Volume 2019
Number 41 *Critical Mathematical Inquiry*

Article 5

March 2019

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Recommended Citation

Harper, F. K. (2019). Collaboration and Critical Mathematical Inquiry: Negotiating Mathematics Engagement, Identity, and Agency. *Occasional Paper Series, 2019* (41). DOI: https://doi.org/10.58295/2375-3668.1277

Cover Page Footnote

This research was supported, in part, by grants from CPM Educational Program and Michigan State University. Opinions, findings, and conclusions or recommendations expressed here are the authors' and do not necessarily reflect the views of funding organizations.

Collaboration and Critical Mathematical Inquiry: Negotiating Mathematics Engagement, Identity, and Agency

Frances K. Harper

Theories of critical pedagogy imagine a problem-posing model of education. This means students raise their own questions about social injustice and work alongside their teachers to address those questions, using the most appropriate disciplinary content (Freire, 1970). Translating this vision to mathematics education suggests that students critically interrogate causes of and remedies to social injustice through powerful forms of mathematical reasoning and inquiry that builds on their knowledge of mathematics and their community to ask questions, solve problems, and explain ideas—that is, critical mathematical inquiry (CMI).

There are examples of this approach to CMI in mathematics classrooms (e.g., Aguirre, Mayfield-Ingram, & Martin, 2013). Often, however, efforts to realize CMI in the school context result in more teacher-led than student-led activities, particularly at the secondary level (Harper, in press). The mathematical inquiry involved in tackling authentic social justice questions is quite "messy." CMI often requires mathematics content above students' grade level, and the interdisciplinary nature of CMI presents significant challenges, given the isolated nature of secondary mathematics. In response, teachers often revert to procedural or direct instruction in an attempt to make CMI more accessible to students, but this response may inadvertently limit students' engagement with mathematics (Gutstein, 2003) and with the social justice topic.

Mrs. Stone's Geometry Class: A Context for Collaborative CMI

At the time of the study, Mrs. Stone (all names are pseudonyms) had been teaching for four years, all at Victory High School. Victory is located in the Midwestern United States in a small city with a racially and ethnically diverse population made up of many low-income families. Mrs. Stone is committed to challenging the systems of oppression that her students of color from low-income families face, by ensuring equity in mathematics engagement and by interrogating social justice issues in her mathematics teaching. She and I have collaborated towards those goals since 2013, focusing mainly on her development of CMI. I also introduced her to complex instruction–a specific approach to classroom collaboration designed to support more equitable access and interactions in small groups. Strategies within complex instruction aim to: (a) delegate authority from the teacher to students; (b) center the curriculum around multiple-ability tasks that require positive interdependence and promote group and individual accountability; and (c) disrupt status issues that limit students' access to and participation in small groups (Cohen, 1994). Mrs. Stone pursued additional professional development on complex instruction in mathematics on her own.

In 2014, Mrs. Stone helped establish Victory's school-within-a-school magnet program. The openenrollment, STEM-themed program's mission emphasizes technology-driven (1:1 student-to-laptop computer ratio), project-based learning, defined as collaborative exploration aimed at solving authentic, real-world tasks or problems; and using ideas, knowledge, and skills across a range of disciplines. Mrs. Stone views project-based learning as complementary to her CMI and complex instruction efforts, and she integrates complex instruction strategies and CMI in all her projects.

In 2015-2016, Mrs. Stone taught 9th grade geometry through this project-based approach for the first time. She welcomed me into her geometry class to try to understand students' experiences of her unique approach to mathematics teaching. Although I spent the entire school year in Mrs. Stone's geometry class, this paper focuses on understanding students' experiences in only two collaborative CMI projects.

Overview of the Collaborative CMI Projects

The two collaborative CMI projects both center on social injustices related to disproportionate access to healthy and affordable food in the students' local urban community. Across the projects, a *food desert* was defined as a low-income area where residents have limited access (more than one mile in urban areas) to a supermarket or large grocery store (United States Department of Agriculture, USDA, 2016).

