):** Teacher introduces idea of creating a presentation on "true math history" to classmates, school, and community. Students divide into groups and explore the MAD resource; construct one slide per group.
- **Explain (25 minutes):** Each group presents their slide to the class, while non-presenting classmates complete a peer evaluation rubric.
- **Elaborate & Evaluate (25 minutes):** Students will complete a reflection on the learned material and presentation feedback.

Condensed Conference Version (10 min)

1. **Chose a topic** and copy-paste the link in your web browser.
    a. Myths, Lies & Truths: http://math.buffalo.edu/mad/myths_lies.html#myths&lies
    b. The Ishango Bone: http://math.buffalo.edu/mad/Ancient-Africa/ishango.html
    c. The Concept of "Zero": http://math.buffalo.edu/mad/Ancient-Africa/mad_ancient_egypt_zero.html
    d. Ancient Algebra: http://math.buffalo.edu/mad/Ancient-Africa/mad_ancient_egypt_algebra.html
2. **Join a breakout room** labeled with the topic of your choice.
3. **Read the material** with your group (taking turns is encouraged).
4. **Discuss the material.** What was your prior knowledge in or exposure to this topic in math history? Did you have any misconceptions? What did you learn?
5. **Choose 1-2** new or interesting facts on your topic to share out as a group.

Teaching Math in Context

Teaching from a historical framework can help answer the commonly asked questions...

1. **Why** is math this way?
2. **Where** did it come from?
3. **Who** makes the decisions in math?
4. **What** does math have to do with me and my life?

...and help empower students to see themselves as part of history,

capable of using and developing skills to address problems

Standards-Aligned Uses for MAD

- Lebombo and Ishango Bones **(Units and Measurement)**
  - **6.SP.B.5.B** Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.
  - **8.EE.A.4** (part) ...choose units of appropriate size for measurements of very large or very small quantities
  - **8.SP.A.1** Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities.
  - **N-Q.A.1** Use units as a way to understand problems and to guide the solutions of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays
  - **N-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
  - **N-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling.
- **Extensions:** physics, chemistry, engineering, biology

Standards-Aligned Uses for MAD

- Origins and Applications of Zero **(Systems and Inverses)**
  - **6.NS.C.5** Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.
  - **7.NS.A.1.B** Understand p + q as the number located a distance |q| from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.
  - **7.NS.A.1.C** Understand subtraction of rational numbers as adding the additive inverse, p - q = p + (-q). Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.
- **Extensions:** physics, engineering, chemistry

Standards-Aligned Uses for MAD

- Ancient Arithmetic **(Number Systems and Intro to Algebra)**
  - **6.NS.C.7.B** Write, interpret, and explain statements of order for rational numbers in real-world contexts.
  - **7.NS.A.2.B** Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then -(p/q) = (-p)/q = p/(-q). Interpret quotients of rational numbers by describing real-world contexts.
  - **N-RN.B.3** Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational and that the product of a nonzero rational number and an irrational number is irrational.
  - **A-APR.A.1** Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
- **Extensions:** physics, economics, computer science

Standards-Aligned Uses for MAD

- Ancient Algebra **(Equations and Real World Problems)**
  - **6.RP.A.3** Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.
  - **6.EE.B.6** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.
  - **7.RP.A.2.C** Represent proportional relationships by equations.
  - **7.EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
  - **8.EE.C.7** Solve linear equations in one variable.
  - **8.EE.C.8** Analyze and solve pairs of simultaneous linear equations.
- **Extensions:** the possibilities are endless

Other Important Uses for MAD

HISTORY OF BLACK WOMEN IN MATHEMATICS

Euphemia Lofton Haynes (1890 - 1980)

Biography by: Kedesha

Martha Euphemia Lofton Haynes was the first African American woman to earn a Ph.D. in Mathematics. Martha Euphemia Lofton Haynes was born in Washington, D.C. Martha Euphemia Lofton Haynes was interested in mathematics she received a B.A. in Mathematics minor in Psychology. Haynes received a masters degree in education from the University of Chicago, where she also did further graduate studies in mathematics. She earned a doctorate degree in mathematics from Catholic University of America (CUA) in 1943, becoming the first black woman to receive a PhD in mathematics. Martha Euphemia Lofton Haynes died in 1980.

Evelyn Boyd Granville (1924 -)

Biography by: Timaijha

The Mathematician I chose was Evelyn Boyd Granville. Evelyn was born and raised in Washington DC where she attended Dunbar high school which she graduated from as valedictorian. She was interested in and studied physics and mathematics. Evelyn earned a degree in Master of Arts at Yale University for physics and mathematics. In 1950 Evelyn accepted the position of an associate professor at Fisk university which she taught at for two years. She stayed at Fisk university for two years after that she started a career in private industry. After that she worked for the National Standards Bureau, then soon retired after that and now she is 96 years old and lives in Tyler Texas with her husband Edward V. Granville.

