

The Hesabu Circle

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Introduction

For many in the mathematics community, the aftermath of the murder of George Floyd was the first time an awareness was sparked of the generational and systemic injustices that have stifled the growth and flourishing of Black minds. Throughout history examples of these systemic injustices include colonial exploitation, slavery, Jim Crow, red lining, and rewriting the history of African contributions to civilization. These have been targeted, overt, and acute interventions that had a specific target population, and a particular outcome in mind. The consequences and repercussions of these are the fabric of the world we live in, with varying degrees of expression in the United States and throughout the diaspora. As a result, for the majority of Black learners in mathematics classrooms at all levels, there has been the burden to navigate a space that was not conceived of with them in mind, from which their ancestors were excluded, and that in various ways can be hostile to their culture. Mathematics classrooms rarely intentionally include Black or African American students, culture, and contributions. Rather, the contributions and ways of engagement of Black students in the classroom are often misunderstood and have even been criminalized [11]. Couple this with societal and academic perceptions of mathematics as objective truth, with minimal concern for one's subjective lived experience, and it should not be surprising at all that Black students rank at or near the bottom of test scores in mathematics, and while they represent 13% of the population in the United States, they represent less than 1% of students in classes with significant advanced math content. A large public institution in southern California recently reported that of their 274 math majors, only 2% identified as Black/African American [3]. Further, less than 1% of PhDs are awarded to African Americans each year according to the *New York Times* [7].

Educational initiatives to overcome these challenges cannot be scattershot. They must be just as intentional as the interventions that led us here. In fact, the instrument used for healing must be even more deliberate than that which inflicted pain, as it is always more difficult to rebuild than it is to destroy. This point has been underscored by many

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DOI: <https://dx.doi.org/10.1090/noti2428>

scholars, most notably Gloria Ladson-Billings and Danny Martin, among others ([1], [5], [6], [10]). While initiatives to support “students of color” or “underrepresented minorities” are critical, there is an important sense in which the awareness, acknowledgement, and celebration of Black/Pan-African heritage as eminently mathematical empowers students to see themselves as capable, and fosters a sense of belonging to the wider academic community. In addition, it has the power to build instructors’ belief in the ability of these students, and chip away at the deficit mindset engendered by the systemic evils spoken of earlier. The Hesabu Circle is a tangible effort to rebuild the identity of members of the Black community as doers of mathematics.

The Hesabu Circle

The Hesabu Circle started in summer 2020 as the intentional response of Black mathematics faculty and administrative staff at southern California campuses to the dual pandemics of COVID-19 and systemic racism. “Hesabu” is the Kiswahili word for “Mathematics.” The founding members include Dr. Kagba Suaray, professor, California State University, Long Beach; Dr. Kyndall Brown, executive director of the California Mathematics Project and board member of the National Council of Teachers of Mathematics; Dr. Rob Rubalcaba, associate professor of mathematics and Umoja Math Coordinator, San Diego City College; Dr. Edray Goins, professor, Pomona College; Dr. Robin Wilson, professor, Cal Poly Pomona; Christine Charles, professor, Long Beach City College; Kekai Bryant, mathematics teacher at YouthBuild Charter School, Los Angeles, CA; Micki Grayson, director of Trio programs at Moreno Valley City College; Pamela Lewis, senior director, Multicultural Affairs & Inclusion, CSU Long Beach. The Circle is about creating connections for mutual support. We seek to break down artificial barriers caused by geography, institution, or academic level, and build networks of support that encourage and empower individuals of African descent to envision and achieve excellence in mathematics. A core piece of our mission is rebuilding our self-confidence, identity as doers of mathematics, and instilling pride in our potential. We endeavor to accomplish this for each individual, and for the community.

How do we make this happen? The two instruments implemented to bring about these goals have been our monthly culturally relevant virtual mathematical explorations, and the “Math-Is-Me” summer program. Our monthly events have connected the Circle with a wide range of participants from four continents. Each event



Figure 1. Hesabu logo.

has drawn 35 participants on average with attendees of all ages including K–12 students, college students, Umoja students, graduate students, college faculty, teachers, and community members. Our first event was during Kwanzaa, December 2020, and has set the tone for how we get down in the Circle. The event was scheduled to coincide with the 3rd day of Kwanzaa, Ujima, which means collective work and responsibility. Over 70 students, their parents, and educators came to the Circle to experience mathematics from a culturally responsive lens. Our first meeting went well beyond our planned event time due to the interest of the parents and educators in having conversations about the importance of mathematics education for the Black community. It was at this moment that we realized great need for this space and its potential impact went beyond what we had originally envisioned.

