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Re-Integrating “Belonging” into  
Mathematics Instruction

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## On Mindset and Practices for Re-Integrating “Belonging” into Mathematics Instruction

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## Abstract

Restoring and protecting a sense of belonging for Black, Brown, and poor youth remains at the heart of social justice in US schools. Drawing on research and my lived experiences as an educator, I discuss mindsets and practices teachers can develop to assuage the assault against belonging and become proactive in restoring equity and opportunity in mathematics classrooms that serve historically disenfranchised students. First, I highlight the critical mindsets necessary for enacting and sustaining equity-based teaching practices. Next, I provide instructional strategies embedded within two high-leverage practices (i.e., *coordinating and adjusting instruction for connection to students' lives* and *analyzing instruction for the purpose of improving it*) aimed at supporting teachers in understanding the significance of belonging beyond simply building classroom community, and to become aware of their power to promote belonging through their instructional choices and practices.

## ON MINDSET AND PRACTICES FOR RE-INTEGRATING “BELONGING” INTO MATHEMATICS INSTRUCTION

In this working paper, I contend that the assault on sense of belonging is a pervasive, yet insidious, threat against the education of Black, Brown, and poor children in American schools today. In light of this, restoring and protecting belonging for historically disenfranchised youth remains at the heart of social justice work in education and in our schools.

The desire to belong is intrinsic to the human design; it is a fundamental element of our lives as relational beings and a source of personal worth and motivation (Baumeister & Leary, 1995). However, individuals who often have the benefit of having their need for belonging met may be less conscious of the central role it plays in their lives. Conversely, for marginalized individuals, belongingness is a palpable concern that must constantly be negotiated, cannot be simply dismissed or displaced, and levies a hefty toll if left unfulfilled. Psychological, sociological, and educational research has shown students' perceptions of belonging in school to be related to virtually all things good regarding healthy school outcomes, such as academic motivation, achievement, mental and physical health, college GPA, and educational aspirations, among many others (Eisenberger & Cole, 2012; Ladson-Billings, 1995; Osterman, 2000; Pittman & Richmond, 2007; Walton & Cohen, 2007). However, data has also shown that the role of belonging in school success may be more substantial for ethnic minority and socially marginalized youth (Matthews, Banerjee, & Lauerman, 2014).

Drawing on my research and lived experiences as an educator, I discuss mindsets and practices teachers can develop to assuage the assault against belonging and to become proactive in restoring equity and opportunity in classrooms that serve students from disenfranchised backgrounds. First, I highlight the necessity for teachers to develop the healthy mindsets as a precursor to enacting equity-based teaching practices. Next, I provide instructional strategies embedded within two broader high-leverage practices (i.e., *high-leverage practice #6* “coordinating and adjusting instruction”, and *high-leverage practice #19* “analyzing instruction for the purpose of improving it”) that work to dismantle threats against students' sense of belonging in the classroom. Most teachers may understand the significance of belonging for building classroom community and student comfort (e.g., celebrating students' culture, students getting to know one another); however, often times teachers can be unaware of their power to promote belonging through their instructional choices and practices.

As a former middle school math teacher and now math education researcher, I ground my examples, strategies, and narratives within the domain of mathematics instruction. Belongingness uncertainty is particularly rife within mathematics for many adolescents, with research connecting the development of value beliefs in mathematics during the middle and high school years to trends in STEM participation during college and career for Black, Brown, and poor youth (Maltese & Tai, 2011; McCoy, 2005). In the next section, I briefly discuss some of the historical, sociopolitical, and hegemonic forces that constrict opportunity and access for marginalized people groups in schools and in mathematics. I also argue that these systems not only impact opportunity structures and policy, but more importantly, they can warp the beliefs (i.e., perceptions of belonging) of disenfranchised youth, as well as the beliefs and practices of the teachers who work to support them. With a critical and compassionate understanding of the issues that impact historically marginalized students, teachers can begin to develop instructional practices to address these matters.

## THE ASSAULT ON BELONGING

As mentioned previously, belonging is an innate human desire, and school belonging is central to a variety of positive school outcomes for all youth. However, when considering historically marginalized youth, there arises a central question every educator, administrator, policy-maker, and researcher must ask themselves: *How do we support student “belonging” within an educational system that never intended for Black, Brown, and poor children to belong?* The history of this country is littered with illustrations of how our educational system never intended for certain people to have access to an equitable education and was in fact designed to create and maintain inequity. In *The Miseducation of the Negro*, Carter G. Woodson underscores how the education of Black Americans through U.S. educational systems reinforced a self-acknowledgement of Black deficiency (Woodson, 1990). He illustrates how Black Americans were taught through formal education to see themselves as less than and unable to attain the status and abilities of White Americans. In one quote, he said, “*The thought of the inferiority of the Negro is drilled into him in almost every class he enters and in almost every book he studies*” (p. 2). The educational history of the United States further support this conception, ranging from the 1974 Detroit School Busing Case (Milliken v. Bradley 418 U.S. 717 Supreme Court decision) which maintained racial segregation in the greater Detroit area, to the 1972 San Antonio Independent School District v. Rodriguez 411 U.S. 1 case, which maintained inequitable funding of schools based on neighborhood property taxes, ensuring that the zip code a child was born into would determine their educational opportunities. Such cases only represent the tip of the



iceberg. However, if a single picture could ever encapsulate this history, there would be no need to look further than the famous Norman Rockwell painting, *The Problem We All Live With*, documenting six-year-old Ruby Bridges being escorted by U.S. Marshalls as she broke the color line to integrate into an all-white elementary school amid threats of violence and social unrest. [What was her sense of belonging on that November morning in 1960? What was the real subject of her learning in that new school<sup>1</sup>?](#)