Mrs. Stone selected this topic because it supported the learning of geometry topics within the required curriculum. She also recognized limited food access as a relevant social injustice in the students' communities. Both projects reflect Mrs. Stone's efforts to use CMI. She planned for students to work collaboratively to: (a) interrogate causes of and remedies to food deserts (i.e., critical); (b) engage with grade-level appropriate mathematics by connecting, generalizing, and representing various geometry topics (i.e., mathematical); and (c) draw on their knowledge of mathematics and their community to ask questions, solve problems, and explain ideas (i.e., inquiry).

Food Desert Project 1

This project took place over five days in October. Mrs. Stone designed it as a mini-project situated within a larger 17-day project focused on lines and angles. The mathematical goal of the mini-project was for students to develop the necessary proficiency with the mathematical distance and midpoint formulas to move forward with the larger project. Typically, Mrs. Stone used problem-centered, inquiry-based lessons to introduce the necessary geometric content within larger projects, but she saw an opportunity to introduce the distance and midpoint formulas through CMI.

Students determined whether or not they lived in a food desert by using the USDA definition and the distance formula to calculate the distance between their home and the nearest supermarket. They then used the midpoint formula to determine a possible location for a new supermarket. Finally, they made recommendations on whether that location would be a desirable place for a supermarket based on their knowledge of the community.

Food Desert Project 2

This project took place over twelve days in January. Mrs. Stone drew from Teaching Tolerance's *Food Deserts: Causes, Consequences and Solutions* lesson (2018) to introduce social justice issues related to food access and affordability, modifying it to include mathematics. Students began the project by exploring the causes and consequences of food deserts. They used the USDA Food Access Research Atlas to locate broader areas of food deserts in their city. Then, to determine desirable locations for a grocery store to help alleviate food deserts, they used triangles and their various centers (e.g., incenter, orthocenter).

Mrs. Stone used a problem-centered, inquiry-based approach to introduce the necessary geometry content over three days. Simultaneously, in their BioHealth course, students were learning about nutrition and creating dietary plans based on USDA guidelines. The project concluded with the students creating presentations in which they shared causes and consequences of disproportionate access to healthy and affordable food and possible locations for supermarkets to remedy local food deserts. These presentations were highlighted at a school showcase open to the public.

Research Approach

I spent the 2015-2016 school year in Mrs. Stone's geometry class in an effort to understand students' experiences with CMI and complex instruction. I observed 93 classes, recording field notes for every observation and creating video and audio recordings for selected classes (specifically those that included CMI and/or complex instruction). I also conducted individual and focus-group interviews with students in order learn about their perspectives on classroom activities and interactions and to gain insight into how they negotiated their mathematics identity with their social identities (e.g., race, gender).

Focal Students

The focal group of students includes:

- Rosy – a Korean-American girl with perceived high status in mathematics
- Jane – a Black girl with perceived medium-low status in mathematics
- Blake – a White boy with perceived medium-high status in mathematics
- Dante – a Black boy with perceived low status in mathematics
- George – a White boy with perceived low status in mathematics

Students' racial and gender identities are based on self-identification. The descriptions of status are based on Mrs. Stone's experiences with students in geometry and as their 8th grade mathematics teacher, as well as my observations and analysis of how students positioned themselves and others during classroom interactions and in interviews across the year.

I characterize students based on status rather than achievement because the construct of status recognizes that abilities in mathematics are socially constructed rather than cognitively fixed. Status is an idea commonly used in complex instruction to describe the social ordering of individuals based on perceived academic ability and social standing, where everyone agrees it is better to have a higher status (Cohen, 1994). Status can change in moment-to-moment interactions as students with perceived low status can make valuable mathematical contributions (Wood, 2013). Overarching perceptions of status, however, often lead students to describe themselves and others as "good at math" and "not good at math" in more rigid ways.

