

**COLLEGE ACCESS FACTORS OF URBAN LATINA GIRLS:
THE ROLE OF MATH ABILITY PERCEPTIONS**

Alma L. Zaragoza-Petty
University of California, Irvine

Maria Estela Zarate
California State University, Fullerton

ABSTRACT

This study investigates the role of math perceptions on the college enrollment of Latinas in urban settings. Using primarily qualitative methods, this study examines the K-12 schooling experiences of 35 Latina students who were part of a larger fifteen-year study. Students had different college enrollment outcomes despite having similarly low mathematics trajectories. Math ability perceptions prevailed as a theme that played a role in their college enrollment.

Introduction

Access to college is still an issue for many urban Latina girls (Castellanos, Gloria & Kamimura, 2006; Ginorio & Huston, 2001). Factors such as peer influence, school characteristics, parental education, socioeconomic status, linguistic characteristics, and immigrant generation have all been associated with Latino students' college enrollment. (Callahan, 2008; Ceja, 2006; Gandara, 1995; Riegle-Crumb, 2010; Perna, 2000). Academic achievement and high school preparation certainly also play important roles in determining which students go on to college (Adelman, 2005; Perna, 2000). Math achievement, in particular, has been found to be an important predictor of college enrollment (Horn & Nuñez, 2000; Crisp & Nora, 2010; Riegle-Crumb, 2010). However, some have noted limitations in applying the typically used measures of math achievement, (e.g., math test scores and math class placement), to models of Latina girls' educational outcomes (Riegle-Crumb, 2010; Riegle-Crumb, King, Grodsky, & Muller, 2012; Zarate & Gallimore, 2005). Questions remain about how best to identify math experiences and achievement factors into Latina girls' educational outcomes.

Our study seeks to address this question and we seek to expand this research by asking how urban Latina girls' perceptions of math ability differ by college enrollment, when they all had low mathematics trajectories. We aim to contribute to the body of work seeking to determine which aspects of Latina students' in urban educational contexts matter to college enrollment. We are especially concerned with girls who are often overlooked in studies of college access, including girls with low academic achievement trajectories (Malagon & Alvarez, 2010).

Literature Review

The Role of Math Achievement in College Enrollment for Latina/os

In the existing literature, mathematics achievement as early as middle school has been found to be a predictor of college enrollment (Adelman, 1999; Choy, Horn, Nuñez & Chen, 2000; Crisp & Nora, 2010; Perna & Titus, 2004; Riegle-Crumb, 2010). Taking high-level mathematics courses early on (Cabrera & La Nasa, 2000; Choy, et al., 2000; Horn & Nuñez, 2000) and having higher scores on standardized mathematics tests (Kurleander, 2006) have been

associated with greater likelihood of enrolling in college.

Although mathematics achievement has a fairly consistent and positive association with college enrollment for the general population, some have pointed to the limitations in relying on this factor as a determinant of college enrollment for Latina/o students in general (Adelman, 2005; Kurlander, 2006; Riegle-Crumb, et al., 2012; Zarate & Gallimore, 2005). For example, in studies of disaggregated samples of Latina/o students, the influence of mathematics achievement on college enrollment is not as consistent as it is for overall samples (Riegle-Crumb, 2010; Zarate & Gallimore, 2005).

Latina Girls' Math Ability Perceptions

Researchers have maintained that tracking practices in schools or school's curricular offerings often relegate Latina girls to a general or basic curriculum that does not include higher-level math classes (Oakes, 1985; Solorzano, Ledesma, Pérez, Burciaga, & Ornelas, 2002; Zarate & Gallimore, 2005). Thus, when examining the impact of math class placement on college enrollment, we may be accounting for the impact of tracking processes or schooling conditions rather than students' achievement. One of the limitations of using standardized test scores and mathematics class placement as indicators of math achievement is that they capture static points in time and may not account for students' perceptions of math ability or the affective qualities of students' mathematics trajectories over their K-12 experiences (Riegle-Crumb, et al., 2012). For example, despite having similar achievement in mathematics tests and classes, Latina girls have more negative attitudes than their male counterparts and White and African American girls, suggesting that their attitudes and perceptions about mathematics are not associated with their test scores and grades in mathematics (Catsambis, 1994). In addition, others have found that mathematics self-concepts may be a better indicator of college major and career decisions, and only partially related to or even independent of mathematics ability (Pajares & Miller, 1994; Riegle, et al., 2012; Zeldin & Pajares, 2011;).

