**Equity and Excellence Framework: Planning Student Centered Social Justice Mathematics Lessons.**

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**Abstract**

Mathematics is generally thought of as a neutral apolitical subject full of formulas and lacking in culture and void in justice/injustice contexts; moreover, systematic ways that math is taught have made math classrooms inequitable. Furthermore, by not engaging in social justice mathematics (SJM), educators are perpetuating a sterile discipline not related to their community or their world. This article examines the continuum of equity-driven frameworks in mathematics to demonstrate how incorporating social justice goals is a continual process. Drawing from Muhammad’s (2020) work to push the current norms to SJM, this article introduces an equity and excellence framework for SJM.

**A Need to Rethink Mathematics.**

You need an appreciation for justice/injustice so that teaching math for social justice is not formulaic. It’s more than what you do as a performance, it’s deeper than that, and it can’t be scripted.” (Martin, 2013 P. 28). Mathematics is usually taught in ways that are separated from the real world, making it unrelatable for many students (Boaler, 2015). Mathematics should be learned in ways that help students make sense of their world and use it to make their world more equitable and just (Berry, et al, 2020, Gutstein & Peterson, 2013). Current events have created a sense of urgency to help students understand the world in which we live. Aligning a social justice approach to the teaching and learning of mathematics provides students with a better understanding of society, preparing them to be critical thinkers and active participants in democracy (Gutstein & Peterson, 2013). Gutstein and Peterson (2013) outline the benefits of a social justice approach to mathematics education including: the motivation to learn important mathematics concepts, the recognition of the power of mathematics to change the world, a deeper understanding of social issues, connecting mathematics to their culture and community, and learning about their own power as an active citizen participating in the building of a democratic society.

Larnell et al. (2016) state, “Whether inside or outside of school, mathematics is political.” (p. 26) Choosing not to include social justice in the mathematics classroom is taking the position of political passivity (Berry, et al, 2020, Gutierrez, 2013). Mathematics is generally thought of as a neutral apolitical subject full of formulas and lacking in culture and void in justice/injustice contexts; moreover, systematic ways that math is taught have made math classrooms inequitable. Furthermore, by not engaging in social justice mathematics (SJM), educators are perpetuating a sterile discipline not related to their community or their world. This article examines the continuum of equity-driven frameworks in mathematics to demonstrate how incorporating social justice goals is a continual process. Drawing from Muhammad’s (2020) work to push the current norms to SJM, this article introduces an equity and excellence framework for SJM.

**Equity Driven Mathematics Teaching Frameworks.**

Social justice work in mathematics education has been an essential part of research in recent years (Berry et al, 2020; Gutiérrez, 2013; Martin, 2013). Different frameworks have been used to help mathematics educators use equitable classroom practices. Berry et al. (2020) outlines the continuum of equity-driven frameworks which include: standards-based mathematics, complex instructions, culturally relevant pedagogy, and critical mathematics education. Each framework builds on the other in a nested relationship and adds new attention to key pieces of equity (Berry et al, 2020). In this section, we will briefly describe these frameworks and show how they point to socially responsive mathematics as the next framework in this equity continuum.

Standards-based mathematics instruction, as a starting point for equity frameworks, stressed access and opportunity for every student to the same mathematics content. While it emphasized learning for understanding over memorization of facts and algorithms, it prioritized equitable access to meaningful mathematics not based on one’s zip code. Moreover, conceptual understanding is developed in a learning environment that includes discourse, conjecture, reasoning, and justification. It set the precedent that schools are responsible for every student learning meaningful mathematics (NCTM, 1989).

Complex instruction counter acted the challenge of small group power dynamics (as they replicated the larger society) (Cohen & Lotan, 2014). Complex instruction is about creating a multidimensional classroom where there are many different ways to be “smart” mathematically (Boaler, 2006, Featherstone et al. 2011). Expectations are raised by providing many different entry points so that more students can access the mathematics.

While standards-based mathematics and complex instruction shifted pedagogy and curriculum to ensure a more equitable classroom, Ladson-Billings’ (1995) research included students’ cultural backgrounds as an essential factor in the learning environment. Culturally Relevant Pedagogy (CRP) demonstrated that meaningful curriculum and instruction need to connect to students’ own cultural backgrounds. Cultural competence and critical consciousness must be valued as much as academic achievement.

Critical mathematics education (CME) expands on the idea of critical consciousness from CRP. CME frames teaching mathematics in a way that focuses on fairness and social justice. Guiterrez (2009) argued that equity is not one-dimensional. She suggests the four dimensions include achievement, access, identity, and power. CME challenges power dynamics in the classroom and grounds itself in identity work. Students’ agency is developed as they begin to see themselves as doers of math, not just passive learners. Students should have opportunities to connect mathematics to the world around them including the problems and (social justice) issues.

