UNIVERSITY OF CALIFORNIA
RIVERSIDE

# Beyond the Monolith: Examining Variability in Latinas' STEM Identity

A Thesis submitted in partial satisfaction
of the requirements for the degree of

Master of Arts

in

Education

by

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December 2023

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ABSTRACT OF THE THESIS

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by

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University of California, Riverside, December 2023
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Efforts to support Latinas' pathway to STEM fields often consider Latina identities as monolithic. Focus on a single pathway to STEM fields overlooks multidimensionality among Latinas and misses opportunities to meaningfully support the success of all Latinas. By attending to the variation in Latinas, multiple pathways to STEM careers for Latinas can be identified. The purpose of this study is to describe variation among Latinas' STEM identity in terms of five components (sense of belonging, trailblazing, motivation, persistence, parental support). There was significant missing data to the items selected for analyses, with on average, less than half of the sample responding to each question. Results revealed no significant variation in survey responses for Latina participants. Linear regression analyses illustrated that motivation and sense of belonging were significant predictors of math achievement. Results highlight the need for more robust large scale, nationally representative quantitative data that allows for inferences about minority subgroups such as Latinas.

## Table of Contents

## List of Tables

**Appendix A**



**Appendix B**



**Appendix C**

**Appendix D**



**Appendix E**



**Appendix F**

**Appendix G**

## Introduction

Among populations that are typically underrepresented in science, technology, engineering, and mathematics (STEM) fields, Latinas earn fewer STEM degrees than most other women in the U.S, despite entering higher education at greater rates than ever before (Gándara, 2015). In 2021, of the 8% of Latinx people who make up the STEM workforce, only 2% were Latina (NCES, 2022). Notably, this low percentage represents a decline of Latina STEM employees relative to a decade prior (NCES, 2022).

One generally effective pathway for combatting the STEM opportunity gap is strengthening STEM identities (Ellis-Robinson, 2021; Ireland et al., 2018). STEM identity describes the socially constructed nature of identity that is accessible "as a result of an individual's competence and performance, she is recognized by meaningful others, people whose acceptance of her matters to her, as a science person" (Carlone & Johnson, 2007). Strengthening STEM identity positively influences women and underrepresented students' participation, interest, retention and achievement in STEM (Fernandez et al., 2022; Martin-Hansen, 2018; Nealy & Orgill, 2019; Seyranian et al., 2018).

Despite the extensive research on STEM identity, little research has focused specifically on Latina's STEM identity. More general research on STEM identity may not be applicable to Latinas because these studies take a color-blind, monolithic approach to building underrepresented students' STEM identity (Collins, 2018). This general approach disregards Latina's unique, multidimensional identities that exist within their science identity (Ireland, 2018). This study focuses specifically on Latina's STEM

identity by exploring the unique variability within the intersectional experiences of Latinas (Rodriguez & Blaney, 2021).

**Latina STEM Identity**

There are numerous unique differences between Latinas and other underrepresented groups; and within Latinas that may differentially influence their STEM identity development. Unlike other underrepresented groups, Latinx students may experience differing levels of microaggressions from peers and teachers depending on if English is their first or second language, whether they are first generation Americans, and whether their physical appearance allows them to be white passing (Rodriguez, Cunningham & Jordan, 2019). Additionally, there are numerous countries and territories in South America with distinct cultural norms and perspectives (Chiu et al., 2016; Conchas, 2001). Although numerous studies over the past decade identified Latinx students as a unique underrepresented group (Garcia et al., 2023; Hsieh et la., 2019; Torres, 2006) and examined girls of color in STEM as distinct from their male counterparts (Kang et al., 2019; Reyes, 2011; Wilkins-Yel et al., 2019), few studies have focused on Latinas as a unique underrepresented group that is separate from both Latinx students and girls of color.