Marjorie Lee Browne (1914 - 1979)

Biography by: Mariah

For my mini-biography I choose to talk about Marjorie Lee Browne. Marjorie Lee Browne was born in Memphis, Tennessee on September 9, 1914. Dr. Browne was interested in continuing education for middle school teachers. She ran many summer programs for that reason, and authored four notes for their use: *Sets, Logic, and Mathematical Thought* (1957), *Introduction to Linear Algebra* (1959), *Elementary Matrix Algebra* (1969), and *Algebraic Structures* (1974). She graduated from Howard University; MS (1935) with BS. Browne also graduated from University of Michigan in (1950) with a Ph.D. Marjorie Lee Browne died October 19, 1979 but will be remembered in history, Math history.

Gloria Ford Gilmer (-)

Biography by: Ayanah

Gloria Ford Gilmer is a mathematician who received her A.B., A.M. and Ph.D. Gloria was born in Baltimore, Maryland. Gloria was interested in ethnomathematics, which describes the mathematical practices of different cultural groups. She earned a B.S. in mathematics from Morgan State University and she earned an M.A. in mathematics from the University of Pennsylvania. After a few years, Gloria Ford Gilmer earned a Ph.D. in curriculum and instruction from Marquette University. She was the first woman to give the National Association of Mathematician's Cox-Talbot Address. Gloria Ford Gilmer is not dead.

Grace Alele Williams (1932 -)

Biography by: Aaliyah

The person I chose to write about is Grace Alele Williams and she has a doctorate. She was born December 16th, 1932 in Warri Nigeria. She was interested in Mathematics and went to a lot of Universities for it. Grace received her education at Queens College in Lagos, University College at Ibadan, and the University of Vermont, before receiving a Ph.D. in mathematics education from the University of Chicago in 1963. Grace studied math a lot. Grace is an educator who made history as the First Nigerian Female Vice-Chancellor at the University of Benin. She was also the first Nigerian woman to receive a doctorate degree and is a professor of mathematics education. Grace Alele Williams is still alive and according to Google, "After serving as the Vice-Chancellor of the University of Benin, she joined the board of directors of Chevron-Texaco Nigeria."

Kate Okikiolu (1965 -)

Biography by: Tayqwuin

Katherine Adebola Okikiolu was a black woman who had a B.A. in math and also a Ph.D. in math. She also was the first black woman to win the most prestigious award for young mathematics researchers. Katherine was born in 1965 and is from England. Katherine was interested in *The Analogue of the Strong Szego Limit Theorem on the Torus and the 3-Sphere.* Katherine had a B.A. and earned it from cambridge university and also she earned a Ph.D from UCLA. Katherine was studying mathematics from both her colleges and eventually she became an assistant professor. Katherine is alive and is 56 years old. She is teaching inner city kids mathematics and is trying to help as many kids by making videos for those who like math.

Decolonizing STEM Ed Using the Abolitionist Teaching Framework

- Decolonizing Education
  - *Teaching to Transgress: Education as the Practice of Freedom*, Dr. bell hooks (1994)
  - Welcoming the struggle of transforming education as subjects with power
- Abolitionist Teaching
  - *We Want to Do More than Survive: Abolitionist Teaching and the Pursuit of Educational Freedom*, Dr. Bettina Love (2019)
  - Acknowledging the intersecting oppressions that impact students
  - Deconstructing and rejecting the "Educational Survival Complex"
  - Channeling abolitionist strategies of resistance, imagination, and boldness
- **How might we apply this framework to STEM Education?**

Decolonizing STEM Ed Using the Abolitionist Teaching Framework

1. Read through some selected practices of abolitionist teaching:
    a. **Working with community groups and activists** (to address issues impacting students and students' communities)
    b. **Civics education** (especially examples and strategies of resistance)
    c. **Restorative justice** (refusing zero-tolerance and school-to-prison pipeline)
    d. **Black Excellence and Joy** (protecting students' spirit & potential)
    e. **Confronting Whiteness** (settler colonialism, Eurocentrism, rage)
    f. **Reimagining curricula** (to include all of the above)
2. Think about your own STEM teaching practice. Identify one area where you might incorporate abolitionist teaching into your classroom, either as an environmental or curricular change.

Thank you! Questions and Comments Welcome

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