The development or construction of math self-concepts is indeed a complex process. Yet, there is evidence that suggests math self-perceptions may be a more accurate indicator of students' long-term educational outcomes, including decisions to continue to college, than test scores or math class placement (Crosnoe, Riegle-Crumb, & Muller, 2007; Riegle-Crumb et al., 2012). Indeed, there are some apparent limitations of relying on mathematics achievement, and not self-perceptions of math ability, as a universally reliable predictor of college enrollment. In this exploration, we study a group of Latina girls whose mathematics achievement trajectories may be classified as "risk factors" in the college access literature (Croninger & Lee, 2001; Horn & Carrol, 1997; Horn & Nuñez, 2000; i), yet half of them defied this "risk" and enrolled in college. We are interested in identifying more nuanced explanations for why some of the girls went to college and others did not, despite having similarly low mathematics achievement trajectories.

Methods

Sample

This study makes use of the Latino Home School Project, a fifteen-year longitudinal study of Latino children and their families from Southern California that began in 1989. At the

beginning of the study, 121 families were randomly selected from several schools to participate in the study. After fifteen years, the retained sample consisted of eighty-three students and their families, including 38 girls. Statistical comparisons of students retained and lost over time indicate no significant differences in parental education or occupation, length of U.S. residence, or a student's early academic performance (for analyses see Zarate & Gallimore, 2005).

Data

Student interviews from years 2001 (10th grade), 2003 (12th grade), and 2004 (one year post high school) form the principal data for this study. Interviews employed a semi-structured format with a standard set of questions and probes and generally lasted 1.5 hours. All participants' interviews were audio recorded and transcribed for data coding and analysis. Generally, participants answered questions about their academic status and progress, educational and occupational aspirations and expectations.

Data Analysis

For the analysis, an inductive open coding approach was used to identify portions of text that emerged as salient themes (Coffey & Atkinson, 1996; Creswell, 2009). This analysis suggested that students often discussed their experiences in school in relation to perceptions of math. Given the link between girls' recollections of math and other schooling experiences, we used descriptive statistics to analyze mathematics course placement and standardized mathematics test scores (1st – 10th grade). We then sorted students into two categories of math class placement: high and low math class placement. Participants were considered to have low mathematics class placement if their last class in high school was any class lower than Algebra II or its equivalent. Participants were considered to have high mathematics class placement if their last class in high school was Algebra II, its equivalent or higher.

From test score and math class placement groupings we developed eight groups based on possible combinations of mathematics test score trajectories, high school mathematics class placement, and college enrollment status (see Appendix). Of those eight groups, two groups stood out that had similar mathematics trajectories but different college enrollment outcomes and for whom the co-occurrence of math ability perceptions and teacher experience codes was nearly uniform: 1) The group we labeled "LLC" had low mathematics test scores and low class placement and went on to college (n = 8); 2) The group we labeled "LLNC" had low mathematics test scores and low class placement but did not go on to college (n=9). We examined data for differences between Latina girls who went on to college and those who did not (LLC v. LLNC). A prominent theme that emerged from the data analyses was the students' perceptions of math ability.

Results

Our analyses revealed that comparable numbers of Latina students with low academic trajectories did not enroll in college (LLNC, n = 9) as compared to those who did enroll in college (LLC, n=8). We further sought to examine *why* these two groups of girls, with similarly low academic trajectories, had divergent educational outcomes. Based on the differences in these findings, we more closely examined what themes were prevalent between these two groups of

girls. A prominent theme that emerged was *how* college and non-college going girls discussed their perceptions of math ability.

