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## **“THEY’RE ALL GOING TO HEAR YOU BEING SILLY”: CHALLENGING DEFICIT VIEWS OF MATHEMATICS CLASSROOM PARTICIPATION**

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*This paper seeks to critically examine the mathematics classroom and illuminate modes of viewing the classroom by teachers and researchers that might constitute a deficit perspective. The focus of the study is a fourth-grade classroom in an urban charter school in a major US city on the North-eastern coast. The students in the class were engaged in computerized mathematical tasks designed by a team of mathematics educational researchers. The researchers’ primary focus was on developing a constructivist understanding of students’ learning of fractions; this paper presents the findings of a secondary investigation into perception of student participation through a critical analysis of the speech-based interactions of one student. The case serves to illustrate one instance of educators’ deficit gaze towards mathematics students, proposing a re-imagining of this gaze.*

### **WHAT DO WE SEE WHEN WE LOOK AT STUDENT PARTICIPATION IN THE MATHEMATICS CLASSROOM?**

In recent decades, researchers in mathematics education have taken an interest in the construction and expression of identity in the mathematics classroom (Gutiérrez, 2013). Research into identity and mathematical practice has been undertaken from various perspectives. Boaler (2002) and Boaler and Greeno (2000) highlighted the relationship between teaching practices and the development of mathematical identities. Nasir, Hand, and Taylor (2008) reported on how students’ performance on mathematical work in traditional and non-traditional contexts reflected how they saw and situated themselves differently in each setting. Esmonde and Langer-Osuna (2013) adopted a figured worlds lens (Holland, Lachicotte, Skinner, & Caine, 1998) to describe how students tend to cast themselves in different roles in different social realms, which in turn could serve as resources for students to empower themselves within formal mathematics schooling. In thinking about identity, the research cited here has focused on the relationship students have to being in the classroom, to other students, and to the practice of mathematics.

A significant portion of identity research has focused on the specific ways in which mathematical engagement produces and is produced by various social relationships (Gutiérrez, 2013; Langer-Osuna, 2018). The questions of researchers tend to emphasize identity as it applies to the accomplishment of mathematical work in the classroom or the ways in which extant social identities and narratives about social groups may realize or disrupt success in formal mathematics (Boaler & Greeno, 2002; Gutiérrez, 2013; Nasir & Shah, 2011). The breadth of such radical research has pushed the mathematics education community to contend with the ways

in which identity and power are implicated in access to school mathematics; it has also inspired discussions on how disrupting the processes of school mathematics—from curriculum to pedagogy—might be essential to reimagining the classroom and creating an equitable learning environment within it (Darragh, 2016; Gholson & Wilkes, 2017; Gholson & Martin, 2019; Gutiérrez, 2013).

It is to this latter goal that I direct the study described in this paper. I am interested in thinking about how educators and researchers view students’ activity and interactions in the mathematics classroom and how this gaze casts students in specific roles that influence the making of their mathematics identities. To this end, the paper takes an interest in all student activity, speech, and interaction, even that which may not explicitly be considered as being related to mathematics. In particular, I include data that some within the research community might characterize as “off-task” interactions—interactions that are not explicitly about the mathematical task students are expected to be engaged in—in enabling and dismantling participation and collaboration during mathematical activity (Langer-Osuna, 2018). It is important to note that the framework of the study reported here does not classify interactions as “on-task” or “off-task”. Instead, it seeks to unpack the many ways in which classroom interactions might be coded by teachers and researchers, and the implicit expectations surrounding mathematical performance that such coding reveals.

The mathematics education researcher is well positioned to examine the participation of the student in the classroom as a means to understanding the expectations of the space. Compared to the teacher, the researcher is in a more privileged position to do the humanizing work of seeing the student as engaged in the social practice of classroom mathematics (Esmonde & Langer-Osuna, 2013) rather than as a student of mathematics assessed to be at some level of success. hooks (1994) describes the “dis-ease (irrespective of their politics) among professors when students want us to see them as whole human beings with complex lives and experiences” (p.15). One might argue that a similar “dis-ease” persists among educational researchers when asked to regard the subjects of their studies—both teachers and students alike—as more than teacher and student. Among mathematics education researchers the discomfort is amplified, as the community remains divided on whether mathematics and its teaching have a socio-political dimension at all. This disagreement and discomfort notwithstanding, I take the view put forth by Gutiérrez (2013): that a socio-political grounding in research is crucial to rethinking mathematics education research, and that such a grounding demands viewing the mathematics classroom space from the perspective of those subordinated by it.

