Storytelling for Mathematics Learning and Engagement

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Image of Jacob Lawrence painting removed from slide deck. View it online at https://lawrencemigration.phillipscollection.org/the-migration-series/panels/58/in-the-north-the-african-american-had-more-educational-opportunities

CADRE Learning Series on Using Video in DRK-12 Research

Overview

This three year DRK-12 study funded by NSF seeks to address three key issues in mathematics education:

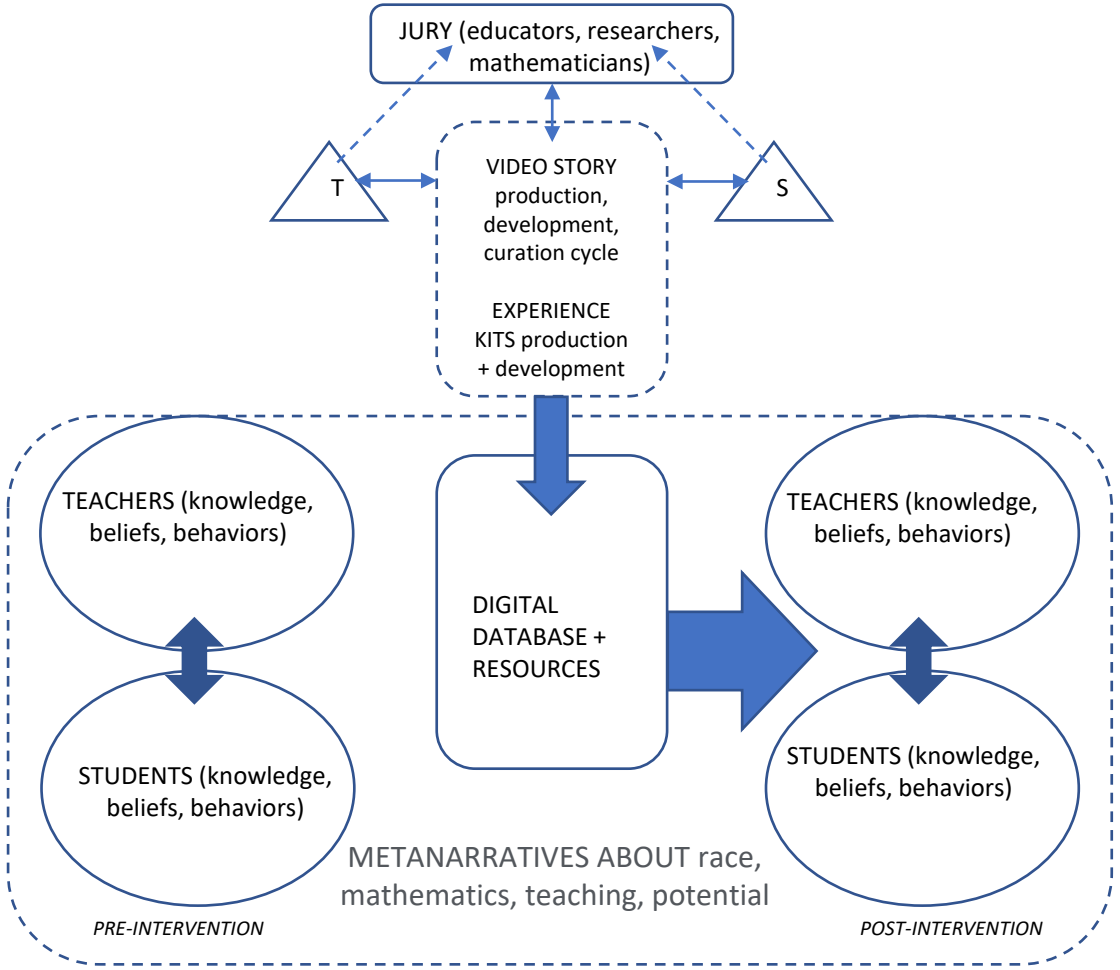
(a) narrow conceptions of mathematics as a discipline;

(b) the lack of racially/ethnically diverse role models for mathematics in terms of representation in the public imagination, media, and schools; and

(c) a paucity of resources for instruction to harness students' early interest and engagement in mathematics across racial and gender groups.