Perceptions of Mathematics Ability

We observed that the ways that college and non-college going girls talked about math classes and their math ability (self-perceptions) was a theme that differentiated these two groups. Since all the girls performed poorly in math throughout their schooling, it was no surprise that they all generally had negative recollections of their exposure to math content. However, the college girls talked about math in terms of its difficulty and their lack of mastery of the content. Non-college girls, on the other hand, talked emotionally about hating mathematics and associated their performance in math with their own learning potential. The ways both of these groups of girls' experienced math indicated that college and non-college going girls had distinct perceptions of their math ability. The following participant cases illustrate how the girls differently coped with their difficult math trajectories.

For example, the following excerpt illustrated how a non-college going girl, who despite doing well in other classes, decides she “doesn’t know nothing” because she does not understand mathematics; yet, she realizes the importance of mastering the subject:

I’m dumb when it comes to mathematics, for real. It doesn’t interest me, what am I gonna use mathematics for, but you need mathematics for everything man. For reals, but one of my favorite subjects, my senior year, was Civics. I would get into it in class, like really interesting. History, that, just Mathematics I always hated Mathematics... ‘cause I don’t know nothing, I don’t know, cause I don’t know I wouldn’t get it. No matter how many times they would explain it to me I wouldn’t get it.

—Participant 110, LLNC

Other non-college girls described mathematics as the only subject in which they struggled and avoided. In the following excerpt, another non-college going girl describes how she excelled in other classes but “didn’t like” mathematics and did not want to attend that particular class.

I was really bad at math, horrible. My history classes, my government classes, my English classes, I was like in a special program where we would get a whole lot of English and a whole lot of philosophy and psychology and I was really good at it. I liked the classes. The bad thing about me is that I would get really, really good grades in those classes and in my math classes, and chemistry I would do really bad because I didn’t like it. I didn’t even want to show because I hated it.

—Participant 005, LLNC

In contrast, girls who later enrolled in college spoke about their struggles in math as a challenge that they were learning to overcome, were developing strategies to improve their math grades, or simply did not see their poor performance in math as indicative of their potential. For example, one college-going girl (Participant 098, LLC) learned that taking each math class twice was the answer to her struggles in math:

The math class [in college] is easy, I think it’s a little bit easier – because a lot of things for

me, the second time for me it's easier... I didn't do that good [in high school] (laughing). I know because I took algebra twice and I took geometry twice and everything just worked out that way... [So, you think that the classes you are taking are going to prepare you for what you want to do in the future?] Math, no. [Why not?] Math no, I see no point in it. Every time I have a math class ... even though I never did good the first time, I knew I was going to get it the second time around.

—Participant 098, LLC

In another illustrative example, a college-going girl developed a strategy to improve her math grades by seeking help from extended family members. In the following excerpt, Participant 112 describes her challenging experiences in mathematics classes and details how her uncle, who has a college education from Mexico, was “always try[ing] to help me out,” even if his assistance was not well received in school:

My uncle would be like do this and you get the answer, but I would get marked down because I didn't show everything...I explained it to one of my teachers and she was like you have to do it this way. You have to show everything. He [the uncle] didn't know the other way, so I kind of got stuck that way.”

—Participant 112, LLC

Generally though, college-going girls simply did not see their poor performance in math as indicative of their academic potential. When asked how she did academically in school, Participant 108 recalls that “elementary was fun and stuff. It was like add and subtract stuff but in junior and high [school] you need to know how to add and subtract and multiply and do fractions. I knew all that stuff.” Although she did not feel challenged by the math level she was in, she felt prepared for the demands of the math classes she took.