Data Sources

I observed and video-recorded four of the five days of Project 1. I conducted an individual interview with George during Project 1, but the interview was a "getting to know you" interview that focused more on understanding how he positioned himself as a mathematics learner. I had conducted a similar interview with Rosy prior to Project 1. When Project 1 was complete, I facilitated a focus-group interview in which Blake, Jane, and other students participated. I asked the focus group to share their perspectives on interrogating food deserts through CMI. I also asked some questions about collaboration, but I did not focus on complex instruction because Mrs. Stone did not draw on complex instruction strategies in Project 1.[1]

I observed nine of twelve days of Project 2 and video-recorded eight of those days. I also collected various artifacts of student work in five classes. At the end of Project 2, I conducted individual interviews with Rosy and George to understand their individual experiences with interrogating food deserts through CMI and complex instruction. I also facilitated a focus-group interview in which Rosy, Jane, Blake, Dante, George, and other students participated to get a broader perspective on interrogating food deserts through CMI and complex instruction.

Data Analysis

I drew on *figured worlds* as the analytical basis for this study. Figured worlds is a construct that helps us to make sense of experience. People use various social, cultural, and political "worlds" as frames of reference to "figure out" the significance of certain individuals, actions, or the value of particular outcomes (Holland, Lachicotte Jr., Skinner, & Cain, 1998). As people and actions come together with social, cultural, and political forces (e.g., norms for classroom behavior; stereotypes about women in mathematics), a social group develops taken-for-granted expectations, or *storylines*, for how to make sense of individuals' roles and actions (Holland et al., 1998).

For example, consider this scenario for collaborative mathematics projects: "At the beginning of a project,

1 This was unusual for Mrs. Stone. She normally incorporated at least some complex instruction strategies into every project. I inferred that one possible explanation was because she envisioned Project 1 as a mini-project supporting the larger project. Thus, she was trying to minimize the time needed for Project 1.

one student takes the lead.” This is a common storyline that we see when we task students to work together in mathematics. One student will naturally act as the leader of the group, and students have come to take this for granted. This is not the full story, however, because how groupmates interpret the leader’s actions can vary greatly.

Students willingly follow the lead of some students more than others, and these different interpretations and reactions are shaped by social, cultural, and political influences. When the “world” of groupwork in the mathematics classroom intersects with the broader “world” of gender, for example, students tell different stories about boys and girls who are leaders. They may position boy leaders as “smart” and girl leaders as “bossy” for similar actions (Langer-Osuna, 2011). The identities of “smart” and “bossy” are enacted by students and assigned by their peers based on taken-for-granted “stories” (i.e., storylines) about both classroom leaders and gender.

Storylines constructed within figured worlds provide the context for what counts as mathematical engagement and for how students make sense of themselves as successful or not in relation to that engagement. In other words, students’ mathematics identities are shaped as they come to see themselves and are seen by others as mathematically capable (or not) in relation to storylines (Horn, 2008). I used storylines to analyze how students negotiated (i.e., took up, resisted, or shifted) mathematics identities in collaborative CMI projects.

Figured worlds provide a powerful analytical tool for analysis, because they allow us to consider influences on mathematics teaching and learning that are not explicitly discussed (e.g., gender) or physically present within the classroom (e.g., food deserts). I analyzed field notes, interview transcripts, and video of classroom observations across projects to identify the figured worlds at play. Theories of CMI (e.g., systems of privilege and oppression, problem posing) and complex instruction (e.g., status, group work) helped me identify relevant figured worlds and connect classroom interactions to storylines within these figured worlds. The findings below describe the taken-for-granted expectations, interpretations, and actions “storying” engagement and identity across Project 1 and 2.

Findings

Table 1 shows how classroom participation structures (as different figured worlds) varied across projects. During Project 1, students spent most of their time engaged in whole-class activity and doing individual work. From Project 1 to Project 2, the decrease in teacher exposition and the increase in small group work are striking. Here, I share selected excerpts to illustrate how the mathematics classroom storylines within these figured worlds changed from Project 1 to Project 2 as students took up and negotiated the teacher’s efforts to encourage equitable small group work during CMI. Because the mathematics classroom figured world was immediately and physically present, identification of these storylines relied heavily on both talk and actions, and this is reflected in the excerpts.

