

BRIEF HISTORY OF THE MATH AVATAR/MATH HERO TWO-PART ACTIVITY

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When I heard Professor Michael Dorff's 2021 [MAA keynote address](#), in which a culturally diverse group of math heroes who have changed people's lives using mathematics was presented as the Frodos and Celies of mathematics, the experience sparked this thought: shining a spotlight on these impactful individuals and their accomplishments might lead students to realize that a diverse group has made their mark in the world with mathematics and using mathematics in service of science and then believe him or herself eligible to

be counted among that group.

I know many students don't do well in math or even believe they can. But what if my students could look into the accomplishments of these unsung heroes, using math to change people's lives, and find one to relate to. Then each student could go through the class with a little avatar of a math hero, a smart angel hovering over a shoulder who whispers in their ear. There are people in the class who don't even want to throw their hat in the ring. Advisors tell me many students delay taking math, thinking it will be too tough. What would happen to success rates, I wondered, if every student could relate to a successful math hero and start with the belief that they could succeed. [The American activist Marian Wright Edelman famously said, "You can't be what you can't see." She believed that children are less likely to be inspired for their future, if they don't have visible role models.](#) "Inequitable access to quality mathematics-learning experiences has been a long-standing, immensely pressing, occasionally infamous, yet gradually growing concern in mathematics education research (Lubienski & Bowen)." [It's a problem.](#)

In the 1980s, Bob Moses started the [Algebra Project](#), meant to expand access to math education into traditionally underserved communities. In 2001, he said, "I believe that the absence of math literacy in urban and rural communities throughout this country is an issue—as urgent as the lack of registered Black voters in Mississippi was in 1961." All these years later, the STEM success gap still exists.

The *Math Avatar/Math Hero* two-part activity is an intervention predicted to increase student success for every enrolled student. This intervention spotlights individuals who used mathematics to change lives. It's simple to explain. On day one, each student selects a math hero and explains why they selected that person as part of their introduction. In the final week of class, each student submits a journal that describes how their math hero would approach a real-life problem they face.

Grit matters most for course material considered especially tough; for university mathematics courses, many students need to internally commit that they will find a way to complete the work and succeed, or it won't happen. And, adult learners won't always apply themselves fully when learning ideas they believe have no practical application. When students become familiar with the achievements of a group of diverse math heroes, they may upgrade their ideas about whether mathematics is useful in the real world. When a student selects a math hero, possibly changing their classroom avatar to the one they

selected (further identifying with the math hero), they may upgrade their prediction of their capacity to succeed in the class.

This powerful intervention has a broad appeal.

*When I presented on the Math Avatar/Math Hero Activity at the 2023 UAGC TLC conference on a panel with non-math professors, more than one *panelist* expressed interest in doing something similar using English heroes or the like with their students.

*When presented with the math avatar activity, professors predicted students in a math class that includes this activity would do better. The data shows the professors' hunches were correct.

Session Type	Session Start Dates	MAT 222 Enrollment	Pass	Fail	Drop
Control	7/23/24 to 1/07/2025	1349	92.9%	4.5%	2.5%
Intervention	1/28/2025 to 7/1/2025	1235	95.1%	2.8%	1.9%

Outcomes so far: Academic performance improved. In our study of over 2,500 students, students who enrolled in an online learning space that included the *Math Avatar/Math Hero* two-part activity were slightly less likely to drop. Of those who stuck with the class, pass rates improved by 2.2%, and students were less likely to fail (4.5% vs. 2.8% with the intervention).

If the intervention group had succeeded at the same rate as the control, then of 1235 students, an estimated 28 students would not have succeeded in their required math course. With the intervention, they succeeded and got one step closer to graduating.

This successful intervention has broad appeal and may be adapted for other classes. It will be added to Introductory Statistics in late 2025.

I will report further at the [2025 UAGC TLC](#), so stay tuned. This could become the gold standard for STEM education.

Math Hero Trivia:

Who can be selected as a math hero? Some examples are provided in the classroom, but as long as the person has used math to change other people's lives, a student can choose their favorite math hero.

Who is the most selected math hero?

In my last four intermediate algebra classes, 15% of students selected Katherine Johnson, a NASA mathematician whose Washington D.C. headquarters bears her name. In the Ethnomathematics lecture, I describe how she did trajectory analysis for Alan Shepard's mission in 1961 and John Glenn's mission in 1962. (John Glenn would not take off until she signed off on the calculations.) If you've seen the film *Hidden Figures*, Taraji P. Henson plays Katherine Johnson, who was awarded the [Presidential Medal of Freedom](#) by President Obama. [Photo of Katherine Johnson](#)

I'm curious about the Ethnomathematics lecture that appears in a couple of UAGC math classes. What is one takeaway from that?

One takeaway: "Mathematical explorers have been part of every civilization in every corner of the earth. [Professor Furuto \(Chair of first Ethnomathematics department\)](#) sees the importance of drawing a straight line from the mathematical explorers in her students' cultural history to the mathematical identity she'd like her students to embrace (Su, 2020)." The study of ethnomathematics reminds students of their mathematical history, including that those who were able to do math and science in favor of their relatives and friends supported their group's survival." (ethnomathematics lecture transcript)

What are some common problems students apply the math hero's strategies to solve?

Juggling competing priorities at work and time management are two that come to mind.

Student quotes: "When I think about how Galois would help me today, I imagine he'd look at a life problem; like juggling school, work and stress; and do what he did best: restructure it. He would find patterns in the chaos, break things into smaller groups and apply order. More than anything, he'd remind me not to wait for permission to believe in my ideas." -- UAGC student

"One challenge I currently face in both my work and home life is completing my bachelor's degree. As a working single parent, pursuing a degree has been incredibly difficult, and there are moments when it feels impossible to continue, especially when life throws unexpected obstacles my way. But when I think of Mary Jackson and her ability to solve problems as both an engineer and a mother, I imagine she would approach a challenge like this by creating a precise schedule and organizing her routine to ensure her success." -- UAGC student

For information on adapting the Math Avatar/Math Hero Activity to your in-person classroom or to a K-12 audience, write to holly.ourso@uagc.edu or on [LinkedIn](#).

References

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