Whereas college girls' self perceptions of their academic ability appear to not be injured by their poor math performance, non-college going girls described their “hate” and dislike for math repeatedly. Unfortunately, these negative experiences in high school also appeared to influence how they viewed their transition to college, as evidenced by the words of one non-college going girl (Participant 062):

I'm just gonna waste my time there [college] you know, porque digo (because I say) ok, if I go to [a community college], four more years of high school - oh my god, Ay como yo soy tan bruta, (how, I am so stupid?) no I can't do it.

—Participant 062, LLNC

Discussion and Conclusion

This study sought to address the factors that contributed to college enrollment decisions of Latina students with low mathematics trajectories. Our analysis revealed that perceptions of math ability contributed to the college preparation and enrollment of a group of urban Latina students. In examining within group differences among a similar group of Latina students we provide further evidence of the significant role that perceptions of math ability may more accurately reflect these students' persistence in school.

An objective of this study was to understand how urban Latina girls' perceptions of math

ability differ by college enrollment, when they all had low mathematics trajectories. Perceptions of their math ability contribute to the college enrollment decisions of Latinas with low mathematics trajectories living in an urban context. Although these findings are based on a small sample and not generalizable, these findings problematize the practice of solely relying on academic trajectories to understand why some Latina girls go to college and others do not.

Implications for Practice, Policy, and Future Research

We suggest this study is particularly timely for the national promotion of math and science careers among women and students of color and the findings of this study have implication for schooling practices and future research. That perceptions of math ability can lessen or obfuscate the influence of math achievement on college enrollment is indeed an opportunity to explore how various dimensions of schooling practices can support students' perceptions of math ability. At the very least, conclusions and verbalizations about students' math abilities, such as "math person," "mathematically-gifted," or "mathematically-inclined" should be avoided and discouraged as a matter of organizational practice. Although this may seem as a simplistic proposal, many of us who have worked in school settings know that such labels can be used to shape teachers expectations of students and as explanations for student disengagement from math content. Such labels, especially those based on high-stakes standardized testing results can be harmful to students and negatively influence students', teachers', and parents' expectations about math ability. Instead, teachers and school should explore the ways in which instilling curiosity and affinity for math becomes a universal expectation. We liken this goal to the "college for all" movement in which college expectations become uniform expectations and objectives of all school personnel.

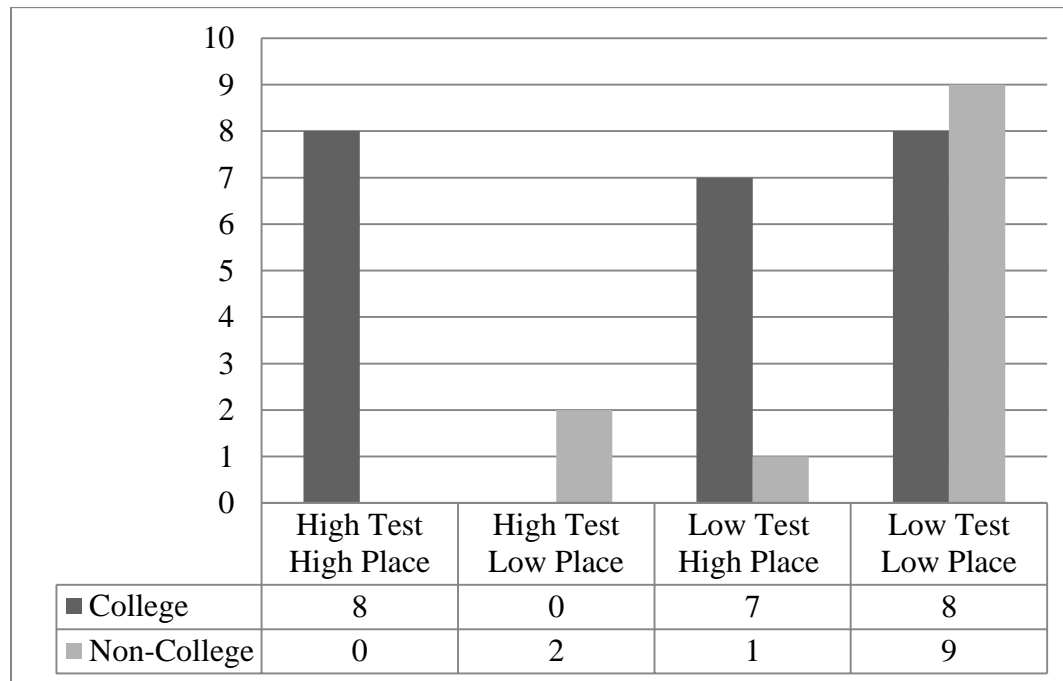
We argue that improving urban Latina girls' self-perceptions of math ability involves more than frequent verbal praise and suggest that structural changes related to how students are organized in school and classes may be more potent in improving support for positive math self-perceptions. Namely, tracking or grouping practices where students become aware of negative evaluations of their math ability should be avoided before the upper levels in high schools. Relatedly, high-stakes assessments of math content should not be used to track students before high school. Such assessments may not be accurate valuations of students' math potential and may negatively and pre-maturely inform students' self-perceptions of math. In fact, we extend this argument to teachers and challenge schools and school districts to extend how math teaching is assessed beyond relying on standardized tests. In this time of increasing emphasis on teacher merit-based pay, largely structured on results of standardized test performance, expanding "teacher performance" to include assessments of how positive math (and overall academic) self-perceptions are supported in instruction and classroom climate can be beneficial to both teachers and students. Given the emergence of research supporting the importance of math self-perceptions to long-term outcomes, instilling positive math self-perceptions should be an instructional objective.