Table 1: *Percentage of time devoted to each classroom participation structure by project.*

Participation Structure			Project 1 (% of time)			Project 2 (% of time)		
Whole Class			47.37			16.78		
Launch	Exposition	Discussion	15.93	20.96	10.48	7.75	0.61	8.42
Small Group			3.57			58.08		
Individual			48.19			24.36		
Other*			0.87			0.78		
Total Time			3 hr 17 min			7 hr 29 min		

**The video camera ran before and after class, when students were setting up or packing up.*

Storyline 1 (Project 1)

The teacher guides students procedurally (as a class or individually), using the necessary mathematics.

Excerpt 1 *(Observation: Oct 22, 2015)*

Mrs. Stone: There's a Geogebra applet, and you're going to play with the distance formula. [*Intervening comments redacted.*] You're going to open up this applet and you're going to change the sliders to these points. And you're going to set up the distance formula. [*Mrs. Stone shows and explains how to use the applet.*] What the distance formula is…I have the formula written on [the worksheet], but it is a fancy way of saying, "I need to know how far this [*points to two coordinates*] is in a coordinate plane." [*Mrs. Stone shows how to set up the first problem on the worksheet in the applet.*]

Jane: I don't understand this.

Excerpt 1 illustrates how Mrs. Stone's launch led to her procedurally guiding the whole class to use technological and mathematical tools (i.e., exposition). Mrs. Stone attempted to explain how to use the technology and to give meaning to the distance formula, but when students expressed confusion (Excerpt 1), she calculated the distance for the first pair of coordinates at the board (Figure 1). She continued teacher exposition for the remainder of class, showing students how to calculate square roots using their calculators. She modified the assignment for the following day to give the students more practice using the distance formula, but she had not provided them with a conceptual meaning for the procedure. As students worked, Mrs. Stone provided individual help on using the formula as needed.

1. Open the Geogebra Applet and work through the problems using the distance formula.

Distance Formula: A way to measure the distance between two points in the coordinate plane.

Points	Set up Distance Formula	Solution
(-4, 3) & (2, 3)		
(-4, 3) & (3, 3)		
(-4, 3) & (-1, 4)		

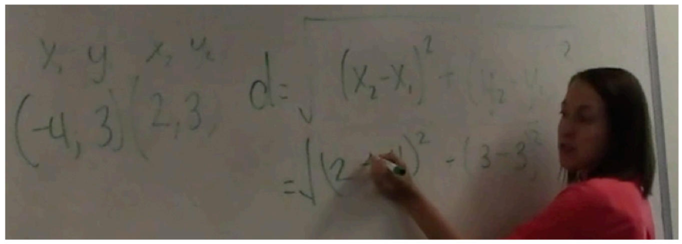

Figure 1. Introducing the distance formula. This figure shows the first part of the worksheet with Mrs. Stone calculating the distance between the first pair of coordinates.

Storyline 2 (Project 2)

Students work collaboratively with each other but independently of the teacher to figure out how to use and make sense of the necessary mathematics.

> **Excerpt 2** *(Observation: Jan 11, 2016)*
>
> Dante (to George): Wait, go back to that thing [in Geogebra]. [Mrs. Stone] said [in the video] you have to click on "perpendicular bisector." [*Points to something on George's computer in Geogebra.*] Click on that.

In Project 2, Mrs. Stone introduced students to centers of triangles by asking them to collaboratively construct and manipulate triangles with various points of concurrency to discover the properties of the centers of triangles. Unlike in Project 1, where Mrs. Stone provided students with the distance formula and the meaning of the formula and planned for them to use a pre-existing Geogebra applet to reinforce the meaning, in Project 2, students made their own constructions and their own discoveries about the mathematics.

Excerpt 2 shows how students worked collaboratively with peers, because they did not need to wait for Mrs. Stone to be physically present to guide them through the procedural aspects of using technology in an unfamiliar way. Using the YouTube videos Mrs. Stone created to show how to make constructions, Dante explained to George how to make the constructions in Geogebra on his computer.

