

Exploring the Math Journeys of Latino American Teens: Their Math Identities, Math Mindsets, and Experiences Studying Math

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Introduction

By developing innovative technologies and products and establishing new companies, workers in STEM professions make a major contribution to our nation's global competitiveness (Noonan, 2017). The STEM sector is experiencing rapid job growth and STEM occupations, on average, pay significantly more than the median annual wage for all occupations:

\$89,780 versus \$41,950 (Noonan, 2017). Thus, jobs in STEM fields offer prime opportunities for employment and advancement. To meet the demand for STEM workers, we need more students to major in STEM subjects and pursue careers in STEM fields.

The participation of Latino Americans in STEM fields in higher education and the workforce is an important labor market issue. Despite some efforts to recruit Latino students to pursue degrees and careers in STEM, they continue to comprise a lower proportion of STEM graduates relative to their proportion in the adult population. For example, in 2019 Latino students represented 9% of math-related bachelor's degree recipients, while representing 14% of the U.S. population (NCSES, 2021).

Research indicates that some of these differences in STEM participation is related to students' early math and science course-taking, their classroom learning environments, and their beliefs about the importance of math and their own math abilities (Gonzalez, et al., 2020). To better understand Latino teens' experiences studying math and the factors

that may influence their math course-taking and achievement, we studied their responses to survey questions about the following factors:

- ❖ Classroom climate (teacher and peer interactions in math class),
- ❖ Math identities and beliefs about math (teens' views of their math ability, how math ability develops and the importance of studying math), and
- ❖ Support from parents around math learning (parental expectations and providing help).

This analysis is part of a larger study NORC conducted to explore how teens view math (math mindset), their own math abilities (math identity) and their experiences studying math (instructional contexts). The data was collected through a survey of a nationally representative sample of teens ages 13-17, administered in the Fall of 2021. Below is a brief description of our methods followed by a summary of the findings.

A note about our approach: We chose to focus this brief on a subset of the population rather than make comparisons across subgroups to avoid “gap-gazing,” a term used to describe the tendency for math research to focus on differences between White students and students from marginalized groups, absent of any discussion about why disparities exist which can inadvertently promote the belief that marginalized students have inherent shortcomings and other misleading ideas about academic achievement (Gutierrez, 2008). By focusing on each subgroup separately, in this case Latino secondary school students, we can understand Latino teens' math beliefs and experiences in and of themselves, and thus support the development of research and interventions focused on creating effective teaching and learning environments for Latino students.

A note about terminology: For this Research Brief, we use the term Latino to refer to teens who identified themselves as Latino/Latina/Latinx or Hispanic. We recognize that, while these terms are intended to be broad and inclusive, they may imply a homogeneity in race/ethnicity and gender identity that is inaccurate.

The Study

For the larger study, teens identifying as Latino were oversampled due to a special interest in the experiences of subgroups who are underrepresented in honors and advanced placement (AP) coursework (Flowers, 2008), and in STEM majors and careers (NCSES, 2021). The final subsample containing 441 Latino teens was balanced by gender (52% female). It was comprised mostly of students in grades 9 through 12 (82%) and was socioeconomically diverse.

Participants completed a 27-question survey where they responded to most items on a six-point Likert scale (Strongly Disagree to Strongly Agree). For this brief, we collapsed responses into three categories representing different degrees of agreement (Table 1).

Table 1. Degrees of Agreement

Degree of Agreement	Survey Response Options
Low/negative	Strongly Disagree/Disagree
Moderate	Somewhat Disagree/Somewhat Agree
High	Agree/Strongly Agree

We tabulated the responses to each survey question and conducted descriptive analysis by gender and SES group. Below is a summary of our findings.

Findings

Consistent with prior research on the different experiences of male and female students when studying math (Jacobs, 2005), we found clear differences in the responses of male and female Latino teens to the survey questions.

1. Math Identity and Beliefs: Female teens were less positive about their math identity and beliefs than male teens.

Because beliefs about math identity reflect how teens see themselves as learners and is also associated with whether they excel in math (Miller-Cotto & Lewis, 2020), we surveyed teens about beliefs related to their math identity. Math identity is especially important for teens from underrepresented racial/ethnic minority groups because these individuals face stereotypes related to their math ability. As a result, these students are challenged with developing a positive outlook of their math identity or seeing themselves as mathematically capable because of this discrimination (Miller-Cotto & Lewis, 2020; Steele, 1997). In addition, research about teens' math identity and beliefs found that young women rate their math ability and competency lower than that of men (Baird & Keene 2019), and that Latino male students report higher STEM confidence than Latino females (Litzler, et al., 2014).

When we explored whether Latino male and female teens differed in their math identity and beliefs (such as beliefs about their own abilities and their sense of belonging in math class), we found a clear difference (Table 2).

- ❖ Latino female students rated their math ability and sense of belonging in math class lower than their male counterparts.

- ❖ More Latino female than male students disagreed that they understand difficult work in math class and that they enjoy math class.
- ❖ Interestingly, more female than male Hispanic/Latinx teens disagreed with a statement that math ability is fixed and cannot be changed.

Table 2. Gender Differences for Math Identity & Beliefs

Math Identity & Beliefs	Gender	Degrees of Agreement		
		Low	Moderate	High
<i>I think I am good at math.</i>	Male	14%	43.0%	43%
	Female	18%	53.0%	29%
<i>When I'm in math class, I feel like I belong.</i>	Male	14%	51%	35%
	Female	18%	56%	26%
<i>In my math class I understand even the most difficult work.</i>	Male	22%	54%	25%
	Female	30%	46%	24%
<i>I enjoy math class.</i>	Male	16%	51%	33%
	Female	29%	41%	31%
<i>I have a certain amount of math ability and can't do much to change it.</i>	Male	34%	53%	13%
	Female	42%	51%	7%

These results suggest that the development of a positive math identity is different for Latino male and female teens, with fewer female teens believing they are good at math and can handle difficult work; and fewer finding math class a place where they belong and a subject they enjoy. These findings are consistent with prior research that found that female students lack early interest and aspirations in STEM fields (Ma, 2011).