At our monthly gatherings we open up with a slideshow of affirming images of Black excellence in mathematics, past, present, and future. From there we extend salutations and recite the Kiapo (a liberatory declaration of unity in struggle and purpose) in call and response fashion. After this, we typically have a distinguished speaker or a panel discussion, demonstrating and exploring the mathematical threads woven throughout Black/Pan-African culture. Topics have included *Hope and Healing for Black Girls in STEM*, *Fractal Motifs in African Culture*, *Mathematics of Hip Hop*, and *Math and Money*. Next, we commence into an interactive portion that draws the participant in to engage with what they have just learned in reflective or fun ways. Activities include learning and developing strategy in the African game Achi, playing Kahoot! games, and creating “Birthday Fractals.” Finally, we always conclude with the “Family Circle,” an open discussion between academic professionals and members of the community. This has led to powerful conversations regarding race in the mathematics classroom, as well as detailed support offered to individual parents seeking to build mathematical confidence in their



Figure 2. Hesabu Circle Math-Is-Me mentor Tre Willingham teaching students at the Compton Comet rocket project.



Figure 3. Hesabu Circle Math-Is-Me mentor Tre Willingham teaching students at the Compton Comet rocket project.

children. One of our regular attendees stated “Please allow me to begin by saying how much I enjoy the Hesabu Circle! 😊 Learning is fascinating regarding the ways that Mathematics is involved in the vast majority of everything that we do in life. Some branches of Mathematics have been extremely difficult, although it is something that I have always loved. Since connecting with the Hesabu Circle, I am learning to say, ‘used to be extremely difficult.’”

Building on the strength of the monthly events, the Hesabu Circle core team sought to create a summer program for more consistent connection and support for Black students. Supported by a Tensor SUMMA grant from the Mathematical Association of America in spring 2021, this program is designed to provide year-round academic support in mathematics and mentoring for students across educational institutions in the greater Long Beach, CA, area and beyond. There are two components of this program:

- The first is year-round tutoring and mentoring for all program participants, with fun projects that connect mathematics to our cultural heritage and real-world challenges faced in the Black community.
- The second was a summer mentoring and support network for girls and young women, which gave them direct connection to academic coaches who modeled and inspired the greatness within.

During the summer 2021 component, 4th–12th graders and college students had one-on-one interaction with nationally recognized mathematicians and math educators, and discovered rich expressions of mathematics in

Pan-African culture. Students learned about Egyptian numerals and multiplication, the Ishango Bone and other uses of mathematics in ancient Africa, the mathematics involved in DeeJayng and music production, two-way tables and probability linked to their African ancestry, origami, and thinking about the “flat earth theory” critically and mathematically. In addition, there was a field trip to the “Compton Comet” led by two of our college student mentors. The “Compton Comet” is a rocket built by Compton College students Manuel Marques, Aarington Mitchell, and Tre Willingham that is estimated to reach an altitude of 20,000 km and will use a 2-parachute dual deployment recovery system (<https://www.rrs.org/tag/compton-comet/>). Central to the pedagogy at the Hesabu Circle gatherings is a value system best described by the ICUCARE framework developed by Dr. Pamela Seda and Hesabu Circle core team member Dr. Kyndall Brown [2]:

- **I**nclude others as experts
- Be **C**ritically conscious
- **U**nderstand your students
- Use **C**ulturally relevant curricula
- **A**ssess, activate, and build on prior knowledge
- **R**elease control
- **E**xpect more

Students and parents have commented on the impact the program has made. For many Black students in America, mathematics as typically presented in the classroom is understood as foreign, other, disconnected to their lived reality. By exposing students to culturally responsive curriculum and engaging them in an unapologetically Afrocentric manner, students who initially called math their least favorite subject were asking their parents for extra practice problems on a random weeknight in the middle of the summer. This speaks to the evolution in the students’ minds from the idea that mathematics is not for them to the idea that “Math-Is-Me” and the formation of a positive mathematics identity. The idea that mathematics is “not for me” is one that many individuals from underrepresented and minoritized groups experience at all educational levels, even post PhD. The earlier in one’s academic journey this evolution into a “Math-Is-Me” identity takes place, the greater chance of enjoyment and enthusiasm for mathematics.