Project Design

We collected and curated digital stories of mathematicians sharing stories of their learning within and beyond schools, excerpted from longer interviews. These short videos are to become part of a K-8 mathematics curriculum as well as part of a more extensive digital database of mathematics stories that will be aligned with K-8 mathematics content and other topics.



Research Questions

Overall, we are exploring questions related to the use of mathematics storytelling and its impact on K-8 teacher and student mathematics learning and engagement:

- How do digital mathematics stories told by mathematicians affect teachers' and students' mathematics engagement?

    Specifically, for teachers, how do they influence teachers' beliefs (about students, mathematics, and teaching) and practice? For students, how do they influence students' beliefs, interests, and attitudes toward mathematics and themselves as mathematics doers?

- *How do teachers incorporate digital and non-digital mathematics stories in their practice?*

What We Are Finding So Far: How Teachers and Students Respond to Mathematicians' Videos

- Teachers' focus group data have centered on 5 key themes (content, pedagogy, production aspects, potential for engagement for students, especially Black and Latinx students, and inspiration for teachers).

- Students (grades 3 – 8, plus a 6 year old) are very engaged by the videos:
*What stood out to me is that I've never heard the term 'applied mathematician.' It stood out because I've never heard that. And using it in aviation especially, or like any other topic. [...] It stood out that she worked in a field of math that I've never heard of. *** The videos reminded me of [...] how math is entwined with a lot of how we think, and we might not even know that. It really changed my view on what we can do about math and how we view and interact with math. *** This helped me a lot for me to think differently about math: solving problems in the real world, doing board games and using probability to win that Connect Four game. This group is very diverse, and I just love it. *** They changed my feelings because they made math feel more fun for me. They used different ways to show how math helps you in the real world and how you can do math with anything.*

What We Are Finding So Far: How Teachers and Students Respond to Mathematicians' Videos

A note: Some teachers felt that some topics brought up by mathematicians might not be accessible to elementary-age students, and some preferred videos that would be directly connected to content students were learning, but students often found this aspect of the videos very engaging (for example, one student said, '*I like how they prepared you for higher math and stuff that we are probably not going to learn in a long time, but they prepared us for it. So then it won't, it won't be as hard as it would be for other people'*).

The (Surprising) Role of Video in This Project

Dr. Nira Chamberlain Interview_1

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NOTES

General: lots of popular culture references; connections to other disciplines; reframing who mathematicians are and what they do; very engaging

Speaker 2 ▸ 09:56

Okay. Um, well there was, um, you know, I do have to mention there was one teacher and, um, you know, and he was a, let's say a career teacher, I believe I was around about 15. And so, cause you know, the age you have to go to the career teacher and the career teacher advise you about your future career. So he said to me, he goes, what would you like to be when you grow up or what you want to do as a career? And I said, I want to do something that involves logic and mathematics. I didn't realize I could actually be a professional mathematician at the time, but I wanted to do something that involved logic and mathematics and the career teacher said to me, he says, well, Nira, somebody of your physique, you should become a boxer. I said, a boxer. I said, yes, you should become a boxer. So, um, I went home, you know, and I told my parents, I said, look, the teacher thinks I should become a boxer. I said, mathematics logic. And he said, I should become a boxer. And my parents said this to me. They says, you don't need anybody's permission to be a great mathematician. So he said that, my parents had something positive and that statement has stuck with me for the rest of my life. You know, you don't need anybody's permission to be a great mathematician.

Speaker 1 ▸ 11:07

Are there other things that your parents, um, did or told you that contributed to your being a mathematician?