To support these objectives, we propose that education researchers continue examining and identifying ways in which teachers can support the development of positive self perceptions of math ability early in the academic careers of urban Latina/o girls. We also speculate that the impact of instructional strategies supporting positive math self-perception varies by students' gender, race, class status, and school characteristics and that rigorous, multi-methodological exploration of diverse strategies can inform classroom practices. Finally, missing in existing

discussions of the emergence or development of math self-perceptions is the influence of families' perceptions of students' ability or parental expectations of math performance. We speculate that families and parents influence how students develop and shape their expectations and perceptions of math ability.

Appendix

Test Score and Math Class Placement Groupings



Eight participant groups by college enrollment and low or high math test scores and class placements:

1. HHC: College enrollment, both high math test scores and class placement
2. HHNC: No college enrollment, both high math test scores and class placement
3. HLC: College enrollment, high math test scores and low class placement
4. HLNC: No college enrollment, high math test scores and low class placement
5. LHC: College enrollment, low math test scores and high class placement
6. LHNC: No college enrollment, low math test scores and high class placement
7. LLC: College enrollment, low math test scores and low class placement
8. LLNC: No college enrollment, low math test scores and low class placement

References

- Adelman, C. (1999). *Answers in the toolbox: Academic intensity, attendance patterns and bachelor's degree attainment*. Washington, D.C.: U.S. Department of Education.
- Adelman, C. (2005). *Moving into town—and moving on: The community college in the lives of traditional-age students*. Washington, D.C.: U.S. Department of Education.
- Cabrera, A. F., & La Nasa, S. M. (2000). Understanding the college-choice process. *New*