How to Get Involved

The Hesabu Circle is here to uncover and facilitate the latent love for mathematics in the Black community. While role modeling by exposing young people to professionals that look like them and have relatable backgrounds is a critical part of what we do, there is an important role that allies can play in this work. Learn about the contributions of Africa to the growth and development of mathematics. Learn about African-descended mathematicians in your field, and give brief biographical sketches as part of one of your lectures related to a result they have proved (the www.mathad.com website is an amazing resource for this). Listen to your

students speak about what is important to them, including cultural distinctives, and invite them to think about how mathematical reasoning or computation might play a role in these things. Find like-minded colleagues and work together to advocate and support the Black students in your program. Acknowledge them, set high standards, provide alternative culturally relevant angles to view and explain the subject matter, and get ready to experience excellence. Request institutional support and find administrators on your campus that see Black student success as a priority. For administrators, put some weight behind your statements regarding racial justice. Many who work in this space do so on a volunteer basis, which can be taxing. Release time or other forms of institutional support for those invested in this work can go a long way. As mathematicians we have the subject matter knowledge to assist learning, but it is important to involve persons with a knowledge expertise in mathematics and STEM education as well as academic leadership to participate in changing the narrative.

Finally, don’t reinvent the wheel. Learn from those that have been engaged in this work about how you can implement their domain knowledge to your specific context ([2], [4], [8], [9]). We received invaluable assistance from the Business of Student Success (B.O.S.S.) program (<https://www.bossprograms.org/>), which had solid connections in local districts and assisted with recruitment. In addition, CSU Long Beach Sister Friends (<https://www.instagram.com/csulbsisterfriends49/>) is a campus organization with a proven track record of mentoring for Black women, and graciously shared that wealth of experience with our participants. In that vein, link up with the Hesabu Circle, and tell your students about it. Our cultural explorations are a great way to accomplish many of the points listed above. Moreover, students will be able to find a space where their identities are affirmed, and the isolation and imposter syndrome so commonly faced by Black students taking STEM courses can be tackled head on.

Hesabu Circle URL:

<https://the-hesabu-circle.mailchimpsites.com/>

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Reflections on Running an REU (With an Eye towards Equity)

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In summer 2021, we designed and ran our first REU. From the start, our goal was to create a positive first math research experience for students from groups historically excluded from academic mathematics. Overall, we had a wonderful time, as did our students! In this reflective piece, we pose the key questions we asked ourselves throughout the process. We hope that readers will not consider our guiding questions as prescriptive or exhaustive—they were simply what worked for us. This article, structured both chronologically and according to some major themes, is aimed at other junior faculty who are organizing REUs with marginalized students in mind.

Every REU should be welcoming to *every* student. Whether you succeed at this or not will have a significant impact on your students' perceptions of themselves as mathematicians. Because most mathematical research communities are, by default, constructed for white, cis, straight, and able-bodied men, it is essential to consciously design a space where marginalized students feel equally represented, supported, and valued. You have the power to create a program where your students have their mathematical talent and identities affirmed.

Why Are You Organizing an REU?

Before doing any organizing or planning, stop to ask yourself: *Why?* You should not be running an REU just to get a line on your CV—this is a serious long-term commitment to your students. Take the time to ask yourself: *What are you hoping to accomplish by running a summer REU? What do you hope to contribute to your REU students and their mathematical journeys?*

Thus, the first step in designing an REU is to set a goal. *Who are you trying to serve and why?* Outlining a guiding principle for your REU will pay off in the short and long term by focusing your efforts throughout the program. Our guiding intention (of providing a positive first mathematical research experience for minoritized students) shaped how we advertised, recruited, and structured our program; we discuss these aspects later in this piece.

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DOI: <https://dx.doi.org/10.1090/noti2427>