Although this history may seem like distal reflections of a dark past, today we remain largely complicit in the ripple-effect of that history. In 2018, a plethora of belongingness assaults still exist that threaten the psyche of Black, Brown, and poor children. For example, tens of thousands of Black and Latino students attend schools that bear the name of confederate leaders who dedicated their lives toward terrorizing and enslaving non-whites. These schools predominantly serve students of color (Klein, 2017) and provide a constant reminder of society's perception of their belongingness (or lack thereof). As another contemporary example, zero-tolerance discipline policies overwhelmingly target and remove Black and Latino youth from the classroom, despite little evidence demonstrating their effectiveness at improving school discipline. (American Psychological Association Zero Tolerance Task Force, 2008; Skiba & Losen, 2010). Black students are four times more likely to be expelled or suspended, even when their infractions are similar to those of white students (Skiba, Horner, Chung, Rausch, May, & Tobin, 2011). Recently, there has also been a trend toward Black girls being removed from class and disciplined for wearing cultural hairstyles (e.g., Cornrows, Afros, Locs; Williams, 2017). Since hair is a natural part of the self and an extension of one's identity, such practices against Black girls signal that they must alter a fundamental part of themselves (i.e., the way their hair naturally grows from their head) in order to belong in the learning environment.

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<sup>1</sup> [https://www.youtube.com/watch?time\\_continue=2&v=ajE9G4aUJRA](https://www.youtube.com/watch?time_continue=2&v=ajE9G4aUJRA)

Education has been described by many as the great equalizer. However, the aforementioned issues continue to create the growing and undeniable impression that some students simply do not belong or are not deserving of an equitable and rigorous education (Gray, Hope, & Matthews, 2018). This often amounts to marginalized students not feeling cherished or valued as if they had true worth. Instead of elevation and empowerment, students begin to feel like they're being schooled for subservience or a second-class living. Martin Haberman (1991) coined the notion of the *pedagogy of poverty*, which underscores teaching practices that reinforce and prepare students to eventually assume roles in larger society either as prisoners or as those trained to take orders. Melanie, a student from the Bronx, NYC featured on the popular podcast, *This American Life*<sup>2</sup>, discussed her experience with the pedagogy of poverty in her school and the effect this had on her sense of belonging and worth. On a field trip where she had the opportunity to witness and experience an elite private school only three miles away from her under-resourced public high school, she truly came to understand that a quality education was “for the privileged or elite”. As she saw the library, course offerings, and resources of this school and compared them to her own high school, she began to visualize a future where she realized that she and her peers at her school were only being taught to eventually “flip burgers” and “hold doors” in service of the students who attended that private school.



Ctrl + click image to listen

It is important to note that the assault on belonging does not purely exist at the structural level (e.g., school resources, policy) but is also conveyed through interpersonal exchanges between teachers and students (Gray, Hope, & Matthews, 2018). In other words, it's not just structural racism and classism that is of concern, but how teachers escort these structural elements into their classrooms through the nature of their daily interactions with marginalized youth. Thus, teachers, administrators, and curricula are often unconscious perpetrators of the assault on belonging. Clark Mckown (2013) discusses how this assault can be perceived by children through verbal as well as non-verbal social signals beginning as early as the third grade. He describes these as *signal influences*, which are interpersonal signals to members of marginalized people groups that they are devalued because of their group membership.

Signal influences are embodied within various social interactions in the classroom. One of the most clear is when students perceive differential teacher expectations for themselves compared to other students (e.g., my teacher asks me easier questions than the other students; my teacher gives me less feedback than the “A” students). In poor rural schools, for example, Carr and Kefalas (2009) have shown that teachers provide richer and more rigorous educational experiences to their “best and brightest,” who they believe have the best chance of “making it out” of the community, and far less attention to students more likely to stay in the community as adults. Similar issues exist in poor urban and racially diverse schools, such as the biased discipline patterns described above. However, other forms of signal influences exist, such as an absence of students’ interests reflected in instruction (i.e., “when am I ever going to use this in the real world?”), or an absence of their people-group reflected in the curriculum. The first absence communicates a disregard of student perspectives and interests as a powerful lever in instruction, while the latter absence intimates that the people group the student is a member of has not contributed to the intellectual discourse of the content being studied. Also, who is *seen* and *heard* as a contributor in the classroom and who is perceived to have knowledge and authority (e.g., my teacher said the textbook way of solving the problem is better than my method) speaks volumes toward students’ sense of belongingness. Considering these insidious signals that devalue students, teachers must remain hyper-vigilant toward coordinating and adjusting instruction that disrupts these inequitable practices (TeachingWorks high-leverage practice #6) and toward analyzing their own instruction (TeachingWorks high-leverage practice #19) to detect and improve upon unhealthy beliefs and inequitable teaching habits.