Recent qualitative studies have begun to highlight variation among Latinas in STEM that is distinct from Latino/x people and other women of color. Rodriguez & Blaney (2021) identified different ways Latina students reconciled their experiences in STEM with their sense of belonging in STEM. Their research illustrated that although Latinas all reported similar experiences of marginalization in their STEM courses due to

grappling with self-doubt, skepticism, and isolation being inflicted on them by their peers and teachers, their reactions to this marginalization in relation to persisting in STEM differed. For some Latina STEM students, they challenged their marginalization by seeking sense of belonging in identity-based STEM organizations to connect with other Latina STEM majors, while other Latina students resisted their marginalization by rejecting the idea of needing to belong entirely and reframed their marginalization as "trailblazing" a path for future Latina students to access STEM success more easily (Rodriguez & Blaney, 2021). Findings highlight significant variability in how Latinas grapple with and challenge the marginalization they experience in STEM. These findings are consistent with other studies that demonstrate that not all Latinas in STEM need positive peer recognition to be motivated to persist and that some may be motivated to persist when receiving negative peer recognition (Frederick et al., 2020; Rodriguez et al., 2019). Therefore, sense of belonging among peers might not be an essential component of STEM identity for all Latinas, as some Latina students may be able to develop a strong STEM identity through overcoming being "othered" in STEM (Belle, 2018; Pietri et al., 2019).

One well studied attribute of Latinas is their interdependence within their family system. Recent studies have explored how Latinas in STEM may experience complications due to their traditional and cultural socialization to adhere to Latinx feminine cultural values (Banda, 2020; Rodriguez et al., 2021; Gonzales et al., 2022). Specific feminine expectation differences between Latinx cultures (Steidel & Contreras, 2003) may create different challenges between Latinas' cultural identities, roles in their

families, and their STEM identity (Rincón & Rodriguez, 2021). The ways in which Latinas reconcile and find meaning in the parts of individualistic STEM culture that are incompatible with their cultural identities may further our understanding of the unique and varying development of Latina STEM identity.

However, Latinas' devotion to their families does not always conflict with STEM identity. In some instances, the way Latinas' cultural identity is interwoven with their families is potentially a strength for their STEM identities when they receive familial support and feel alignment with their STEM and cultural identities (Rodriguez et al., 2021). Although family interdependence is a well-known cultural trait for Latinx women, not all Latina students have collectivist cultural frameworks and some Latina students' cultural outlook may align well with individualistic institutions (Banda, 2020). Therefore, pathways to STEM that center collectivist values may exclude Latinas who thrive in individualistic environments.

Although familial support and sense of belonging are two prominent factors of STEM identity that have been investigated extensively in Latina students, other important factors of STEM identity have not yet been explored exclusively in Latina students. For example, motivation within the expectancy-value framework, which emphasizes that students' beliefs in whether they can succeed in STEM and the value they see in STEM influences their participation in STEM and identifying themselves as a "STEM person" (Simpkins et al., 2006). This form of motivation has been studied extensively within Latinx students in relation to their STEM identity (Stets et al., 2017; Hsieh et al., 2019; Robinson et al., 2019) but not specifically within Latinas. Another highly researched

factor of STEM identity in Latinx students is persistence/resilience, which has been viewed as fundamental in having Latinx students overcome marginalization and othering in STEM to form a STEM identity (Ackert et al., 2021; Cole & Espinoza, 2008; Crisp & Nora, 2012). Based on this research, aspects of STEM identity have begun to be studied qualitatively in specifically Latina students. These aspects include sense of belonging, trailblazing, and familial support. In addition to these factors, STEM motivation and persistence/resilience were factors studied extensively in research on Latinx students but have not been studied specifically in Latina students.

**Identity & Theoretical Frameworks**

The concept of STEM identity has foundations in identity development literature. STEM identity is primarily evaluated as a process that occurs within identity exploration (Ceglie, 2011; Sfrad & Prussak, 2005). Identity exploration is broadly conceptualized as the process in which a learner reflects on their current experiences and builds upon this reflection for self-conceptualization (Kaplan, Bridgelal & Garner, 2020). Research suggests that facets of identity exploration play a significant role in underrepresented students' participation and retention in STEM as it pertains to their own self-perceptions of being a "science person" (Fan et al., 2023). This identity framework has foundations in Erikson's theory of identity development, which asserts that individuals conceptualize their identity by resolving a series of psychosocial crises throughout their stages of development (Erikson, 1970). However, in contrast to Eriksonian schools of thought, educational researchers have investigated STEM identity from the perspective of a

single-phase identity, rather than looking at STEM identity formation over various stages (Kelly et al., 2020).