These four equity frameworks ground SJM. The former two frameworks provide ways to give all students more access to mathematics, and the latter two frameworks focus on identity and cultural consciousness. SJM strives to achieve access and cultural consciousness, empowering students to connect mathematics to their world and culture (Berry et al, 2020). We will draw on Muhammad’s (2020) equity framework for culturally and historically responsive literacy (HRL) as a way for teachers to create socially responsive mathematics lessons. Although her framework is situated in literacy, this article demonstrates how it can be adapted for mathematics. Muhammad’s (2020) five-layer framework includes identity, skills, intellect, criticality, and joy. Based on this framework we further developed a template for SJM lessons.

**Muhammad’s five layers of restoring equity and excellence to the classroom.**

Identity, the first layer of her framework, is “composed of notions of who we are, who others say we are (in positive and negative ways), and whom we desire to be” (Muhammad, 2020, p. 67). Identity is dynamic and fluid and shaped by our social and cultural environment (Brown & McNamara, 2011). Therefore, opportunities should provide students ways to explore and develop their own identities. Equally important, is learning about other’s while honoring the differences and how they relate to identities unlike their own (Muhammad, 2020).

Skills, the next layer in Muhammad’s (2020) framework, are defined as the competence, ability, and expertise that students need to be successful in a content area. “Our goal is not to help students become better test-takers or academic achievers, but also for them to gain the confidence to use learning as a personal and sociopolitical tool to thrive in this world” (Muhammad, 2020, p68). The skills that are taught in US classrooms are often the manifestation of learning standards provided by the state and are often the focus of reports on student achievement. Through these reports, we find a gap in achievement between students of color and underrepresented populations compared to their white counterparts. Muhammad (2020) challenges educators to consider more than just skills as the primary component of a lesson but instead focus on how skills connect to the other layers of the framework.

The third layer, intellect, encompasses understanding, enhancement, and exercising of mental powers and capacities that allow one to better understand and critique the world around them. Here, students learn concepts that allow them to connect lessons to other subjects and applications in the real world. Intellect is linked to action, which should lead to learning experiences that connect to the human condition. Students of color greatly benefit since society, historically, presents a deficit mindset, where they are not viewed as smart or capable learners (Muhammad, 2020).

Criticality is the fourth layer of Muhammad’s (2020) framework. She defines criticality as “the capacity to read, write, and think of ways of understanding power, privilege, social justice, and oppression, particularly for populations who have been historically marginalized” (Muhammad, 2020, p120). Criticality focuses on the connections between *facts* and *truths*. Although *facts* state historical events, they do not always capture the complete story of the people and their culture. *Truths* are the lived experiences of people in that given moment. Keeping *facts* and *truth* separate limits our understanding of the world and the human condition and often dehumanizes marginalized populations. One myth is that criticality is only for those who are oppressed. However, given the complex and dynamic nature of identity, all students and teachers benefit when criticality is a part of their learning experiences (Muhammad, 2020).

Muhammad’s (2020) fifth layer is joy. Although this layer may seem trivial and out of place, its significance can assist in the dismantling of the often taught oppression and violence of black and brown people’s stories. “When we frame the stories of people of color as narratives steeped in pain or even smallness, this becomes the dominant or sole representation” (Muhammad, 2020, p. 21). Furthermore, mathematics is often thought of devoid of interesting context or applications, creating a joyless learning experience.

**Equity and Excellence Framework for Socially Responsive Mathematics**

In addition to drawing from Muhammad’s (2020) historically responsive literacy framework, the Equity and Excellence Framework (EEF) for SJM expands the work of previous equity-driven frameworks for mathematics. The framework encompasses four main components of mathematics lessons as the launch, explore/explain, summarize, and assess/align. We then provide guiding questions for each layer of Muhammad’s framework (adapted from Muhammad (2020)) and define what each layer would look like in each part of the lesson. Table 1 outlines these definitions. This framework provides a lens to examine current mathematics lessons and a guide for creating new ones. Layers can be presented through any of the components of the lesson. For example, you may have *identity* represented in the launch, *skills* in the explore/explain, *intellect* in the summarization, *criticality* and *joy* in the assess/align. The combinations of where each layer is represented may change, and oftentimes more than one layer will be present in a part of the lesson, but it is important to include all five layers somewhere in the lesson.