Although signal influences exist across classrooms of varied domains, they can be particularly pervasive in mathematics. The ways we’ve taught and understood mathematics over recent decades threatens many students’ sense of belonging, especially poor and

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<sup>2</sup> Listen to the entire episode at [www.thisamericanlife.org/550/three-miles](http://www.thisamericanlife.org/550/three-miles)

disenfranchised youth. Since mathematics is often perceived as objective and possessing only one correct answer, the teacher and text almost always have absolute authority, and students are compelled to find correct answers to prove their worthiness to that standard. Further, mathematics as a domain tends to hold an acute focus on “correctness,” which quickly informs students whether they belong or not. This often results in youth trying to measure their mathematical competence by how quickly they can arrive at the correct answer. Students ultimately learn to believe that if math doesn’t come quickly and effortlessly, it must not be for them. However, a culture of “correctness” and perceiving math as a talent can limit opportunities for discovery and meaning-making in mathematics. This is doubly reinforced through the obsession with testing, content coverage, and teaching to the test, which all predominantly occur in urban schools that teach Black, Brown, and poor youth. When meaning in mathematics is substituted for correctness in a culture that esteems math prowess as a talent, disenfranchised or struggling youth will begin to question “Am I a math person?” or “When am I ever going to use this in the real world?” (Matthews, 2017). These are inherently statements of frustrated belonging. Consider the comments of a 9<sup>th</sup> grade student who I interviewed in my research project:

*I feel like it is important and like some things that the teachers teach is not that important. Like I don't see why we need equations in life, graphing. I mean I understand if you want to work with like math; a math teacher, engineering, or like a scientist you need to know that stuff. But I don't want to deal with nothing that has to do with math. (Nina, Latina female, 9<sup>th</sup> grade)*

This student seems to be saying that math is important for certain people who will have prestigious jobs, but for her options and outlook, the power of math is limited. She feels she does not belong to the group or class of people for whom knowing math is advantageous. Beyond a future class or career, many disenfranchised students are looking to understand how math can help them navigate their immediate environment, especially the social challenges they face. Unfortunately, the way we teach math today rarely addresses these issues; rather, it alienates many students, reinforcing the utility of math as something for the privileged ([see how one high school in Indiana is combatting this<sup>3</sup>](#)).

Altogether, the structural as well as interpersonal threats against belonging for Black, Brown, and poor youth are clear and well-substantiated beyond the very brief review above. While many educators have come to understand the structural and systemic threats against belonging, often their realization of the interpersonal threats that exist in their own classrooms is limited. Further, research has shown that teachers may see the importance of belonging for building classroom community and student comfort (e.g., celebrating students’ culture, flag day); however, they are unaware of the power of belonging for their instructional choices (Matthews & Lopez, 2018). In the following section, I present options for teachers to process structural and systemic threats to belonging as well as to build avenues for addressing interpersonal issues through their instructional choices in the classroom, particularly mathematics classrooms.

### **ASSUAGING THE ASSAULT: MINDSET AND PRACTICES FOR RE-INTEGRATING BELONGING**

Given the importance of belonging, not only for student comfort but also for academic learning, I discuss teacher mindsets and practices that can begin to assuage the assault on belonging, and protect opportunity and equity through interpersonal interactions in the classroom. I purposely make the distinction between teacher mindset and practices, and thereby discuss them in separate sections. In an educational age where best practices are often marketed by so-called experts, desperately sought after by school personnel, and mandated in three-to-four year cycles by policy-makers, it is essential to return to understanding the appropriate mindsets that are the foundation for making teaching practices authentic, effective, and powerful. Once healthy

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<sup>3</sup> <https://www.chalkbeat.org/posts/in/2018/02/05/forget-frustrating-equations-this-indiana-high-school-teaches-algebra-youll-actually-use/>



and critical mindsets are in place, teachers can then attend to developing the skills and strategies for enacting instruction that disrupts inequity.

Growing up in Manhattan, New York City, I've had the opportunity to witness the construction of numerous skyscrapers, many from my own bedroom window. I was always fascinated by how the constructors would work on the footprint of a building for months on end, asking myself, "How long does it really take to make a hole in the ground?" However, after that time-intensive foundation was set, the building would explode into the sky in a matter of a few weeks, with new floors appearing every couple of days. My environment taught me that you have to dig down deep before you can build up, and I use this analogy to underscore why the distinction between teacher mindsets and practices is important. Teacher mindsets must be excavated and fashioned with the same intentionality, precision, and time as that of skyscraper footprints. Only after this can equitable teacher practices be built upon each other with confidence to sustain the demands of classroom life and the trials of social injustice.

### Teacher Mindsets

Here I discuss three important teacher mindsets for developing and sustaining equitable teaching practices. These are *critical awareness*, "*seeing*" *students through empathy*, and understanding a teacher's role as an *ally versus a savior*. I have derived these mindsets from my personal research, the research of respected colleagues, and my lived experiences as an educator. However, these mindsets must be flexible to be adapted across diverse schooling contexts and regions, and to meet the unique challenges of the disenfranchised people being served on a case by case basis.

**Critical Awareness.** Critical awareness is known across research literatures by various terminology, including *equity literacy* (Gorski, 2013) or *critical consciousness* (Valenzuela, 2016). Teacher critical awareness is teacher knowledge that recognizes bias and prejudice through understanding a) the historical context of disenfranchised students; b) the discrepancy between what is typically validated as knowledge in classrooms and the challenges to those assumptions; and c) the ways in which curricula in schools serve to replicate the power structure in society (e.g., Apple, 2004; Darder, 2012; Ladson-Billings, 2003). Put shortly, critical awareness is deep knowledge of structural and systemic biases that negatively impact Black, Brown, and poor children, and how those biases find their way into the classroom through the teacher beliefs and practices. Critical awareness is essential knowledge that enables teachers to engage in culturally responsive instruction (Darder, 2012; Gorski, 2013; Ladson-Billings, 1995a). However, research has revealed that high teacher expectations alone (i.e., wanting and believing your students can be academically successful) is not enough to predict whether a teacher will teach in culturally responsive ways. Rather, high expectations coupled with critical awareness predict whether teachers are likely to integrate their students' culture and interests into instruction and are also predictive of achievement outcomes for those students (Matthews & Lopez, 2018). Thus, critical awareness is an essential precursor to enacting equitable and high-leverage teaching practices that integrate disenfranchised students' perspectives and experiences into instruction.