Evaluating STEM identity as a single-phase identity starkly contrasts the growing body of identity research that asserts identity exploration as a long-term, developmental process that cannot be fully understood as occurring in a single-phase (Fan et al., 2023; Soenens et al., 2005; Waterman, 2015). Additionally, treating STEM identity as a single-phased process limits the variability in and multiplicity of experiences and identities among Latinas (Kelly et al., 2020). Recent studies have begun to use an understanding of identity exploration as a long-term process that occurs throughout stages to qualitatively evaluate STEM identity in a way that exposes the nuances of STEM identity development in underrepresented students (Atkins et al., 2020; Collins & Roberson, 2020; Mclean et al., 2022; Robinson et al., 2019). Research suggests that underrepresented students have varying STEM identity conceptualizations depending on whether they are novice STEM students or more advanced STEM students (Fan et al., 2023). This suggests that STEM identity evolves as individuals advance in their STEM coursework, grapple with challenges in STEM, and may continue to evolve throughout an individual's STEM career (Fan et al., 2023).

Recent qualitative studies have explored the multifaceted identities and experiences of Latina students in STEM through the lens of intersectionality (Pietri et al., 2019; Rodriguez & Blaney, 2021; Rodriguez et al., 2021; Sparks et al., 2021). Intersectionality is an analytical framework used to understand how different aspects of a person's gender, ethnic, social, and political identities combine to create various intricate

forms of discrimination and privilege (Crenshaw, 2016; Ireland et al., 2018). This concept was developed to expose the shortcomings of a one-dimensional approach to anti-racist and anti-discriminatory discourse in relation to women of color (Crenshaw, 2016). This framework has since been applied to understand many issues of educational inequity such as the achievement gap, the school to prison pipeline, advanced course access, and educational funding (Agosto & Roland, 2018; López et al., 2018; Morris, 2016; Palermo et al., 2022). For instance, intersectionality has been used to understand the disparity in access to honors and advanced placement courses for students of color with low socioeconomic status, and to understand how systematic barriers intersect for those with these two identities (Palermo et al., 2022).

Over the past decade, intersectionality has been used to understand the impact of race *and* gender in relation to the STEM opportunity gap (Ireland et al., 2018; Sparks et al., 2021; Starr et al., 2020; Tulagen & Simpkins, 2022). Approaching the STEM opportunity gap with an intersectional lens helps decrease the gender gap within STEM, decrease stereotype threat, increase role models for underrepresented students, and increase access to STEM resources (Crenshaw, 2016; Mitchell et al., 2014). Building on this approach, this study will use intersectionality as a theoretical lens to understand the differing ways Latinas relate to and acquire the individual components of STEM identity through long-term identity exploration.

## Measuring STEM Identity in Latinas

STEM identity has been evaluated primarily using qualitative approaches. These approaches have been essential for providing a rich understanding of this construct, the various factors that build STEM identity, and how this construct impacts STEM success (Herrera et al., 2012; Sfrad & Prusak, 2005). Additionally, this research has been instrumental in defining the abstract concept of STEM identity in ways that were then operationalized in quantitative research to examine STEM identity in underrepresented students (Carlone & Johnson, 2007). Although quantitative research on STEM identity has provided a general understanding of the utility of the various factors that contribute towards building a STEM identity in underrepresented students, quantitative research has not yet assessed the utility of factors of STEM identity in specifically Latina students.

Empirical knowledge about the ways students can be supported in building their STEM identity is essential for bridging the gap between understanding the influence of STEM identity on STEM success in underrepresented students and understanding how to effectively implement classroom practices that effectively develop STEM identity in underrepresented students. Many quantitative studies have evaluated the general utility of STEM identity and empirical measures that assess an individual's present identity as a "science person" have been developed to quantify this construct (Sfrad & Pusak, 2005; Young et al., 2013). These quantitative studies have focused on several specific factors of STEM identity such as parent education, teacher support, sense of belonging, persistence/resilience, and motivation (Aghekyan, 2019; Gonzalez et al., 2022; Kricorian et al., 2020; Rainey et al., 2018). Recently, quantitative research has begun to focus on

the development of STEM identity in Latinx students as a distinct group of underrepresented students. These studies have focused primarily on STEM interest, motivation, and persistence/resilience (Denner et al., 2019; Peralta et al., 2013; Starr et al., 2022). This research highlights additional aspects of STEM identity that could be differentially influential for the development of STEM identity in Latinas, as qualitative research has demonstrated Latina STEM students have varying needs for sense of belonging and parental support to build STEM identity (Rodriguez & Blaney, 2021; Rodriguez et al., 2021; Wilkins-Yel et al., 2023).