## **THEORETICAL FRAMING**

This paper adopts Gholson & Martin’s (2019) conceptual lens on mathematics learning as a performance that requires students to negotiate race, class, and gender identities simultaneously. Through an analysis of the speech-based interactions of one student during mathematics class, I try to illuminate the implicit expectations surrounding participation and interaction within the classroom space. The unit of analysis for the paper is thus the mathematics classroom as a social and interactional space, where the doing of mathematics is constituted through interactions with mathematical tasks and materials; with other students; and with the teacher (Darragh, 2016; Esmonde & Langer-Osuna, 2013; Gholson & Martin, 2019; Gutiérrez, 2013).

As a first attempt at describing the mathematics classroom as a social space, the study illustrates and

examines the interactions of one student, a black student. As such it is necessary to also frame the students' performance within the context of what it means to be black in the mathematics classroom, and what it means for the black student to be doing mathematics. Gholson & Martin's (2019) conceptual framework for studying mathematics learning as performance provides important context: Gholson & Martin justify their focus on blackness by describing the history of the mathematics classroom as an anti-black space in North America and the tendency of school administrators (as the primary actors on behalf of entrenched school systems) to police black bodies—specifically black female bodies—and regard them incapable of productive mathematical engagement. How blackness is taken up by the classroom space forms, therefore, some part of my theorization of the social space of the mathematics classroom.

Indeed, for sociolinguists studying Black English, research into language development in Black children is regarded as being worthy of its own subfield. Lisa Green, in her seminal work on the development of Englishes in black children, argues for the need to account for children's blackness in developing language teaching and assessment tools: how black children interpret and respond to teacher questions is often distinct from how non-black children typically might; when the black child is asked a what or what-and-how question, for instance, she is more likely to answer the "how" of it, ignoring the "what" of it (Green, 2010, p.6). As most educators and administrators work without such context, the responses and actions of the black children are disproportionately perceived to be incongruous and incorrect when compared with those of non-black children.

Other sociolinguistic research into Black bodies corroborates Green's (2010) arguments above and makes a case for educational research to discuss blackness when discussing black students' experience within the classroom space. Rickford & Rickford (2000), in their seminal work on African American Language "Spoken Soul: The Story of Black English", demonstrate how the language pervades American history, art, society, and popular culture "liv[ing] on authentically," (p. 3), in all spaces where life plays out in the United States, including schools. African Americans

...still invoke Spoken Soul as we have or hundreds of years, to laugh or cry, to preach and praise, to shuck and jive, to sing, to rap, to style, to express our individual personas and ethnic identities ("spress yo'self,!" as James Brown put it), to confide in and commiserate with friends, to chastise, to cuss, to act, to act the fool, to get by and get over, to pass secrets, to make jokes, to mock and mimic, to tell stories, to reflect and philosophize, to create authentic characters and voices in novels, poems, and plays, to survive in the streets, to relax at home and recreate in playgrounds, to render our deepest emotions and embody our vital core. (Rickford & Rickford, p. 4)

Indeed, soul inhabits Black spaces and the Black body so exhaustively that its invoking cannot be helped by those who speak it. Black performance is a tool for survival crucial to navigate the various spaces, including formal classroom environments, through which the Black body moves (Smitherman, 1999).

The sum of this research suggests that any examination of the social space of the North American classroom demands an account of blackness within that space: how do teachers and educators make available or inhibit access to mathematics learning because of how the formal classroom space takes up blackness? In other

words, what is the dominant imagining of the mathematics classroom, how is this imagining raced, and how does this imagining cast students as learners?

## DATA AND METHODOLOGY

This paper follows the engagement and interactions of a Black student named Olu, a nine-year-old in a fourth-grade mathematics classroom in an urban charter school in a North-eastern city in the United States. Olu uses he/him/his pronouns. The school is an urban charter elementary school located in a largely immigrant neighbourhood of the city. The majority of its students are from immigrant families of colour. Students in two of the school’s fourth grade classrooms were participants in a three-month pilot study. They were engaged in pairs on computer-based tasks on fractions designed by the researchers for the pilot. The primary interest of the investigators was in developing a constructivist understanding of how young learners learn fractions through interactive fraction-related activity. Each class in the pilot study had between 24 and 28 students.

As the participants worked through computer-based tasks in pairs, the researchers recorded their laptop screens in order to keep track of choices made within the activity as well as their own speech and voice-based interactions with each other as they peddled through the tasks. The tasks were designed to be somewhat self-guided, with the teacher checking in on each pair every now and then during a lesson. Sometimes, the teacher would conclude the lesson with a whole-class debrief of some of the tasks.

A secondary analysis of data from the pilot revealed interesting aspects of students’ participation in the classroom with the tasks. Students’ speech consisted of conversations with partners about the task they were collaboratively engaged on; conversations about the task with non-partners; conversations with partners not directly related to the task both while performing task-related functions on the computer and while not; conversations with non-partners not directly related to the task both while performing task-related functions on the computer and while not; interactions with the whole class during teacher-led discussions; interactions with the teacher that were one-on-one, with a partner, or with non-partners.