**"Seeing" Students through Empathy.** In line with my discussion of belonging thus far, people (especially children) feel most special when they are seen and understood for who they truly are. *Seeing* students means looking beyond the students' characteristics that afford them success in a classroom and seeing them for the multiple and diverse facets (e.g., emotions, strengths, frustrations, aspirations) that are encapsulated within the complex individual. *Seeing students through empathy* means evaluating them through the complex lens that you would evaluate your own behavior or that of someone you love. While I certainly realize the primary job of teachers is to support and evaluate student learning, when teachers only see students as learners, this creates a linear, black-and-white scale onto which complex individuals are reduced. History and data have shown that those students who rank high on that learner scale (i.e., achievers) get to be recipients of the teacher's best version of themselves, while lower-ranking students usually receive some lower form of teacher care, effort, and patience. Mathematics teachers in particular can struggle with seeing students as only mathematical beings. One teacher in my research mentions this proclivity and her desire to work against it.

*I think I'm pretty nonjudgmental of what the students bring in that day, and I think I'm really good at gauging them as people. Like I don't just see them as math students. It's easy to do that, I think. (Mrs. Bairos, Algebra 1 teacher)*

In my own research with urban math teachers, I have identified a few consistent patterns of the empathetic caring mindset (Maloney & Matthews, under review). Math teachers with this mindset consistently (a) demonstrated emotional consciousness to understand and manage student frustration, (b) reinforced students' identity while engaging them in the academic content, and (c) showed a willingness to partner with student struggles inside the classroom and outside. Finally, these teachers always enacted their empathy through consistent verbal and physical actions; thus, their empathy was *active* versus inert philosophy or rhetoric. True empathy leads to action. In the following example, Mrs. Emmett, a 9<sup>th</sup> grade Algebra 1 teacher, discusses her struggles in connecting with a disengaged student in her class.

*...she was like "I know, I get it, I've always failed math, I'll just do summer school". She's already in her head gonna take algebra II in summer school... "Don't you want your summer, though? You're a junior, how old are you? When's your birthday?" Found out she's a Sagittarius and I go "Oh me too!" tried to - you know, try some kind of connection,... Found out she likes English, she's doing well in her English class. So, Ms. [teacher name], who's well-read, I don't like to read, suggested this book that she thought that any teenage girl would like. So I borrowed the book and I gave it to [student name],... I read the book just so I could have a book club talk with her, never read the book. Just gave it back to me...nothing worked. Um, what else did I try? ... like, just anything, anything outside of class just to find something that would make her smile and see that I'm human, I'm not just here to give you a grade...*

Here, Mrs. Emmett was clearly working hard not to reduce this student as someone who is "simply disengaged" or write her off as one of the unmotivated ones. Instead, her willingness to create emotional space for empathy to see the student beyond her disengagement (pattern a) led her into an *active* responsiveness, where she made multiple attempts to bond with the student outside the realm of math, even if those attempts were ultimately unsuccessful. As seen in the last sentence of the quote, she tried to engage the student's humanity, not just her math motivation, and convey that she was not just "there to give a grade" but was also willing to partner with her through her difficulties in math and beyond (pattern c; Maloney & Matthews, under review). While many teachers may believe such empathetic care is a luxury for which they do not have time, such care is imperative to equitable practices that allow teachers to meet students where they are at.

Throughout my own career as an educator I've come to realize the power of *seeing students through empathy*, as this was a perspective that was particularly underdeveloped in my early years as a teacher. My students, teaching experiences, and time helped me to realize the importance of this mindset; therefore, I share it in this working paper not to browbeat, but as someone who learned the power of this perspective through my own struggles with it. However, beyond personal anecdotes, empirical evidence from my research also underscores how teachers' empathetic care predicted students' feelings of belonging within their mathematics classrooms and students' perceptions of teacher support (Maloney & Matthews, under review).

**Allies versus Saviors.** Consistently providing support to students is imperative for teachers, but how teachers see the role of their support in their students' lives is also important. This leads to the third mindset of teachers perceiving themselves as *Allies versus saviors*.

*And again I try to make a connection with them,... even in college, I was declared, I was undeclared my freshman year and then my sophomore year I decided to do applied math. Even my advisor was like "That's a hard major. Are you sure you want to do that? It's mainly towards men" That's what my advisor said in college and I tell my kids that, I'm like the best thing you can do is prove them wrong. So whoever said it in 8th grade, 7th grade, 6th grade, that you don't get math, you were never good at math, let's prove them*

*wrong. Give me a try. You've never had me, give me a shot. And they're like "alright, I'll give you a shot"... Yeah. I always try to do something personal with the kids. I feel like if I introduce a little bit of what I went through, and then show them that I know you're going through the same thing, maybe together we can help you get - maybe not an A, but at least leave with more than what you came with. That's always the goal.*

Within this text, Mrs. Emmett again displays the patterns of seeing students through empathy (patterns a, b & c) mentioned above. However, she also foreshadows how she perceives her role in supporting students as an ally (i.e., advocate) versus a savior (i.e., the standard). In other words, her goal is not to have her students become like her (i.e., achieve her goals/success in the way she did); rather she shares difficult experiences from her life as a means of connecting with them, empathizing with them, and convincing them that she is their advocate in supporting them in becoming the best version of themselves.