Figure 2 shows George looking at Dante's computer as they watched the video, and Excerpt 2 shows how Dante would subsequently look onto George's computer as George did the construction with Dante's guidance. During more than 30 minutes of small group work, they re-watched the teacher videos together as needed, completed most of the constructions, and answered open-ended questions about their discoveries without help from Mrs. Stone.

Figure 2. Dante and George watch videos and make constructions in Geogebra together.

Storyline 3 (Project 2)

The teacher reinforces norms for small group tasks that require collaboration and the participation of every group member.

Excerpt 3 *(Observation: Jan, 11, 2016)*

Rosy (to Dante, George, and Blake): Do you guys all have the same question of, “What is a point of concurrency? And where to put it?”

Dante: Yeah. [*Continues working with George.***]**

[*Rosy raises her hand.*]

Excerpt 4 *(Observation: Jan 14, 2016)*

Rosy (*looks at table in Figure 3.5*): Visual picture of an altitude [*Does a search for an image of “altitude” on her phone.*]

Blake: Good job on using your technology, guys! [*More loudly and with a different tone than usual.*]

Rosy (*shows her phone to the group*): Ok. So look for something that looks like this. [*Looks at cards with diagrams of triangles.*] They all look the same!

George: Not all of them. [*Points to one diagram.*] This one has a right angle.

[*Intervening comments redacted as Rosy, George, Dante, and Blake continue to look for the visual representations of each segment.*]

Dante: Here. [*Hands a visual representation of “median.”*] The median is the point in the middle.

Rosy: Oh, yeah. Smart! [*Looks at card.*] Are you sure?

Dante: Yeah. It’s the right one.

In Project 2, Mrs. Stone introduced three complex instruction strategies (Esmonde, 2009b; Featherstone, Crespo, Jilk, Parks, & Wood, 2011) to encourage collaboration:

1. **Group questions:** Students can only ask the teacher a question if they ask everyone in the group first and everyone has the same question. (Excerpt 3)

2. **Checkpoint:** Students must stop at checkpoints on the worksheet to make sure the group is together and to check in with the teacher before moving to the next part of the task.

3. **Participation quiz:** The teacher evaluates groups on how they participate collaboratively. Mrs. Stone assigned groups to sort cards with different properties using the table shown in Figure 3. Groups were assessed on their ability to: (1) get started quickly; (2) provide justification when they sorted the cards; (3) ask their groupmates why they sorted the cards in a particular way; and (4) make the materials accessible to all.

Segment name:	Altitude	Angle Bisector	Median	Perpendicular Bisector
Visual				
Definition				
Special name of point of concurrency				
Special Characteristic				
Other characteristics				

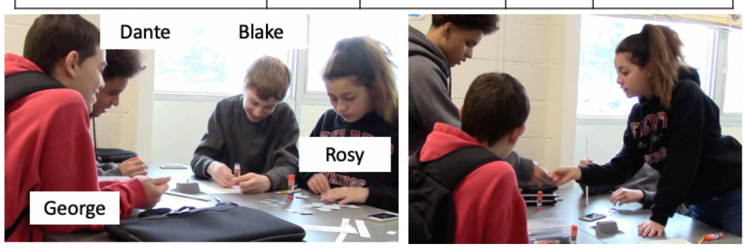

Figure 3. Students work on sorting cards during participation quiz. Initially Rosy had most of the materials, and Dante, George, and Blake had to lean in to have access to the cards (*left*). After Rosy distributed the cards at Blake's request, each student in the group contributed to sorting (*right*).

Together, Excerpts 3 and 4 show variation in how students took up norms for collaboration. In both cases, students played along and participated (at least superficially) as the teacher instructed. Sometimes this "playing along" seemed insincere and for the benefit of the teacher. In Excerpt 3, Rosy's question and Dante's response suggest that Rosy simply wanted the group to agree to having the question before calling Mrs. Stone over. This way, the group could get help without actually discussing the mathematical concept.