In the two incidents analysed, Olu is working on a task with another student, Maggie. Maggie is a non-black student of colour for whom she/her/her pronouns are used. The episodes include instances of Olu interacting with the screen, with Maggie, with other students, and with the teacher, Anna. Anna is a white curriculum administrator who has been recruited to teach this class for the purposes of the pilot. She is, therefore, relatively new as a teacher to the students; still, she has been with the group for about 6 weeks at the time the episodes analysed were recorded. She has, at this point, developed a good, affectionate rapport with the students. It is also important to note that as an administrator who is stepping into the role of teacher for the express purpose of the pilot study, her interactions with the students is often influenced by the broader goal of ensuring the students are engaged with the mathematics through the particular tasks designed for the study by the research team.

Screen recording software and microphones were used to pick up both students’ work on the computer-based

tasks as well as student speech during each lesson. Based on screenshots of student work, we determined whether Olu's (and Maggie's) speech at a given point in time should be categorized as directly related to his mathematical activity or not. The transcripts described here are selected from portions that were determined to be directly unrelated to the mathematical tasks students were working on.

## RESULTS AND ANALYSIS

In the analysis, I will describe instances of Olu's interactions from two different class sessions, interpreting them in terms of how his interaction is taken up (or not taken up) by Anna (the teacher) and by his peers (including Maggie, his partner). The first set of excerpts comes from a class in which Olu's partner, Maggie (who is also occasionally addressed as Magg), does not feel well for the duration of the lesson. Early into the class, Olu starts working through the tasks based on Anna's instructions. As he finishes his thinking on the first task, he relays his answer on the problem to Maggie:

Olu : Magg?  
Maggie : <no response>  
Olu : Magg!  
Maggie : <no response>  
Olu : The first answer is 18! Okay?  
Maggie : <no response>  
Olu : Are you okay? Are you okay?  
Maggie : No.  
Olu : You want me to do it by myself while you relax a little?

A few minutes later, as Anna stops to check in on the progress the pair are making, she notices that Maggie isn't participating in the tasks:

Anna : Maggie, are you helping?  
Olu : No, she isn't feel good right now, I'm going to do the work for her.

Anna acknowledges Olu's response to her question, and moves on to work with other students. Several minutes after this exchange, Olu decides to check in on Maggie again:

Olu : Maggie, do you feel better now?  
Maggie : (*inaudible*) A little.  
Olu : Okay.

The design of the study required students to work collaboratively on the tasks, so that they discuss ideas and make decisions together as they work through prompts. This is a significant expectation of the pilot, one that Olu attempts to meet by repeatedly trying to get Maggie involves in their collaborative mathematical work. Olu becomes alert to her non-responsiveness. He starts checking in on her, repeatedly asking if she's okay, and then suggesting that she take care of herself while he does the work. Between these interactions Olu is engaged in doing the work, thinking aloud as he figures out a task, and even occasionally letting Maggie know what progress he's made.

Throughout this episode, the screen recordings of the app show that Olu is working through the mathematical questions posed within the task. He is using the functions available on the app to generate images and representations that he then uses to answer the questions. Sometimes, in the moments of silence between the three sets of interactions described above, he speaks the answers loud enough to the screen so that the microphones can pick it up; at other times he turns to Maggie and speaks the answers or “what he got” out loud; the rest of the time he records his answer on the worksheet provided to him by the teacher.

In thinking about this mathematics classroom as a social space, Olu’s exchanges with Maggie and Anna suggests that the space is constructed to support students checking in and caring for each other; it suggests that the space supports a “doing” of mathematics that is simultaneous to these other types of interactions and cannot meaningfully be separated from them; it suggests that within the space, mathematical and non-mathematical activity are interwoven and need not be viewed as inhibiting each other in any way.

In the second instance presented for analysis, Olu continues to work by himself as Maggie, still feeling unwell, has left school early. Throughout this episode, Olu talks through the mathematical work, but much of this speech is interspersed with pronouncements about himself and with bursts of performance and singing. At nearly every stage of completing a task, Olu cries out the answer to no one in particular. “It’s two!” or “It’s four units, guys!” or “Another three, I think!” It remains unclear that anyone is listening as he shouts these answers out; yet for Olu the exclaiming seems like a way for him to validate and indeed affirm his work. In the same lesson, when Anna checks in and alerts Olu that he may have misread the directions on a task, Olu, upon realizing his error exclaims “I’m so stupid!” This is followed shortly by an exclamation of “I’m totally rocking this” after a different task. Olu’s performance of mathematics is loud and excited; he is happy to have “got the answer,” in some sense, and this might have to do with the value placed on the “right answer” in the classroom environment he finds himself in.