The ally versus savior distinction is particularly relevant within the domain of mathematics, where many math teachers can come to see their mathematical success as the standard for what is good/correct and thus try to get students to become like them, at least mathematically if not in other ways as well. This savior mentality is rooted in deficit thinking at its core and feeds into the culture of "correctness" that is so pervasive in mathematics instruction, creating obstacles to students' sense of belonging if they do not measure up to the standards of the teacher. To juxtapose the savior mentality with the ally mentality, I've included an excerpt from Mr. Todd, another 9<sup>th</sup> grade Algebra 1 teacher in the same school as Mrs. Emmett. There are similarities in that both teachers harken back to challenges in their formative experiences as students; however, there are subtle distinctions as well. In Mr. Todd's excerpt, notice how he reflects on his own prior experiences not as a means toward connecting or empathizing with his students (as was clear in Mrs. Emmett's excerpt), but more so as a means of presenting a model that his students should seek to emulate.

*So to me with math, practice makes perfect. I got good at math because I did more than the minimum. I wasn't a math genius. I'm still not! ... So I think what it comes to, let's see what would I call that, um, self-motivation? ...I came from a poor family myself, and my family, they were drug addicts, alcoholics... my family was far from anything special. I know they say we're a product of our environment, but I looked at my environment and realized that wasn't for me. And I try to pass this on to the kids.*

Ultimately he uses himself and his previous experiences to communicate to students that they should not blame their circumstances for their lack of success, rather their own lack of self-motivation to persevere through difficulty. He was able to "practice himself into perfection" and become self-motivated to overcome the odds of his environment; thus, he believes his students should follow his example. This quote and my analysis of it is in no way meant to undermine the importance of practice and hard work in one's mathematics success. However, it is meant to illustrate how an exclusive focus on self-initiative in overcoming challenges is unhealthy, usually results in a deficit perception of students, and indirectly exalts oneself as the model to be imitated.

### **Teacher Practices**

With a compassionate and critical understanding of the issues that impact historically disenfranchised students, teachers can begin to develop high-leverage instructional practices that have the potential to disrupt structural and interpersonal inequity, and to restore a sense of belonging and worth in the classroom. In this section, I describe a practice centered around coordinating (HLP #6) and reflecting (HLP #19) on equitable math instruction, which I've coined the *4Hs of belonging-centered math instruction*. I then provide examples of adjustments teachers can make during instruction (HLP #6) to increase opportunities for reinforcing belongingness in their classrooms.

### ***The 4Hs of Belonging-centered Math Instruction: Coordinating and Reflection***

Since mathematics is often seen as culturally neutral and objective, many math teachers are skeptical about how culturally relevant pedagogy can apply to their instruction. For teachers who struggle to see the cultural aspects of mathematics learning or how mathematics instruction can reify inequity, I would suggest not to engage this proposed activity just yet; rather, consider some of the literature by Milner (2010, 2015), Gutiérrez (2013a, 2013b, 2016), Emdin (2016), Ladson-Billings (1995), and others to engage in equity mindset work. For teachers who have begun to develop critical awareness, but don't know where to begin integrating students' culture into mathematics instruction, I offer this heuristic and partner activity – the *4Hs of belonging-centered math instruction: Home, Hobbies, Hopes, and Heritage*. This heuristic offers four locales of meaningful connection for students. *Home* refers to consistent activities engaged at home or the properties of the home space (e.g., cooking, interactions with family, the heating bill, dimensions of the living room). *Hobbies* are personal activities engaged in at least once per week (e.g., sports teams, social media, work, smart phone apps/games). *Hopes* are personal aspirations, interests, or goals (e.g., desired career or major, making the varsity team, making my paycheck last all week). *Heritage* is a connection to a tradition or a people that is a source of pride (e.g., local celebrities in the community, Black female mathematicians).

Next, I describe *interest interviews* as a partner activity to the 4H framework that can support teachers in coordinating classroom instruction (HLP #6) that disrupts inequity and the assault on belonging. Interest interviews draw on the 4H knowledge and experiences among students within a class and aid in planning for instruction that consistently connects to those 4Hs. Before providing details of the activity, there is an important caveat that supports the activity's effectiveness and authenticity; that is building trust and genuine interest in students' lives as a key ingredient for planning to integrate their culture into instruction. Allow students to tell you how they see their culture and their interests through their own eyes versus making assumptions about their culture and running the risk of reinforcing stereotypes. Regardless of what you may already think you know about students' culture (or whether you share your students' culture or ethnic background), culturally-based instruction will come off to students as disingenuous if you do not take the time to learn from your students and study their interests. It is not as important to master all the details of their culture (which could be daunting); rather, the key is giving students an opportunity to be heard and feel like they are being paid attention to, especially when it involves their own learning.