However, current quantitative approaches to measuring STEM identity imply that STEM identity is an all or nothing construct (Lee et al., 2019), which could limit our ability to understand the variability of how STEM identity is developed in different Latina students. This approach to measuring STEM identity is in contrast to qualitative research, which demonstrates that STEM identity is dynamic and changes throughout life stages (McDonald et al., 2019). To address this, recent studies have examined quantitative measures that account for the gap between one's current self and their idealized future self (Dou & Cian, 2022). For example, McDonald et al. (2019) developed the STEM identity/STEM career overlap measure to assess both present STEM identity and future STEM identity within one measure. In the STEM identity/STEM career overlap measure, participants are instructed to "select the picture that best describes the current overlap of the image you have of yourself and your image of what a STEM professional is" on a 7-point Likert scale (McDonald et al., 2019). This

measure allows for inferences about individual's current and projected STEM identity so that we can better account for how STEM identity changes throughout life stages.

Although the STEM Identity/STEM career overlap measure accounts for the dimensionality of STEM identity, single item measures of STEM identity do not account for the many contributing factors of an individual's self-concept. Understanding the various aspects of STEM identity is essential for understanding the multiple paths Latina students can take toward building a STEM identity. Therefore, quantitative research must also examine the various factors that enable a person to construct a present and future self-perception of being a "STEM person". Although numerous studies have investigated the attributes that build science identity (sense of belonging, motivation, etc.), few studies have evaluated these various attributes together as a measure of STEM identity (Dou & Cian, 2022).

**Present Study**

This study will examine variability in five aspects of STEM identity that support Latinas' self-perceptions of being a "STEM person." These five aspects of STEM identity (sense of belonging, trailblazing, motivation, persistence/resilience, and familial support) were selected based on previous research suggested that these aspects influence STEM identity in Latinx and Latina students. In examining these aspects of STEM identity, this study will consider the relationship between these different aspects and the relationship of these aspects to STEM outcomes. While these different aspects have been identified in the literature as being influential to STEM identity for Latinas, this study brings together these different aspects in a single study. This study will be guided by the

following three research questions: 1) Is there variability in the five factors of STEM identity (motivation, persistence/resilience, sense of belonging, trailblazing, and parental support) among twelfth grade Latina students? 2) Is variability in aspects of STEM identity among Latinas similar to the variability in other girls of color in high school? 3) Is there a significant relationship between these five aspects of STEM identity and twelfth grade math achievement, twelfth-grade science achievement, and entrance into a STEM career?

## Methods

### Data Source

The data for the present study is from the Longitudinal Study of American Youth (LSAY; Miller et al., 1991). The LSAY project was originally funded by the National Science Foundation in 1985, with a goal of examining the development of student attitudes toward math and science, student achievement in math and science, student interest in math and science careers, and student plans to pursue a career in math and science. The relative influence parents, an individual's home environment, teachers, school, peers, media, and selected informal learning experiences had on these developmental patterns were also measured in this study.

The LSAY began collecting data in 1987 with base year samples of approximately 3,000 seventh grade students and 3,721 tenth grade students from public high schools throughout the United States (Miller et al., 1991). Questionnaires were used to collect data from the students on the student's family and school background, attitudes, and achievement in science and mathematics during the Fall and Spring of each school

year. Additionally, students were administered the science and mathematics achievement tests each Fall. STEM career attainment was collected in 2007 when questionnaires were administered to participants who were now approximately 31 to 34 years old after extensive location and activity tracking was conducted.

The LSAY was chosen as a data source because it provides nationally representative data on student attitudes towards STEM. The student questionnaires used in this study included several items that are relevant to the five STEM identity aspects chosen for this study. Although this data is over 30 years old, the barriers to forming a STEM identity for Latina students has not progressed significantly, as there is still a similar lack of diversity in STEM for Latinas as there was in the 1980s and 1990s (Alegria, 2020). Additionally, as LSAY has longitudinal data on whether participants had entered the STEM workforce, there is potential to do follow up critical quantitative analyses in future studies to examine the different combinations of STEM identity aspects that may enable Latinas to enter the STEM workforce.

**Participants**

Participants include twelfth grade Latina students ($n$ = 131) and twelfth grade Black girls ($n$ = 174) collected in Fall 1989 from the Longitudinal Study of American youth. Black girls were chosen as the comparison subgroup because research on women of color and STEM identity has been widely focused on Black girls in STEM (Collins et al., 2020; King & Pringle, 2019), and recent qualitative research has explored the variability of Black girls in STEM (Burnett et al., 2022; Ireland et al., 2018).