- Directions for Institutional Research*, 2000(107), 5–22.
- Callahan, R. M. (2008). Latino language-minority college going: Adolescent boys' language use and girls' social integration. *Bilingual Research Journal: The Journal of the National Association for Bilingual Education*, 31(1-2), 175–200.
- Castellanos, J., Gloria, A. M., & Kamimura, M. (2006). *The Latina/o pathway to the Ph.D.: Abriendo caminos*. Sterling, VA: Stylus Pub.
- Catsambis, S. (1994). The path to math: Gender and racial-Ethnic differences in mathematics participation from middle school to high school. *Sociology of Education*, 67(3), 199–215.
- Ceja, M. (2006). Understanding the role of parents and siblings as information sources in the college choice process of Chicana students. *Journal of College Student Development*, 47(1), 87–104.
- Choy, S. P., Horn, L. J., Nuñez, A. M., & Chen, X. (2000). Transition to college: What helps at-risk students and students whose parents did not attend college. *New Directions for Institutional Research*, 2000(107), 45–63.
- Creswell, J. W. (2008). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. Thousand Oaks, CA: SAGE Publications.
- Crisp, G., & Nora, A. (2010). Hispanic student success: Factors influencing the persistence and transfer decisions of Latino community college students enrolled in developmental education. *Research in Higher Education*, 51(2), 175–194.
- Croninger, R. G., & Lee, V. E. (2001). Social capital and dropping out of high school: Benefits to at-risk students of teachers' support and guidance. *Teachers College Record*, 103(4), 548–581.
- Crosnoe, R., Riegle-Crumb, C., & Muller, C. (2007). Gender, self-perception, and academic problems in high school. *Social Problems*, 54(1), 118–138.
- Coffey, A. J., & Atkinson, P. A. (1996). *Making Sense of Qualitative Data: Complementary Research Strategies*. Thousand Oaks, CA: SAGE Publications.
- Gandara, P. (1995). *Over the ivy walls* (p. 151). Albany, NY: SUNY Press.
- GINORIO, A., & HUSTON, M. (2001). *¡ Sí, se puede! Yes, we can* (p. 88). Washington D.C.: American Association of University Women Educational Foundation. Retrieved from http://www.aauwnorthstar.org/SiSePuede_spanish.pdf
- Horn, L. J., & Carroll, C. D. (1997). *Confronting the odds: Students at risk and the pipeline to higher education* (p. 72). Washington D.C.: U.S. Department of Education.
- Horn, L. J., & Nuñez, A. M. (2000). *Mapping the road to college first-generation students' math track, planning strategies, and context of support* (p. 86). Washington, D.C.: U.S. Department of Education.
- Kurlaender, M. (2006). Choosing community college: Factors affecting Latino college choice. *New Directions for Community Colleges*, (133), 7–16.
- Malagon, M., & Alvarez, C. (2010). Scholarship girls aren't the only Chicanas who go to college: Former Chicana continuation high school students disrupting the educational achievement binary. *Harvard Educational Review*, 80(2), 149–173.
- Oakes, J. (1985). *Keeping track: How schools structure inequality*. New Haven, CT: Yale University Press.
- Pajares, F., & Miller, M. D. (1994). Role of self-efficacy and self-concept beliefs in mathematical problem solving: A path analysis. *Journal of Educational Psychology*, 86(2), 193–203.
- Perna, L. W. (2000). Differences in the decision to attend college among African Americans, Hispanics, and Whites. *Journal of Higher Education*, 71(2), 117–141.

- Perna, L. W., & Titus, M. A. (2004). Understanding differences in the choice of college attended: The role of state public policies. *The Review of Higher Education*, 27(4), 501–525.
- Riegle-Crumb, C. (2010). More girls go to college: Exploring the social and academic factors behind the female postsecondary advantage among Hispanic and White students. *Research in Higher Education*, 51(6), 573–593.
- Riegle-Crumb, C., King, B., Grodsky, E., & Muller, C. (2012). The more things change, the more they stay the same? Prior achievement fails to explain gender inequality in entry into STEM college majors over time. *American Educational Research Journal*, 49(6), 1048–1073.
- Solorzano, D. G., Ledesma, M. C., Perez, J., Burciaga, M. R., & Ornelas, A. (2003). *Latina equity in education: Gaining access to academic enrichment programs*. Los Angeles, CA.
- Zarate, M. E., & Gallimore, R. (2005). Gender differences in factors leading to college enrollment: A longitudinal analysis of Latina and Latino students. *Harvard Educational Review*, 75(4), 383–408.
- Zeldin, A. L., & Pajares, F. (2000). Against the odds: Self-efficacy beliefs of women in mathematical, scientific, and technological careers. *American Educational Research Journal*, 37(1), 215–246.