I have adapted the mathematics interest interviews from the work of [Candice Walkington and her colleagues \(2014\)](#). Early in the school year (during the first three weeks ideally), the teacher will conduct a short interest interview among their students. This is to get a sense of the types of things students are interested in outside of school and how mathematics is involved in those things. Teachers have a couple different options in how to structure this:

- First, teachers will want to assign the interest interview questions for homework to give students time to think about, develop, and write out their answers. If given as homework, students should receive some sort of credit for it to help communicate the value of this assignment.
- During the next period of class time, the teacher should allow students to pair up to formally interview one another using the same questions given for homework.
- Students will use their phone to record each other's interviews (a good way to integrate students' phones for classroom tasks instead of a distraction). These video recordings will be submitted to the teacher for credit.
- In these short steps, the teacher has just collected a rich repository of student "data" that they can use throughout the entire school year to generate word problems, create powerful examples and illustrations, and facilitate group discussions or discovery-based learning projects.

- The teacher should then examine students' responses and organize the responses into the 4H categories. The teacher can even turn this into a class assignment and have the students organize the data into categories, reporting frequencies and other descriptive statistics for each category. It may be fun for students to see what their peers said and figure out ways to organize those responses into categories.

#### REAL WORLD MATH INTERVIEW QUESTIONS

- How do you use math in your everyday life? Where do you see numbers outside of school?
- What's your favorite thing to do on weekends?
- Where do you see numbers when you play or watch sports?
- What is a weekly/daily ritual that you have with your family?
- Do you have a part time job? How are numbers important at your job?
- What do you watch on [Youtube](#)? Where do you see numbers on [Youtube](#)?
- How are numbers used in the video games you play? How are player scores determined?
- How much do you talk or text on the phone? How is your phone bill or family plan calculated?
- What's your preferred choice of social media and why? How are numbers involved in social media?
- Who is one of the most important people in your community? How do they use math in what they do?
- What's your favorite store to shop in? How do you calculate sale prices when shopping? Do you ever shop online?
- How do you use numbers when you're cooking at home or when you go to your favorite restaurant with family or friends?

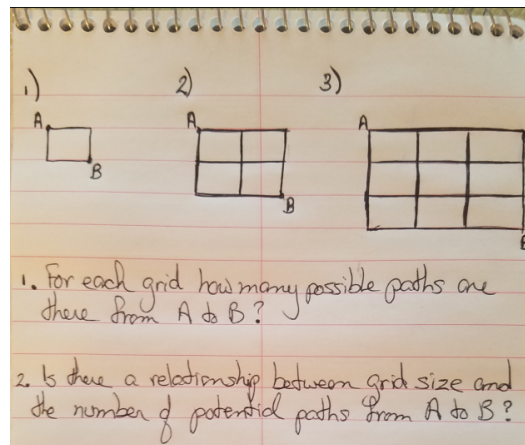
Adapted from [Walkington, Sherman, Howell, 2014](#)

*\*All of these questions may require probing for additional details*

The categories and the student examples within each can be used when the teacher is lesson or unit planning for the remainder of the school year. For example, when planning a unit on exponents or exponential functions, instead of using the illustration the textbook provides, the teacher can use or build upon one of their students' interview responses on how "Youtube videos go viral". The possibilities here are endless once the student data has been collected and organized.

Depending on students' interviewing and probing abilities, the quality of detail within the interviews is likely to vary. To improve the overall quality of interview detail, the teacher may elect to assign the interview questions as homework in the way previously described, but then set up several small focus groups of 6-7 students, which they can conduct during lunchtime or after school. This clearly requires more work and preparation for the teacher but also permits opportunities to ask follow-up and probing questions that can facilitate richer detail in students' responses. It is also a way for the teacher and students to bond during informal, non-class time, which can also support students' sense of belonging.

In the video interview of one 7<sup>th</sup> grade student, he conveyed his expert knowledge of the New York City subway system, including his ability to plan the most efficient route from any part of the city to another part without having to consult the map. His knowledge was particularly impressive, because the NYC subway system is the largest in the world with 472 stations, 25 lines, and over 650 miles of subway track. Further, he has never lived in NYC and has only ridden the subway a handful of times; however, he spent hours memorizing the map and vividly remembers details of his visit to the subway museum in NYC with his family as a small child (i.e., Hobbies). His dream was also to become a NYC subway conductor one day (i.e., Hopes). I worked with a group of teachers to develop tasks tailored to his knowledge. His strong spatial awareness allowed us to use the coordinate plane system and graphing as a scaffold to map out lines, trends, and directions of seemingly abstract linear equations. This helped build an understanding of what equations “look like” on a grid or in space and how equations could be important for planning subway routes. We also developed a simple word problem that was easily solvable without any deep mathematical knowledge but illustrated the idea of a function, or the relationship between the size of a geographical space on a map and the number of travel pathways possible between two points on the border of that space. To involve the rest of the class and celebrate his strengths, we proposed one activity to bring the student to the front of the class, have the class select two points to travel between within the local community, and have that student “compete” against the google maps app to determine different routes to travel that space. This was intended to be a fun activity but also lead into a discussion of algorithms, and conjecturing the process google maps take to decide a route in contrast with the process of this student, considering various factors such as time of day, cost, travel time, and route complexity.