At some point in this episode, Olu starts to sing as he does his work. There is an entire four-minute stretch of data in which Olu sings uninterrupted, pausing only to shout out the answers he’s found to an audience of researchers listening to the audio files several months later. His singing elicits two responses. The first is from another student in the class. The student calls out to Olu, saying, “You gotta start coming to chorus!” Olu pauses his singing to reply “I’m already in band!” That seems to be the entirety of the exchange, and Olu returns to his singing and task work. A few more minutes into this simultaneous engagement in singing and mathematics, we hear Olu counting numbers on the screen to the tune of the song he has been singing. Here, the singing appears to take precedence over the mathematics, with the latter being accommodated into the music that simply must be performed.

At this juncture, Anna arrives to check in on Olu’s progress:

- Anna : What are you doing?  
Olu : Counting (*then resumes singing*)  
Anna : If you’re going to be silly on the microphone, then they’re all going to Hear you being silly.  
Olu: I’m just singing.

At the end of this exchange, Anna leaves and Olu immediately resumes both singing and his mathematical work.

This excerpt illuminates both Anna's and Olu's different imaginings of the classroom. For Anna, counting must sound a certain way (and perhaps not like song) and "being silly" is not something that needs to be captured as data for "them". Perhaps for Anna, as it is with most teachers and educators, mathematics is done in isolation and cannot possibly be simultaneous to other activities like singing. As a teacher-administrator with a vested interest in making sure "they" (the researchers) have something meaningful to work with, Anna is also construing Olu's participation as non-mathematical, or, worse, anti-mathematical. In policing—even if gently and with affection—Olu's body and performance within the classroom, Anna is adopting a deficit view of his work; discounting the mathematics that he is clearly engaged in because of the way in which he is performing this mathematical engagement.

Because it *is* mathematical engagement, as Olu asserts: he's counting. He doesn't even view his own practice as "silly" the way Anna describes it; he is doing math. When Anna points to his "silliness," she is referring to his singing—something Olu realizes immediately, based on his response that he is "just singing". Even if for Olu his singing does not interfere with the other activities expected of him, Anna's gaze interprets singing and counting as activities intrinsically at odds with each other in the social space of her classroom. Olu continues to sing, to call out the answers, and to congratulate or berate the quality of his own work for the rest of the lesson. To Anna these interactions do not add up to mathematics; perhaps Olu does not see them as separate, and therefore is unable to tease them apart.

## DISCUSSION AND SIGNIFICANCE

Olu's being in the mathematics classroom summons several performances: of self-declared successful and unsuccessful mathematics doers, of the singer, of the caring friend, to name a few. His mathematical work continues unabated, and often his non-mathematical engagement gets fused with it. Indeed, it is the gaze of the teacher or the looming but invisible researcher that delineates the two as different types of engagement. What is produced is a sort of engagement often invalidated by the system, with teachers often questioning the value of the mathematical work done if it is performed in a manner different from what is prescribed by mathematicians and educators. Olu's interactions in these episodes offer important perspectives for mathematics educators and teachers to consider: why should singing and caring be thought of as somehow separate from and worse detrimental to the doing of mathematics? Why can't one count to a tune and why can't one percussively call out the answers to math questions without being framed as somehow disrupting the social practice of mathematics? Olu exemplifies what it means to be many things at once and reminds us that the student is so much more than just a student in the classroom; in fact, Olu reminds us that the mathematics classroom is and could be much more than a site at which specific forms of mathematical practice take place—he reminds us to consider that mathematical practice itself can be expansive enough to include many different types of social interactions.

Olu's story of affirmative expression of several identities in the mathematics classroom hold value for

teachers and educational researchers alike. For teachers, it helps imagine the classroom as a far more active space in which mathematics can be accessed and executed in a multitude of ways. It may help teachers become more attentive to the myriad ways in which students demonstrate their mathematical abilities and help them also design classes to recruit students’ different identities to mathematical sense-making. For educational researchers, it provides an important lesson in what to attend to in the data. In ignoring non-mathematical data, we risk reducing the individual in the classroom to a student alone; by including such data we set ourselves up to better understand mathematics as a social activity. We are also able to see the classroom from the perspective of the student. I expect that students like Olu, who inevitably perform their various social identities in the elementary school classroom, eventually learn to “turn off” these identities at school or in the presence of teachers and re-learn how to perform mathematics for the black body, like Cameryn does in Gholson & Martin’s analysis (2019). Future research must consider the implications of this “learning how to be in school” for the personhood of the child as they enter and exit school spaces.

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