Likewise, in Excerpt 4, Blake made a comment about how the group was working (i.e., using technology well), seemingly to score a positive evaluation from the teacher. Prior to this, Blake made a similar comment when he noticed Rosy initially had all the materials. As Mrs. Stone walked near the group, Blake loudly reminded Rosy to make the materials accessible to all, and she distributed cards to everyone (Figure 3). As Excerpt 4 and Figure 3 illustrate, after the materials were accessible, George and Dante provided mathematical justifications that there were differences in the visual images and that one of the diagrams must be the median. The group correctly sorted the cards without soliciting any help from Mrs. Stone.

Discussion

Project 1

Even though the school's mission and the teacher's goals promoted collaborative, creative, and critical work, Project 1 reinforced a storyline that is typical when mathematics learning is an individual and procedural endeavor: classroom interactions were dominated by teacher exposition and individual work. The teacher was viewed as the mathematical authority and the "owner" of mathematics knowledge. In Storyline 1, mathematical power resided with Mrs. Stone as she provided and explained the distance formula and guided students through its use. Mrs. Stone held the authority to decide what was mathematically correct, and students had opportunities to be positioned as good at mathematics in limited ways. Namely, good mathematics students correctly solve problems without help from others or from Mrs. Stone. The "critical," "mathematical," and "inquiry" components of Mrs. Stone's plan and vision for the project fell short of being realized.

Project 2

In contrast, during Project 2, storylines emerged that were more consistent with mathematics learning as a collaborative endeavor and aligned more closely with goals for mathematical inquiry in CMI. Mathematics authority and "ownership" of mathematics knowledge was shared among students and teacher. Although the teacher still held elevated authority to determine what was mathematically correct, mathematics knowledge was collectively constructed through small-group and whole-class activities (Table 1). By working autonomously (Storyline 2), students had more opportunities to take on mathematics identities as good at math because the features of the task supported them to work without direct help from the teacher.

In Excerpt 2, Dante and George, two students with perceived low status in mathematics, were able to rely on each other to engage in the mathematics work with only limited direct help from Mrs. Stone. In those moments, they enacted identities as students who are good at mathematics. Moreover, the reinforced norms for collaboration (Storyline 3) offered more diverse ways for students to demonstrate their ability to do mathematics. In this class, being good at mathematics meant more than getting correct answers; it came to include being able to communicate mathematical thinking and provide justifications for claims. In Excerpt 4, Dante and George correctly and meaningfully communicated their mathematical reasoning and moved the mathematical work of the group forward when working with Rosy and Blake.

A less often discussed aspect of teachers' efforts towards equitable collaborative learning is also demonstrated in these findings. Although Dante and George had numerous opportunities to take on identities as good mathematics students throughout Project 2, differences in status persisted. Namely, Rosy and Blake maintained higher academic status than Dante and George. In Excerpt 4, Blake assumed a facilitator role (by encouraging the group to do what is necessary to do well on the quiz), and Rosy assumed the role of mathematics authority (e.g., "owning" the cards initially; evaluating Dante's mathematical thinking). Persistent distinctions between those who are good at mathematics and those who are not are problematic and consequential. Being capable in mathematics is associated with broader social status and “smartness” (Gutiérrez, 2013), and differences in status can limit students’ access to mathematics learning. When students who are perceived to have high status talk, group members (and their teacher) listen, thereby validating their competence and allowing them to dominate group interactions. In contrast, when students perceived to have low status talk, their contributions are often overlooked by group members (and their teacher) (Cohen, 1994; Esmonde, 2009a, 2009b).