I would suggest a couple cautionary notes for teachers who plan to implement this activity. First, this activity is about more than just “getting to know” your students. Rather, it is geared toward showing them that their prior knowledge and experiences are important to your instruction and their own learning. Therefore, do not initiate this activity if you are unwilling to or unsure you will integrate the data back into your instruction through illustrations, projects, etc. Asking students for input and then not using it can backfire, causing students to lose trust and a sense of agency in the class. Second, I would caution teachers not to become frustrated if students do not make all the anticipated connections between the math in their lives and the math content for your course during their interview. The purpose of this activity is to flush out student experiences, and it is your role as the instructor to help students discover connections between those experiences and the learning content for your course. If the connections are difficult to make, teachers may consider doing this activity within a team of math teachers and looking for connections during common planning periods or with the school’s math coach.

In concert with planning for instruction that integrates students' 4H experiences, reflection and analysis of the results of this integration needs to take place regularly to perpetually improve the instruction (HLP #19). To support teachers in consistent reflection and analysis of 4H integration, I have created a 4H weekly reflection sheet (see appendix for a printable version). In the left-hand column are the methods through which math teachers typically make math applications to the real world. These include word problems that integrate students' experiences (e.g., "Tops are 15% off and jeans 20% off at your favorite store..."), relevant teacher analogies (e.g., relating percentage charts to pizza pies), discussions of how math is used in contemporary society (e.g., statistics to predict presidential or local elections), analysis of real data (e.g., collecting classmates' data to see the relation between height and shoe size), tangible math representations (e.g., algebra tiles), and mathematical modeling of real world phenomena (e.g., writing an equation to represent the relation between years of education and money earned; Gainsburg, 2008). The next five columns represent the days of the school week. Teachers should

**4Hs Weekly Reflection Worksheet**

*Keep track of how often you provide mathematical applications to the 4Hs of your students.  
See how you are progressing week-to-week!*

Directions: For each application item, on each day, rate yourself on the scale:

<b>Did not Attempt</b>	<b>Attempted</b>	<b>Attempted Partially Successful</b>	<b>Attempted Highly Successful</b>
0 pts	1 pts	2 pts	3 pts

WEEK OF:	CLASS:					Weekly Total	Notes on connections to 4H
Daily Rating							
Word Problems	Monday	Tuesday	Wednesday	Thursday	Friday		
Teacher analogies	Monday	Tuesday	Wednesday	Thursday	Friday		
Analysis of real data	Monday	Tuesday	Wednesday	Thursday	Friday		
Discussions of math in society	Monday	Tuesday	Wednesday	Thursday	Friday		
Tangible math representations	Monday	Tuesday	Wednesday	Thursday	Friday		
Mathematical modeling of real world phenomena	Monday	Tuesday	Wednesday	Thursday	Friday		
Weekly Total of ALL ITEMS:							

give themselves one point if they made an attempt to integrate student 4H data through one of the above methods (e.g., word problems), but it went poorly. Teachers can record 2 points for themselves if they made an attempt that was partially successful but not quite everything they hoped for. Finally, teachers can award themselves 3 points for every 4H integration that was successful up to desired expectations. Teachers should tally their point values on Friday to get a complete 4H integration score that can be tracked from week-to-week. Teachers can also make notes in the right-side column to reflect on what integrations worked well that week and what could use more refinement.

Through keeping these weekly reflection sheets, teachers can monitor progress and document success in their integration of student 4H data. These can also be useful data for a portfolio documenting self-analysis of the patterns, failures, successes, and development of a teacher's attempt to be culturally responsive. This reflection sheet can also easily be adapted for use in other content areas outside mathematics.

**MAKING ADJUSTMENTS DURING INSTRUCTION TO CHALLENGE THE IDOL OF "CORRECTNESS"**

In the previous section, the 4H framework, the interest interviews activity, and reflection sheet were discussed in connection with high-leverage practices regarding planning for equitable instruction (HLP #6) and analyzing instructional choices in order to improve on them (HLP #19). The current section discusses subtle pivots and adjustments that teachers can utilize during instruction, which adheres to the "adjusting" (vs. coordinating) component of high-leverage practice #6. Since these practices are often extemporaneous and in response to unplanned turns

in classroom instruction, they can be difficult to discuss in a standardized way. Therefore, I provide a few illustrations of these adjustments from my observations of teachers within my research project on urban mathematics education. These in-the-moment adjustments were often focused on increasing students' sense of belonging in class, mitigating the obsession with correctness in mathematics, and reinforcing critical thinking that allows for contributions from multiple students regardless of their achievement history.

Mr. Espada used a technique he called "My Favorite No," where he would engage the class on common misconceptions during instruction by having students pick their favorite wrong answer while reviewing a homework problem amongst each other. Students would discuss the different ways they chose to solve the problem and determine the part of the process that might have gone awry for their favorite wrong answer, in addition to why it was their "favorite" wrong answer. This practice helped reduce student and teacher infatuation with correctness and mitigated the personal sting of wrongness by disarming and normalizing it. It also helped students realize that their errors and mistakes were an important part of learning. Teachers may want to consider starting with an anonymous version of "My Favorite No", where the identity of students' answers is hidden until this practice is normalized and student comfort and trust has been established. Capitalizing on teacher instances of mistakes in calculations or procedures can also be another opportune moment to model this technique.