Speaker 2 ▸ 11:15

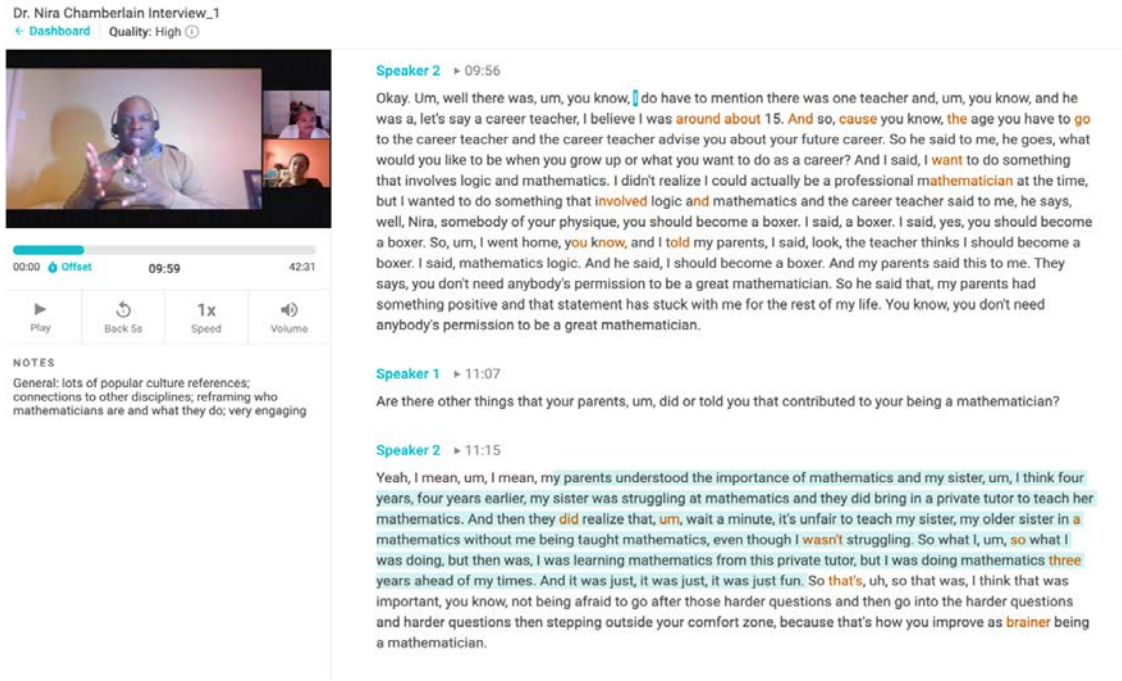
Yeah, I mean, um, I mean, my parents understood the importance of mathematics and my sister, um, I think four years, four years earlier, my sister was struggling at mathematics and they did bring in a private tutor to teach her mathematics. And then they did realize that, um, wait a minute, it's unfair to teach my sister, my older sister in a mathematics without me being taught mathematics, even though I wasn't struggling. So what I, um, so what I was doing, but then was, I was learning mathematics from this private tutor, but I was doing mathematics three years ahead of my times. And it was just, it was just, it was just fun. So that's, uh, so that was, I think that was important, you know, not being afraid to go after those harder questions and then go into the harder questions and harder questions then stepping outside your comfort zone, because that's how you improve as brainer being a mathematician.

The (Surprising) Role of Video in This Project

We have ended up using video in two different domains:

1 Design

- Using Streamyard to digitally record ~60 minute interviews between mathematicians and the research team
- Using video (Temi) for AI generated transcripts with which to identify key moments, engaging stories, and curriculum topics for excerpts (3 per mathematician)
- Using video and embodied engagement of mathematicians to create and choose animations



The (Surprising) Role of Video in This Project

2 Research

- Key research design plans for collecting data were affected; the COVID pandemic meant that we collected data (focus groups, so far) via Zoom;
- We are now coding and analyzing video data in addition to printed transcripts [on a constant quest for good tools];
- Using Zoom has meant participation in focus groups for teachers and students is often easier and more accessible (for example, several teacher focus groups included teachers from around the country, whereas before we would have travelled to sites to interview 'local' teachers. This has highlighted some regional/political concerns that teachers have about using these videos in math class;
- Video recordings of focus groups allow us to see things we might not have seen otherwise, e.g., the research team often sees and hears important data (for example, nonverbal cues) in reactions to videos and other participants' comments.

Closing Thoughts

- Access to 30 full-length interviews (~60 min): Researchers, participants, the public?
- Access to 90 excerpts (~2-3 min)
  - Some excerpts 'live' in a K-8 mathematics curriculum
  - Set of 90 will live in a freely available digital database [sample videos available here]

Dr. Tasha Inniss

Introduction

Advice to Teachers

Prices & Ratio

Thank you !

Project Team

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