In Project 2, Mrs. Stone reinforced features of complex instruction designed to disrupt these inequitable power dynamics (Storyline 3). For example, in Excerpt 4, these features encouraged Rosy to share ownership of the materials so that Dante and George could take on mathematics identities as students good at mathematics. This strategy resulted in Rosy explicitly positioning Dante as smart. While some researchers have found such complex instruction strategies to be effective at encouraging more equitable group interactions in mathematics (e.g., Boaler & Staples, 2008), Excerpts 3 and 4 illustrate how the shift towards equitable collaborative learning is a more complex process. Students might only superficially take up features designed to disrupt power differences, which can be problematic when students do not collaborate to enhance group mathematics learning as intended (Excerpt 3) and when status differences persist (Excerpt 4). Nonetheless, superficial uptake may also be an important step towards overall increases in collaboration on the part of the teacher (Table 1) and shifts towards more equitable interactions on the part of the students.

In other words, supporting every student to engage in the *mathematical inquiry* necessary for CMI is not a straightforward task. Promoting interrogation of social injustices through mathematical inquiry may necessarily start with challenging systems of privilege and oppression that operate within the classroom itself. Additional research in classrooms where teachers are combining complex instruction or other equity-minded strategies with CMI could help teachers and teacher educators better understand how to effectively introduce and enact CMI in classroom spaces.

Relevance to Critical Inquiry

This particular analysis focused heavily on understanding the nature of *mathematical inquiry* within CMI. Elsewhere, I have described an analysis across these same projects focused on understanding shifts in the storylines about social justice issues related to disproportionate access to healthy and affordable food (Harper, 2017). In that analysis, I found that students first passively accepted and then resisted Mrs. Stone’s definition of food deserts. Eventually (in a third project related to the same social justice topic), students took up the USDA definition, but reframed the social justice issue to focus on nutritional education rather than access to supermarkets, which empowered them to imagine and take action towards alleviating access to healthy food in the community (Harper, 2017).

This analysis showed how Mrs. Stone maintained mathematical authority in Project 1, and analyses elsewhere showed how Mrs. Stone also maintained authority over the social justice topic in Project

1 (Harper, 2017). She did so by insisting on a particular definition of food desert as a way of ensuring students used geometry content required by the school curriculum. In such cases, when the required school curriculum takes priority, a focus on mathematics might overshadow the social justice issues (e.g., Bartell, 2013). In this study, however, the teacher strove to shift authority (in mathematics and social justice) across projects. By Project 2, these efforts showed promise of balancing the focus on mathematics inquiry (this analysis) and critical inquiry (Harper, 2017) while allowing for student agency in regard to both mathematics and social justice issues.

This suggests an important relationship between students' mathematical agency and students' capacity for taking up critical inquiry in meaningful and relevant ways in mathematics classrooms. In other words, as students take more ownership of and more equitably distribute mathematics learning, they may also be better equipped to frame social justice questions and take actions towards social change. This case of collaborative CMI is promising for teachers who wish to integrate mathematics and social justice at the high school level but are concerned about balancing learning about both mathematics and social justice topics.

Significance

Naturally, in the figured world of the mathematics classroom, students' mathematics identities were salient, specifically in regards to their relationships to mathematics (Horn, 2008). My analysis of classroom interactions shows the fluidity of mathematics identity in different instructional contexts (teacher exposition and individual work in Project 1 and small-group collaboration in Project 2). Students enacted different mathematics identities in different moments throughout the two projects. Other researchers have observed this phenomenon (e.g., Wood, 2013), but the analysis here extends these findings by illustrating how the teacher's introduction of equity-minded pedagogical efforts was associated with different storylines within the same classroom in a relatively short period of time.

Much of the research on complex instruction at the secondary level in mathematics focuses on "master" teachers who are experienced with the pedagogical approach (e.g., Boaler & Staples, 2008) or contexts in which students experience complex instruction across the curriculum (e.g., Horn, 2008). Moreover, there is no research on complex instruction that considers how this approach might supplement other sophisticated teaching approaches, such as CMI. These findings are important because they illustrate how the different and emerging storylines that accompanied complex instruction strategies provided opportunities for students to perform identities as capable mathematics doers, even though the teacher's enactment and the students' adoption of the strategies were still emergent. Understanding the process of introducing and enacting more equitable teaching strategies in CMI is an important step in transforming mathematics classrooms into more socially just spaces.

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