

Developing a Positive Mathematical Identity

In mathematics classrooms, mathematical identity is mediated by how students engage with mathematics. Consequently, mathematics teaching involves not only helping students learn concepts and develop skills and understanding but also empowering students to see themselves as capable of participating in and being doers of mathematics. In the Bike and Truck vignette above, Ms. Shackelford orchestrated a mathematical discussion with her students to engage in practices allowing them to see themselves as doers of mathematics. In doing so, Ms. Shackelford positioned her students as mathematically competent.

In too many high school mathematics classrooms, students are passively engaged with mathematics, and little mathematical discourse occurs. Reasoning and sense making are rarely encouraged, and mathematics is positioned as having little relevance to students' lives or experiences. In other classrooms, students are active participants, engaging in reasoning and sense making, striving to make their mathematical thinking visible and intelligible to others, using multiple forms of discourse, and critiquing their world through the use of mathematics.

Depending on the context, one's mathematical identity reflects a sense of oneself as a competent performer, able to do mathematics. How students are positioned to participate in mathematics affects not only what they learn but also how they come to see themselves as learners. The ways in which students view themselves as learners of mathematics greatly influence how they participate (Bishop 2012; Nasir and Hand 2006). Developing students' identities should be part of teachers' daily work, in which they use teaching practices that focus on mathematics, leverage multiple mathematical competencies, affirm mathematical identities, challenge marginality, and draw on multiple resources of knowledge (Aguirre, Mayfield-Ingram, and Martin 2013). Furthermore, reasoning and sense making and the mathematical practices and habits of mind (NCTM 2009) are components of "doing mathematics."

Developing Mathematical Agency

The ways in which students participate in mathematics and express their mathematical identities determine their level of agency. *Agency* refers to the expression of one's identity (Murrell 2007). Students tell others through words and actions who they are and what their purpose is in a particular setting, space, or situation. In mathematics classrooms, agency is expressed in the ways that students engage in productive struggle, take risks to make their mathematical thinking visible, and understand that learning results when they successfully leverage an approach that works for them. In the Bike and Truck vignette, Jacobi and Charles made their mathematical reasoning visible by engaging in the classroom discussion to reach

agreement about a description of the movement of the truck. This level of engagement is an example of agency because both students verbalized their reasoning, persisted in explaining it, and remained engaged in the discussion until they reached an understanding of it. A high sense of agency allows and encourages students to continue with a rigorous course of study in mathematics.

Mathematical agency is about participating in mathematics in ways that are meaningful, both personally and socially (Berry 2016). Because participation in mathematics involves problem solving, reasoning, sense making, discourse, modeling, and appropriate use of tools, effective learning settings implement core equitable mathematics teaching practices that support mathematical agency (Bartell et al. 2017). Equitable mathematics teaching practices support identity and agency by creating structures for having students' mathematical ideas considered during instruction, supporting students in viewing themselves as having ownership of mathematical meaning, and coordinating enterprises across contexts to strengthen this ownership (Aguirre, Mayfield-Ingram, and Martin 2013; Oppland-Cordell and Martin 2015).