**What does equity or mathematics for social justice look like in the classroom?**

Mathematics for social justice can be interpreted in multiple ways. First, it is widely acknowledged that marginalized students often have less prepared teachers and fewer accessible college preparatory courses. Social injustices *in* access to quality mathematics classrooms are to be recognized as an initial strategy needed to erase this dismal statistic. Others, however, interpret mathematics for *social justice* as the examination and inclusion of social injustice topics as a foundation for the mathematics students will learn.

For the purpose of this article, we focus on the middle grades and the inclusion of social injustice topics in the teaching and learning of the mathematics content. We also recognize middle school as a pivotal developmental, social, and emotional juncture where the unique needs of these learners can be supported in their mathematics classrooms. Here, the COVID-19 pandemic is the social issue for context. Also note, the mathematics content is based on the Common Core Standards (2010).

**Table 1:** Equity and Excellence Framework for Social Justice Mathematics - Lesson Plan Guide

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Layer:  Adapted from Muhammad’s (2020) Framework | Lesson Components | | | |
| Launch | Explore/Explain | Summarize | Assess/Align |
| **Identity:** How will your lesson help students learn something about themselves or others? How are you ensuring that students see themselves as a mathematician? | Provide students opportunities to:   * Connect with the topic or application to get them interested in the lesson. * Connect to their community members’ funds of knowledge. | Students are exploring:   * Applications that connect on a personal level * Applications that are relevant to their community or people group. | Students are:   * Summarizing and generalizing the information; students’ words are being used. * Retelling another student's strategy. | Students are given an opportunity to:   * show how they can use this application in their own life. * define things in their own words and pictures. * see how this application is helpful in other’s lives. |
| **Skills:** What Math skills will you be teaching? What math skills do your students need to know for this lesson? | Students can:   * Connect to prior knowledge of skills. * Review skills needed for this lesson. | * Students are getting direct instruction on a new skill. | Students are provided:   * General formulas or procedures are shared. * Procedures or formulas are summarized formally. | * Students can show you the new skill they learned in that lesson. |
| **Intellect:** How will your students apply the new math skill(s) to real-life problems? What real-life problems will they be able to solve? How does this connect to other subjects? | Students are:   * Connecting to real-life application problems presented. * Making predictions about real-life problems | Students have opportunities to explore:   * Real-life applications using math strategies. * The connection to other subjects. * collected data to evaluate their predictions. | Students use:   * Real-life applications to understand a mathematical concept. * Applications to build up the abstract procedure. * Connections to other applications. | * Students are given the opportunity to transfer their knowledge of the skill they learned to either a broader context or a new situation. |
| **Criticality:** How will you engage your thinking about power, equity, and anti-oppression in the text, in society, and the world? What problem or question in your community will this lesson help solve? What are the perspectives of the situation being presented? What is being normalized in the given situation? | Students are:   * Introduced to a problem in the community. * Asked to evaluate if something is fair based on their own experiences. * Introduced to a new perspective on a problem. | Students are introduced to:   * Mathematical strategies to evaluate a problem in a community or school. * A new perspective of mathematics is explored- possibly with a guest speaker or community member. | Students are asked to:   * Evaluate what is being normalized in the generalizations of the skills. * Summarize ideas from different perspectives. | * Students are given the opportunity to reflect on the impact problem-solving or lesson application has on a community or people group. |
| **Joy:** How are you teaching students about the beauty and truth in humanity? How will your instruction spread and amplify joy? Do you include more than negative contexts for marginalized populations? | * Students are introduced to challenging issues humanly. | * Students are shown how other cultures influence this concept of mathematics | * Students share their solutions, and how they were successful in the lesson. * Students make positive connections between mathematics and their world. | * Students hear stories or examples that highlight marginalized populations being successful using the new skill. |

The “lesson starters” that follow are used to examine the framework through the types of questions that teachers can use to address learning goals from Muhammad’s (2020) lesson plan template (p. 159). This template suggests four learning goals of every lesson – identity, skills, intellect, criticality, and joy. We discuss identity, criticality and joy through parts of a mathematics lesson (launch, explore/explain, summarize, and assess/align). The other two learning goals – skills and intellect – are omitted because content is usually the goal that teachers already do proficiently. The following descriptions are not necessarily used in the same lesson but are merely given as strategies for weaving in identity and criticality in different parts of a lesson.

We used data taken from The Minnesota Department of Health Website found: <https://mn.gov/covid19/vaccine/data/index.jsp>. We used Minnesota data since that is the state we are living in. However, even those outside the state of Minnesota can use this data. Research has shown that a good starting point into social justice mathematics is to look at a similar context that has happened in a different location (Berry et al, 2020). This helps build respectful conversations about social justice topics without it being too personal for the students in the community.

**Identity**: **How will your lesson help students learn something about themselves?**

***Launch***: *How has the pandemic affected your life?* Students’ responses will probably include references to online classes, isolation, job loss by a family member, and the possibility of health challenges experienced by someone they know. Teachers should be prepared to accept and address those challenges. Yet, a question like this at the beginning of a mathematics lesson invites every student to participate and begin to see themselves in the mathematics.

***Explore/Explain***: *Has the vaccine been distributed equally among the population?* In this lesson, students will receive vaccine data disaggregated by race/ethnicity. These data could be presented on a table or on a graph. This information is presented as the context for comparing fractions, decimals, or percentages. In reality, this is also addressing the “skills” learning goal from Muhammad’s lesson template. Common Core Mathematics standard: 6.RP.A.3.A make tables of equivalent ratios relating quantities.

***Summarize/Generalize***: *So, has the vaccine been equally distributed?* Students will make a decision based on the results of their mathematics calculations. Making concrete decisions on information addresses data and statistics standards. Assessing the reasonableness of results for problems in context is also an important mathematics practice (also a Common Core Mathematics Practice: Reason abstractly and quantitatively). This summary here is tied to the exploration/explanation section of the lesson.

**Criticality**: **How will you engage your thinking about power, equity, and anti-oppression in the [text], in society, and in the world?**

***Launch***: *Why do you think there is a difference in the percentage of Minnesotans who have received the vaccine based on race?* Giving students an open-ended question allows students to contribute to the discourse without the fear of being incorrect. Answers here will be based on their experiences and/or ideas centered on fairness. This character trait is clearly an important characteristic of middle schoolers.

***Explore/Explain***: *Let’s examine the data/graph of vaccine recipients.* There are several mathematics standards that could be addressed here. Whether they are comparing positive rational numbers (Common Core Standard: 6.NS.C.8), determining the probability of an event (Common Core Standard: 6.SP.B.5) or calculating experimental probabilities (Common Core Standard: 6.SP.B.5) students will be able to see connections to their communities with these numbers. These data suggest that Covid-19 has affected communities disproportionately.

***Summarize***: *What suggestions do you have for distributing the vaccine more equitably?* This question aims to help the student see themselves as part of the solution to a social injustice. It challenges students to understand the world and see themselves as important participants.

**Joy:** **How are you teaching students about the beauty and truth in humanity?**

First, let’s talk about “joy.” The New Oxford American Dictionary defines it as “a feeling of great pleasure and happiness” (Oxford University Press, 2022). Joy is limited if it is defined as an emotion when emotions very often are based on circumstances. But while the term hasn’t been specifically defined by Muhammed, we choose to define joy as a condition. The “condition” requires educators to examine the mindset of their classrooms and the condition that mathematics leaves on students.

***Summarize:*** Is the classroom environment steeped in humanity? Can students see themselves in a positive light? Are students able to see hope in the world in which they live? Reflecting on the Covid-19 context, there are more opportunities for students to feel heavy and without hope. It is imperative that teachers, in this case and other cases where data may present BIPOC communities as underserved, uplift the positive consequences of the pandemic on our communities. No longer is it odd to wear a face mask in a classroom. Washing hands and good hygiene are not frowned upon.

Obviously, there are other social issues and injustices that provide a wealth of lesson context, each addressing one of Muhammad’s lesson goals. Other topics that could be a foundation for the context of a mathematics lesson include global warming (examining the change in temperature over time and discussing causes for the changes), gender equity by examining pay for professional athletes (determining equity by comparing income data on graphs), or homeownership equity (as determined by comparing local data by race/ethnicity). When using social injustices that concern more private circumstances like homelessness or food insecurity, know your students and proceed with respect and caution. Another strategy for developing a plethora of contexts is to solicit students for concerns or injustices they experience or see in their communities. Most importantly, help students develop a conscience for equity and social justice through the lens of mathematics and become a part of the solution by critically examining the situation and understanding their role in it.

**Conclusion**

For everyday equity, math educators must be intentional about implementing socially responsive mathematics or it will not happen. It cannot be just a series of math lessons taught at opportune times during the school year (Berry, et al, 2020). It needs to be a natural part of the classroom on a regular basis and not separate superficial lessons. Students need to experience socially responsive mathematics as part of the everyday culture of the class so they can use mathematics to critique and make sense of their world (Berry, et al, 2020). With the equity and excellence framework for social mathematics and lesson plan guide, mathematics educators can find ways to incorporate mathematics for social justice in existing lessons, not necessarily come up with new lessons. Through this rising consciousness of social justice, there is a call to action. It is also important to engage in the community around the school to give students the opportunity to use the information they have learned to make a difference. We believe change happens in the classroom, and through this change, students can make a big impact on their community.

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