Using a similar adjustment technique, Mrs. Emmett's immediate response to the class after a student finished explaining their thought process on a problem was, "*What do we like about the way [student name] solved this problem? What don't we like?*" She often asked this regardless of the correctness of the answer. A student would respond, "*I like that they showed that it is distributive property, but I don't like that they forgot a negative times negative is a positive.*" Through her follow-up questioning on every student demonstration, she socialized the students to value conceptual understanding over simple correctness and emphasized that everyone has something to contribute regardless of their answer. She said, "*I always have questions, and follow-up questions, and follow-up questions [laughing], so they know it's coming... So we do that together for maybe two questions. And then, they take the lead on the next one. Meaning, they're now the ones asking the questions to each other.*"

In this working paper, I've provided several examples on the mindset and concrete practices of a specific teacher, Mrs. Emmett. I've done this intentionally not only due to the sheer quality of her examples, but also to corroborate the power of her examples by demonstrating how her students feel safety, belonging, worth, and opportunities to thrive in her classroom. Shae is one of Mrs. Emmett's ninth-grade students, and she talks about her (and other students') sense of belonging in the classroom through the way Mrs. Emmett facilitates group work, feedback, and student contributions.

*Everybody learns differently. So, maybe the way she's teaching, they feel comfortable when a student explains it than when she does. So that's why we do groups and the group help us teach... Because maybe her way of explaining it. Cause everyone explains it differently. Like [teacher name] could say one thing and I change it all the way up like how I see it. And they be like, "Oh, I get it." And if how I said it gets them to get the right answer. She keeps me going around to the other people, or anybody else that get it to the first person. She keeps them going around to people that don't understand it. And then she'll tell us to go up so the whole class could know now. And they understand it my way and her way. Because maybe she could use maybe like vocabulary they don't understand, or they wasn't paying attention [laughing] and then they just get it my way. Anybody else's away. I think that's how we become a successful class. We have multiple aids.*

These illustrations convey that some of the most adaptive adjustments during instruction may involve releasing the reins of control for students to take charge in supporting each other's learning. This can be difficult for teachers who see themselves as the lone authority on mathematical knowledge in the classroom or those who possess a savior mentality. When teachers see themselves as allies/guides and trust that students have expertise in the content



and in teaching, multiple opportunities for in-the-moment adjustments present themselves to be capitalized on.

Once a teacher has begun to coordinate and develop rich problems through the 4H and interest interview activity, they will need to be skillful in leveraging the power of these illustrations to maximize their impact for student learning. A ripe area for adjustment in mathematics instruction is encouraging teachers to provide greater opportunities for students to “finish” word problems (aka story problems or rich tasks). Through countless hours of classroom observation, I’ve come to realize that math teachers often fail to capitalize on the power of word problems (especially culturally-relevant word



problems) to illustrate how math is connected to everyday life and to allow students to see themselves represented in the math. Students and teachers often 1) read the problem to ascertain the important information, 2) model the problem mathematically in order to solve, and then 3) solve for the answer and double-check for correctness. However, a critical fourth step is to re-insert the achieved answer back into the problem to interpret the meaning of the answer conceptually and contextually (please see the video for a deeper explanation and sample word problem). Teachers rarely press students to follow through on this fourth and important step. When this happens, they reduce the meaning of math to simple ‘correctness’, and over time students struggle to find meaning in math beyond whether they can solve a problem correctly, because the meaning-making discussions are rarely processed or rewarded. Due to this, students, especially those who may struggle in arriving at the correct answer quickly and consistently, may begin to perceive that mathematics is not for them. “Finishing” word problems allows students the opportunity to contribute to the meaning-making process through discussion and application to their own lives. Further, “finishing” word problems can be achieved through a short two-minute discussion of the conceptual and contextual meaning of the answer after it has been found. I would also encourage teachers to make “finishing” word problems a part of their summative assessments, allotting credit to how students discuss the conceptual and contextual meaning of the answer in addition to the correct answer.

Altogether, the assault against students’ sense of belonging in school, and specifically mathematics, is real and ubiquitous for historically disenfranchised students. These assaults are not only clear within the history of our educational institutions in the United States, but also exist in contemporary educational policy and opportunity structures. Teachers can unconsciously perpetuate these threats through interpersonal interactions (i.e., signal influences) as well as their instructional choices. Therefore, teachers must develop critical mindsets in order to disrupt the reification of hegemonic forces in teaching and learning. Finally, high-leverage strategies like the 4H framework, interest interviews, and “finishing” word problems can help assuage the assault against belonging for students from disenfranchised people groups.

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<b>WEEK OF:</b>						<b>CLASS:</b>		
	<i>Daily Rating</i>					<i>Weekly Total</i>	<i>Notes on connections to 4H</i>	
Word Problems	Monday	Tuesday	Wednesday	Thursday	Friday			
Teacher analogies	Monday	Tuesday	Wednesday	Thursday	Friday			
Analysis of real data	Monday	Tuesday	Wednesday	Thursday	Friday			
Discussions of math in society	Monday	Tuesday	Wednesday	Thursday	Friday			
Tangible math representations	Monday	Tuesday	Wednesday	Thursday	Friday			
Mathematical modeling of real world phenomena	Monday	Tuesday	Wednesday	Thursday	Friday			
<b>Weekly Total of ALL ITEMS:</b>								

Word problems that integrate students' experiences (e.g., "Tops are 15% off and jeans 20% off at your favorite store..."), relevant teacher analogies (e.g., relating percentages to pizza pies), discussions of how math is used in contemporary society (e.g., statistics to predict presidential or local elections), analysis of real data (e.g., collecting classmates' data to see the relation between height and shoe size), tangible math representations (e.g., algebra tiles), and mathematical modeling of real world phenomena (e.g., writing an equation to represent the relation between years of education and money earned; Gainsburg, 2008).

Reflection notes from the week: