

BUILDING TOWARDS HARMONY BETWEEN IDENTITY AND MATHEMATICS SYNTHESIZING FIGURED WORLDS AND RIGHTFUL PRESENCE

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As identity becomes more discussed within education, it becomes crucial to understand identity in relation to power and social justice. In this paper, we discuss the identity frameworks of figured worlds and rightful presence to operationalize the critical consideration of identity within mathematics learning environments. We argue that by themselves, figured worlds and rightful presence have shortcomings that make it difficult to attend to power, and contextualize change, respectively. When considered in tandem, however, these two frameworks complement one another and build a stronger attention to identity that mobilizes student agency in the classroom. We call on educators and researchers to combine and utilize these frameworks to address the dissonance of identity that often occurs for marginalized students, thus building towards a greater harmony of identity and mathematics.

Keywords: Identity, Social Justice

Identity-- the notions and processes by which we recognize ourselves, and others recognize us, as a certain “kind of person” (Gee, 2000)--has become an increasingly discussed topic within education over the past several years. Within education, the development of identity has been articulated as the central purpose of education, where its outcome is, in fact, learning (Bracher, 2006; O’Donnell & Tobbell, 2007). Unfortunately, particularly in mathematics, many students are asked to give up parts of their identity in order to assimilate into the field. Thus, in order to ensure that students, especially those who are marginalized, are not leaving parts of themselves behind in order to study mathematics, it becomes critical to consider identity within mathematics education (Gutierrez, 2012).

As educators, we have the authority to position, or influence the ways that students are perceived, into a variety of identities, both academic and nonacademic (e.g., smart, lazy, collaborative, independent, etc.). The way that students are positioned to participate in mathematics learning environments affects how they learn math as well as how they perceive themselves as learners of mathematics (Turner et al., 2013). With this authority and understanding comes great responsibility. Students ought to be viewed as holistic beings with lives that extend beyond where they learn mathematics; thus, understanding identity is vital if we are to more fully understand and position our students in productive ways that help them succeed both in and outside these learning environments (Wilkes & Ball, 2020). Having a positive mathematical disposition impacts an individual’s identity far outside of the walls of education. Positive dispositions towards mathematics—where one’s identity is in harmony with the field as opposed to clashing with it— can lead to persistence, agency, and confidence, all of which are useful qualities for navigating everyday life (Bishop, 2012; Brown, 2004).

A focus on identity within mathematics education equips researchers with the analytic lens needed to comprehensively examine ethnicity, gender, culture, and power in mathematics (Brown, 2004; Martin et al., 2010). Identity research also helps us to understand the oppressive narratives, such as positioning students of color as “not being good at mathematics,” that exists within mathematics classrooms (Reinholz, 2021). The dissonance that can arise from these

dynamics can be leveraged to create harmony within mathematics by reauthoring narratives that allow us to more productively position students and help them succeed within mathematics (Gay, 2018; Gholson & Wilkes, 2017). In this paper, we will discuss two identity frameworks: figured worlds (Holland et al., 1998; Urrieta, 2007) and rightful presence (Calabrese Barton & Tan, 2019; Squire & Darling, 2013). We will discuss some of the main dimensions of these frameworks, and then synthesize the frameworks in tandem to highlight how these ideas, when applied together, can help educators and researchers bring identity as a tool into mathematics learning environments to build towards harmony between identity and mathematics, furthering the possibilities of learning for all students.

Background

While the field of mathematics has long been perceived as an objective field and thus a neutral space in which all students have equal access to succeed (Gutierrez, 2013), a large body of research exists that evidences the reality of mathematics functioning as a field which further marginalizes students (Dubbs, 2016; Gutierrez, 2017, 2019; Leyva et al., 2021; Reinholz, 2021; Solomon & Craft, 2015; Solomon et al., 2021). This body of research highlights dissonance (e.g., stereotype threat, mathematics anxiety, microaggressions, etc.) that exists for many students as they encounter mathematics through an identity-blind paradigm (Jett, 2019; Spencer et al., 2016).

Research shows that attending to the various aspects of students' identities can improve their learning opportunities and experiences (Gay, 2018; Bishop, 2012). In other words, attending to identity can serve as a way to create harmony and to mediate some of the challenges that otherwise exist within mathematics education. We present the identity frameworks of figured worlds and rightful presence to make sense of the vast concept of identity. Figured worlds is a commonly referenced identity framework (Hatt, 2007; Holland et al., 1998; Urrieta, 2007), and rightful presence is a more recent framework that contributes additional considerations to expand our understanding of identity and the possibilities that can be achieved by attending to it.

Figured Worlds

Figured worlds are “socially and culturally constructed realms of interpretation in which particular characters and actors are recognized, significance is assigned to certain acts, and particular outcomes are valued over others” (Holland et al., 1998, p. 52). Common roles in a mathematics classroom might include instructors, students, and teaching assistants. Certain types of actions are typically associated with each of these roles, such as lecturing, working with peers, and answering questions, respectively. Certain values are also promoted within this context, predicated by the norms that are established, such as solving for correct answers or collaboration. These characters, actions, and values inform how individuals can construct their identities in a given context. Thus, figured worlds function as a production of identity in mathematics education and serve as a framework for understanding the context in which certain identities can or cannot emerge (Voigt et al., 2021; Urrieta, 2007).

Figured worlds as a framework often provides a lens through which to identify the dominant narratives surrounding identity within various contexts (Hatt, 2007; Urrieta, 2007). However, values, such as smartness and success, can be associated with differing actions or roles in various figured worlds, creating inconsistent expectations students must negotiate (Hatt, 2007; Zuckerman & Lo, 2021). While there can be dissonance between various figured worlds, the concept of *third spaces* helps to conceptualize how these worlds can be mediated (Calabrese-Barton & Tan, 2019). According to Jackson and Seiler (2018), third spaces are spaces which blend multiple figured worlds. This enables individuals to incorporate resources from various

figured worlds in which they participate into a new blended space which is itself a figured world. Participating in these third spaces also allows new resources to be created within them. An example of this might be students forming a study group outside of class. This space creates the opportunity to form different norms (e.g., sharing personal experiences, playful interaction, etc.) compared to those of the class. Students can pull from the figured world of their classroom, as well as personal figured worlds, to mediate a learning environment that better suits their learning needs. The emergence of third spaces allows us the opportunity to consider, and perhaps even disrupt dominant narratives that are shaped by these interpretations of characters, actions, and values.

Rightful Presence

Rightful presence is a social justice oriented identity framework, which implies that it is a framework that elicits action toward change. This framework was first applied to the concept of sanctuary cities serving refugees (Calabrese Barton & Tan, 2019; Squire & Darling, 2013). In these cities, refugees are often viewed as guests and the city as a host. This guest-host dynamic is thought to perpetuate inequity since the city functions as a host which extends rights to its guests-- the refugees. However, this notion of extended rights means that refugees are extended the opportunity to assimilate into the city and culture which they are now living in; it does not empower the refugees to change anything, rather it maintains the status quo, which is often rife with injustices. Rightful presence challenges this notion of extended rights (Calabrese Barton & Tan, 2019; Squire & Darling, 2013). The rightful presence framework seeks for people to reauthor their rights within a space, making all characters fully fledged members of their own accord rather than guests who must assimilate to the dominant notions that currently define the space. There are three tenets to the rightful presence framework: 1) allied political struggle is necessary to reauthor rights, 2) rightful presence is claimed when (in)justices are made visible, and 3) rightful presence is a shared burden between the guests and host.

We now outline what these three tenets might look like in a mathematical learning environment. In a mathematics classroom, reauthoring rights could take the form of challenging what valid participation or meaningful learning looks like. The first tenet of rightful presence highlights that if allies, like teachers, are not engaged in this political struggle, it is difficult for reauthored rights to gain legitimacy in the classroom (Calabrese Barton & Tan, 2019). For instance, if a teacher helps students challenge what are considered valid ways of knowing and doing mathematics (i.e., encouraging partial solutions, valuing and discussing mistakes, etc.), they are engaging in a politically-oriented act of reauthoring rights in mathematics. The second tenet underscores the need to highlight the cultural historical relevance of a context in order to understand its current dynamics, and how these injustices must be both visible and present in teaching and learning in the classroom. Teachers can make injustices visible in their classrooms by highlighting the voices of their students, creating opportunities to find intersections between students' authentic lives and the discipline of math. These greater insights can help instructors find ways to position students with greater agency (Calabrese Barton & Tan, 2019). Lastly, the third tenet states that rights are not reauthored with top down approaches from teachers to students, rather they must be mediated by both groups working together. While allied political struggle from a teacher is necessary, the teacher alone cannot reauthor their students' rights; together, action must be taken by both the students seeking to reauthor their rights and the teachers who have the power to extend rights, thus disrupting the traditional power dynamics in a mathematics classroom (Calabrese Barton & Tan, 2019).

We now discuss our reasons for bringing the two frameworks together, and what we believe can be accomplished through their synthesis

Purpose and Aim

In this paper, we advocate for research that collates the theoretical frameworks of figured worlds and rightful presence. In particular, we see a need for researchers and educators to consider these perspectives within mathematics learning environments. The racist and sexist narratives that women and people of color are forced to navigate in their pursuit of mathematics can inhibit them from viewing themselves as mathematicians (Leyva et al., 2021; Reinholz, 2021). Thus, we see a need to study identity from a critical lens that both recognizes the unjust reality that exists and leverages the discomfort created by this recognition in order to make mathematics classrooms more equitable.

Figured worlds is a commonly used framework in identity-based research (Holland et al. 1998; Hatt, 2007; Urrieta, 2007). While this framework does discuss notions of power and acknowledges the potential for artifacts to be repurposed for liberation (Holland et al., 1998; Urrieta, 2007), we believe that the insights that figured worlds provide cannot be successfully operationalized to disrupt the status quo without a more critical lens. We argue that while the framework of figured worlds allows us to study how classrooms function within the status quo and how students negotiate their identities within them, rightful presence gives us the tools to work toward disrupting the status quo locally. We believe that considering the figured worlds of mathematics learning environments while seeking rightful presence allows researchers to situate their research within the broader sociopolitical issues that affect traditionally marginalized students while providing tools to work toward healing local injustices.

Synthesis

In this section, we discuss the shortcomings of figured worlds and rightful presence and affordances that the two frameworks provide one another. In particular, figured worlds as a framework falls short of explicitly challenging power dynamics while rightful presence can be challenging to contextualize. By considering these shortcomings, we see opportunities for these frameworks to complement and support one another. Specifically, figured worlds help to identify change that can occur via rightful presence, and rightful presence provides a way to navigate the tensions that are merely identified within figured worlds.

Shortcomings

Figured worlds fall short as a framework in the way it models power and its impact within society. The roles and actors in any given figured world are likely to have rank and status associated with them, creating a hierarchy through which power and privilege play out (Holland et al., 1998). Power and privilege are not preexisting in figured worlds, but are constructed relationally and made visible through interactions (Esmonde & Langer-Osuna, 2013; Holland et al., 1998). While the figured worlds framework does account for power, it is often presented in an amoral, objective way, such as by stating who the actors are, what their roles are, and what significance is bestowed upon their acts. While the framework acknowledges that the constraints in a figured world (such as the actors, roles and actions permitted) can paradoxically be repurposed for change and thus disrupt power dynamics, it does not explicitly provide a way to analyze how such repurposing takes place (Holland et al., 1998). While figured worlds has helped many to conceptualize identity, these holes surrounding the concept of power make it challenging to use this framework to model a dynamic that challenges the status quo.

Because rightful presence seeks to disrupt oppressive power dynamics (Calabrese Barton & Tan, 2019; Squire & Darling, 2013), many may find the framework challenging to contextualize in their own learning environments, which could be interpreted as a shortcoming. Knowing *how* to engage in political struggles, to make invisible injustices visible, and sharing burdens of injustice with those who are marginalized is a different task from simply knowing the importance of these tenets. A framework is only as useful as it is applicable, and rightful presence might require some scaffolding for many in order for the action-oriented tenets to be approachable.

Affordances

While figured worlds and rightful presence both have shortcomings of their own, we see these two frameworks working together and complementing one another, allowing new ways for educators and researchers to consider identity within mathematics. We will first discuss how figured worlds questions and makes explicit the context in which rightful presence needs to occur, and then we will discuss how rightful presence navigates tensions created via third spaces within figured worlds. These affordances provide opportunities to create greater harmony amid the dissonance that often surrounds identity in the world of mathematics because these synthesized ideas attend to power dynamics and their potential oppression within figured worlds and provide actionable steps towards rightful presence.

Figured Worlds for Rightful Presence. While rightful presence in and of itself can seem like a major jump from reality for some, figured worlds provides a way to mediate some of these tensions by asking questions about the roles, actions, and values at play within a mathematics learning environment, which can help bring to light the local injustices that exist within them. When considering rightful presence, Yeh et al. (2021) challenges us to ask the questions “what is mathematics?”, “who can do mathematics?”, and “where is mathematics done?” (p.4). We now use these questions to help us consider the roles, actions, and values that might exist within a mathematical figured world, thus enacting the frameworks in tandem.

When we address the question of what mathematics is, we consider the actions that are expected for individuals to be perceived as successful in math. Is mathematics the process of memorizing procedures? Is it a representation of the universe that allows us to abstractly problem solve? These questions, and their subsequent answers for various mathematical figured worlds then give rise to roles that are allowed to exist, answering the questions who can do mathematics and where. What does it mean to be a mathematics student? Does this identity exist only in the classroom or does it extend outside of school? Are students’ funds of knowledge from outside of class valued in class discussion or are they dismissed and seen as irrelevant (Esmonde & Langer-Osuna, 2013; Langer-Osuna, 2015)?

These questions that naturally arise when considering mathematical figured worlds help us to recognize how and where we can start to enact rightful presence. As we critically consider the ways that mathematics is expected to be done in a given context, we can start to see the ways that certain types of students might be positioned as smart and successful or otherwise (Hatt, 2007; Leyva et al., 2021). As we consider these types of roles that we position students to fulfill within the classroom, we can see the values that are being assigned to math. These critical considerations allow us to bring to light some of the injustices that otherwise go unseen within mathematics, bringing to life the second tenet of rightful presence. Our understanding of the figured worlds that exist within mathematics is what allows us to understand what rights need to be reauthored so that students can be positioned for further success within and beyond the classroom.

Rightful Presence for Figured Worlds. Rightful presence and its orientation toward the illumination of political struggles can help educators be more intentional about creating opportunities for third spaces to arise in the classroom. Because each figured world has its own characters, roles, and values, the convergence of figured worlds in these third spaces can create tensions if characters, roles, or values do not align from one figured world to the next (Jackson & Seiler, 2018; Zuckerman & Lo, 2021). Rightful presence helps bring to light the tensions that can emerge in the process of creating these third spaces, and can also appropriate ways to navigate these tensions. By challenging the status quo of given figured worlds, rightful presence carves a pathway of political struggle, making injustices visible, and sharing the burden of reauthoring rights.

When various figured worlds are recognized within a classroom, then rightful presence as a social justice framework can be operationalized simultaneously as a means to productively leverage tensions that might arise with the emergence of third spaces, allowing for new resources to also emerge that students can utilize in the classroom. Rightful presence does this first by highlighting and giving permission for the political struggle that is a part of this process. While change is not a comfortable process, educators and researchers can take comfort in knowing that engaging in political struggles is to be expected on the journey towards liberation, where education fundamentally should act as a tool and process of empowerment and liberation (Calabrese-Barton & Tan, 2019; Gutierrez, 2013). Rightful presence helps to highlight *why* political struggle is necessary by demanding that injustices at play be brought to light. Where educators might recognize tensions within classrooms, rightful presence can bring these issues to the forefront of attention so that the group (both hosts and guests) can collaborate together to navigate and mediate these challenges. This process of open communication and collaboration is in and of itself the beginning of reauthoring rights, allowing the tensions that inevitably exist within learning environments to serve a purpose. When educators open up these spaces to include students in these ways, the burden of change can be shared by all involved, allowing for more resources to be utilized in navigating tensions by way of third spaces. Once these third spaces have been cultivated through enacting rightful presence, students have an ideal environment that affords the benefit and utility of their full identities, rather than just fractions of them, within mathematics.

Discussion

We see important implications that can stem from drawing upon the figured worlds and rightful presence frameworks together. The figured worlds framework allows educators to characterize how the status quo operates within their classroom. A mathematics classroom exists as a figured world but also serves as a third space where additional figured worlds with highly established hierarchies and power structures, such as race and gender, intersect. While students can draw upon more resources when figured worlds come together like this (Calabrese-Barton & Tan, 2019; Jackson & Seiler, 2018), in mathematics classrooms, the dominant narratives in the figured world of mathematics that regard innate ability, intelligence, race, and gender actively position women and people of color as not belonging in mathematics classes, and even as being incapable of mathematics altogether (Leyva et al., 2021; Reinholz, 2021). Thus, characterizing the extant roles, actions, values, and dominant narratives surrounding student identity in a mathematics classroom reveals to educators what currently exists in these educational spaces, bringing awareness to where change can occur. Rightful presence then provides a student-centered lens oriented toward creating this change.

For researchers, applying these theoretical perspectives concurrently provides a powerful lens through which to analyze how students renegotiate their identities and reauthor their rights within educational contexts. This perspective could be powerful in revealing how problematic narratives within mathematics manifest locally within classrooms and how educators can most effectively leverage the insights figured worlds grant them while studying how the tenets of rightful presence give space for students to renegotiate their beliefs and reconfigure their figured worlds within the classroom (Calabrese Barton & Tan, 2020). Thus, lessons and learning environments can be designed with an orientation toward revealing current injustices in the classroom through the active analysis of figured worlds while the tenets of rightful presence can orient the lesson and learning environment toward remedying these injustices. This creates an explicit focus toward leveraging student agency to use what exists within figured worlds to disrupt and ultimately rewrite the roles, actions, and values within students' figured worlds, creating new counter-narratives for what it means to study mathematics and to be a mathematician.

While we do not claim that this critical lens of identity can be operationalized to change mathematics as a whole, we believe they can greatly assist educators and researchers to better understand how students negotiate their identity and leverage their agency within mathematics learning environments. This can help educators and researchers to then enact these ideas, designing and implementing mathematics lessons and contexts that treat students as holistic beings, creating space for students to mobilize their agency, and working toward disrupting systemic issues within mathematics, one classroom at a time.

Conclusion

In this paper we have discussed the importance of identity in mathematics education and the affordances of synthesizing the frameworks of figured worlds and rightful presence as a means to create harmony among the dissonance in mathematics that surrounds mathematical identity. By viewing mathematics learning environments as figured worlds, researchers can identify how the status quo and power dynamics operate within it. Through explicitly identifying the roles, actions, values, and dominant narratives in the classroom, the possibility for change emerges. By contextualizing the dynamics of injustice, rightful presence equips us with the tools needed to navigate tensions within these environments. Thus, through the illumination of injustices, spaces like classrooms can be cultivated in a way that mobilizes student agency in order to disrupt and reauthor the roles, actions, and values within the pre-existing figured worlds. Through this reauthoring, counter-narratives can be created, blazing the trail for a new conception of what it means to study and do mathematics, as well as what it means to be a mathematician. Together, figured worlds and rightful presence can inform us of *what is* within mathematics and empower us to build towards *what could be*. We call on educators and researchers to consider and apply these frameworks, in tandem as outlined, in their future work so that we might work towards creating mathematics education as a space of liberation.

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