2. Classroom Experiences & Parental Supports: Female teens were less positive about their classroom experiences & parental supports than male teens.

Teachers undoubtedly play an important role in the academic success or failure of students, and teacher beliefs and perceptions of students' math abilities is one avenue through which students' math outcomes are influenced (Strayhorn, 2010). In addition, student-teacher relationships matter as well (McGrath & Van Bergen, 2015). Several studies have found that students from racial/ethnic minority backgrounds and students from lower socioeconomic backgrounds experience fewer close student-teacher relationships (McGrath & Van Bergen, 2015). Moreover, while research has found that having a teacher of the same race often has a positive effect on students' achievement and course-taking, research also finds that Black and Latino students often do not have

a math teacher of the same race (Grissom, Kabourek & Kramer, 2020; Joshi, et al., 2018; Shaw-Amoah, et al., 2020).

We explored Latino teens' experiences in their math class (such as whether they feel supported in class and have positive interactions with their teacher and peers) and parental support (help with homework). As presented in Table 3, we found a clear difference in male and female Latino teen classroom experiences and parental support.

- ❖ Fewer Latino female than male teens reported that their teacher was someone they could count on for help.
- ❖ More Latino female than male teens reported that students in their class work together.
- ❖ Fewer Latino female than male teens reported that their parent(s)/guardians help them with their math homework.

Table 3. Gender Differences for Classroom Experiences & Parental Support

Classroom Experiences & Support	Gender	Degrees of Agreement		
		Low	Moderate	High
<i>My teacher is someone I can count on to help me.</i>	Male	7%	37%	56%
	Female	9%	43%	48%
<i>Students in my math class work together.</i>	Male	13%	54%	33%
	Female	12%	47%	40%
<i>My parent(s) or guardian(s) help me with my math homework.</i>	Male	23%	32%	45%
	Female	24%	41%	36%

These results suggest that Latino female teens feel less supported by their teachers and by their parent(s)/guardian(s), but experience greater collaboration with peers than their male counterparts.

3. Math achievement and course-taking: More female teens reported passing math class and taking higher-level math courses.

Research has found that even though males, and particularly Latino males, rate their math ability as high, Latino females enroll in more advanced classes, pass their math courses at a higher rate, and earn higher grades (Safavian 2019). We explored students' math achievement by asking the number of honors/advanced courses they were enrolled in and if they passed their math course in the previous year.

Consistent with prior research, we found that even though Latino females reported having fewer positive experiences in the classroom and less belief in their math ability, more Latino females reported passing their previous years' math course than Latino males. Additionally, more Hispanic/Latinx females than males reported taking at least one AP/honors course. (Table 4.)

Table 4. Gender Differences in Math Achievement & Course-Taking

Math Achievement	Gender	Failed	Passed
<i>Passed math course last year</i>	Male	11%	89%
	Female	4%	96%
Math Course-Taking	Gender	No courses	At least one course
<i>Took at least one honors/AP math course</i>	Male	78%	22%
	Female	69%	31%

These results may speak to a resiliency of Latino female teens to perform well in math class and take higher level math, despite their less positive classroom experiences and belief in their math abilities.

4. Findings by SES groups: Few differences found among Latino teens from different SES groups.

There is a general expectation in education that SES drives many of the differences in students' experiences and performance. In addition, prior research highlights how students from different SES groups experience different levels of access to resources and quality of instruction when studying math (Strayhorn, 2010). However, when we examined Latino teens' responses by SES groups, we found an overwhelming similarity in how they responded to questions about their classroom climate, math identity and beliefs and parental involvement. Latino students in both the lowest and highest SES groups responded similarly to questions such as whether they enjoy math, feel good at math, count on their teachers for help, and get help with math homework from parents.

Conclusion

Our exploration of Latino teens' math beliefs, classroom experiences, and math performance revealed differences between male and female students. Overall, female Latino teens were less positive about their math identity and beliefs than male teens and were less positive about their classroom experiences and parental supports than male teens. Despite responding less positively to questions about their math identity, beliefs

and experiences overall, Latino females in our sample reported slightly higher achievement than males as measured by passing their courses last year and taking at least one honors/AP advanced course.

It is important to frame this conundrum from a resilience perspective especially if programs or interventions are being considered to increase the participation of Latino females in math and STEM more broadly. As Ma (2011) points out, men are more likely to pursue STEM majors and careers earlier on, following a full pathway, while women's pursuit of STEM majors and careers typically begin later in high school. Clearly, there is a solid base of achievement to build on for this subgroup but dedicating more resources to understanding what causes female teens' less positive view of math and of their own math abilities is paramount in engaging this population to pursue coursework and careers in STEM. Interestingly, these insights would not have surfaced if we had chosen to compare Latino teens to white teens or another group such as Black/African American teens.

More research is needed to explore further the barriers and facilitators to Latino teens' math journeys. One next step would be to study teens' math experiences longitudinally, to learn more about the ways different factors influence their math journeys and identify barriers and facilitators to their successful pursuit of math and other STEM subjects in college and careers. Efforts being undertaken to increase participation of Latino teens in math and STEM more broadly might consider the role gender plays in Latino teens' math journeys, and that interventions or policies should be designed with these differences in mind.

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