## Measures

### *STEM Identity*

The student surveys administered included questions about students' STEM motivation (such as how beneficial they think STEM is for their future), work ethic (such as if they like to keep trying difficult tasks), and their self-perception compared to their peers (such as whether they believe STEM is for boys). Additionally, the student surveys included questions about how much they valued being a community leader to correct social inequalities and about their families' role in their pursuit of STEM and higher education. Items representing the five aspects of STEM identity were selected based on conceptual frameworks specific to each of the five chosen aspects of STEM identity (Table A1).

To measure motivation, the expectancy-value framework for understanding motivation was used to select five relevant items (Table A1). The expectancy-value model of motivation describes the relationship between a student's level of expectancy of success or achievement of a goal, in relation to the value of that task or goal (Eccles, 1983). Eccles & Wigfield (2020) expanded on this model by elaborating on how individuals understand and interpret their own performance and by elaborating on cultural and situational aspects of value. This framework has been widely used to investigate STEM identity in K-12 students as it highlights the development of individuals' hierarchies of expectancies of success and subjective task values and how this relates to their performance, choice, and engagement (Aschbacher et al., 2014; Aschbacher & Ing, 2017; Eccles et al., 1983; Grodsky & Muller, 2012; Hunter &

Handelsman, 2013). The items for STEM motivation in this study were based on this recent expanded model of expectancy-value motivation.

The five items were selected for persistence/resilience based on the definition of grit, which is a construct that encompasses the concepts of persistence and resilience to describe a trait that enables individuals to overcome challenges due to a sustained effort and interest to achieve a long-term goal (Duckworth et al., 2007). Prior to the development of the idea of grit, extensive research had been done investigating how persistence and resilience supports underrepresented minority students in academic and career success (Graham et al., 2013; Nagaoka et al., 2013; Byars-Winston, 2016 Winberg et al., 2018). These studies understand persistence as the willingness to stick to a task despite challenges or setbacks whereas grit refers to a specific type of persistence. Rather than focusing on an individual's overall commitment to a task or goal, grit focuses on the extent to which a person's passion for their goal enables them to be committed to that goal. For the purposes of this study, grit will be used to select items for persistence/resilience to focus the items on participants' attitudes towards persisting through barriers to STEM specifically, rather than the participants' general willingness to persist through challenges.

For the sense of belonging, trailblazing, and parental support aspects, recent qualitative studies exploring the multidimensional experiences of Latina students with these aspects of STEM identity were used as conceptual frameworks to select items. For example, items for the sense of belonging and trailblazing aspects were chosen in alignment with the conceptual understanding of these aspects of STEM identity used in

Rodriguez & Blaney's (2021) article entitled "*We're the unicorns in STEM": Understanding how academic and social experiences influence sense of belonging for Latina undergraduate students*. This study illustrates differences in how Latinas overcome marginalization to feel accepted in STEM and to gain a sense of purpose in STEM. As this study suggests some Latinas seek out sense of belonging in STEM by seeking out a sense of being valued, included, and encouraged by others (Goodenow et al., 1993) through race affiliated STEM organizations, the five items selected for sense of belonging measure the extent to which participants feel accepted in STEM by their peers and teachers.

Additionally, Rodriguez & Blaney (2021) describe trailblazing as the reframing of marginalization as an opportunity to make a difference for future Latinas in STEM. Following this definition of trailblazing, five items were selected that measured the participants' drive towards being a community leader and correcting social wrongs and the extent to which participants view STEM as an opportunity to make a positive impact on society. Lastly, items for parental support that examined the extent to which the participants' parents discussed future academic goals (such as college) with the students and the extent to which parents supported their STEM interest. These items were understood within the framework of *familismo,* which describes a strong attachment to family in a way that emphasizes cooperation and interdependence (Espinoza, 2010).

*STEM Outcomes*

There were three STEM outcomes included in this study: twelfth grade mathematics achievement, twelfth grade science achievement, and whether the

participant was in a STEM career 30 years after they graduated from high school. Data on the participant's achievement in science and math was measured by using participants' summary science and summary math achievement scores, including imputed scores.

**Analyses**

Once variables related to each of the five aspects of STEM identity were selected, descriptive statistics were conducted in R (R Core Team, 2023) to evaluate variability among twelfth grade Latinas. Descriptive statistics were then conducted to assess the variability among twelfth grade Black girls. STEM identity for Black girls were compared to Latinas using descriptive statistics, t-tests and correlations. To address the third research question, linear regression was conducted for the variables. Prior to running the regression, correlations were conducted between the five aspects of STEM identity, math achievement, science achievement and entering into a STEM career. Assumptions of linearity, independence of errors, homoscedasticity, normality of residuals, and no endogeneity were checked in R and results show all assumptions for the linear regression were checked (Poole & O'Farrell, 1971).

Linear regression for the aspects that were significantly correlated with the outcomes were conducted. Correlations were first conducted using the original Likert scale scores and then the scores for each variable were dichotomized. Composite scores were then calculated for each aspect of STEM identity using the five items being evaluated for each aspect. Correlations between STEM identity aspects and the three outcome variables were then conducted. Linear regressions were run for each significant correlation found between the aspects of STEM identity and the outcome variables. For example, if a

significant correlation was found between motivation and math achievement, the below linear regression would be conducted:

$$Y_{ij} = \beta_0 + \beta_{motivation} + \varepsilon$$

In this equation, Y is the math achievement score (dependent variable) and $\beta_{motivation}$ is the motivation aspect of STEM identity (predictor variable). Furthermore, $\beta_0$ is the Y intercept and refers to the value of math achievement if motivation has no effect on math achievement. Lastly $\varepsilon$ refers to the variability in math achievement that cannot be explained by motivation (residual error).

## Results

Initial descriptive statistics revealed a significant amount of missing data across the 25 items for both Latina and Black girls. Of the sample of 128 Latina twelfth grade students who participated in this study, there was an average of 43 respondents per item, with the highest being 54 respondents, and the lowest being 8 respondents. Similarly, of the 174 Black girls participants, there was an average of 64 responses per item, with the highest being 80 respondents, and the lowest being 15 respondents. For both Latina and Black girls twelfth grade students, less than half of the participants responded to each item. Given the high amount of missing data, imputing missing values for the missing responses was considered but not carried out due to the risk of introducing significant bias by imputing more than half of the values.

**Variability in Motivation**

Three of the motivation items were measured on a 5-point Likert scale from 1 (strongly agree) to 5 (strongly disagree). All Latina and Black girls reported that they do not need advanced math or science for their future career plans (Table B1). While there was greater variation in responses to some of the other items related to motivation, there were no statistical or practical differences in responses when comparing Latinas and Black girls. In addition to considering the average responses (Table B1), the distributions of responses for motivation indicate low variation for Latinas (Table B2). There is slightly greater variation in responses for Black girls (Table B3). T-tests between Latina and Black girls for each motivation item showed that there are no significant difference in STEM motivation between Latina and Black girls (Table B1).

The only motivation item Latina participants indicated that they strongly disagreed with was the item on whether math is generally more useful for boys than girls. There was a small percentage (10%) of respondents who agreed or were not sure (10%) that math is more useful for boys than girls, but 80% of the respondents indicated that they did not think that math is generally more useful for males than girls. Although Latinas all agreed that they do not need advanced math or science for their future plans, the sample size for both items were low. In order to assess the validity of the motivation items, correlation analyses were performed to determine if the items selected for measuring motivation were related. The correlation analyses revealed that none of the motivation items correlated with each other (Table B4).

**Variability in Persistence**

Descriptive statistics for the scaled persistence items showed some variability in Latina participants' responses, with a majority of the participants indicating an average amount of persistence (Table C1). Similarly, frequency distributions for Black girls indicate some variation in responses, and this variation was more evenly spread across compared to Latina respondents' variation in responses (Table C3). T-tests revealed that there were no significant or practical differences between Latina and Black girls' responses to these five items (Table C1). Correlation analyses revealed one significant correlation, $r(47) = 0.42$, $p < 0.01$, for Latina girls' responses between the two items measuring the extent to which participants accept their conditions and the extent to which they give up when they don't understand a problem.

**Variability of Sense of Belonging**

Descriptive statistics for the sense of belonging items illustrate that overall, Latina participants indicated that they feel a sense of belonging in STEM but (Table D2). The frequency distributions for Latina respondents shows that there is slight variation for the three items measuring participants' internal sense of belonging (Table D2). Latina participants reported that they were advised against taking advanced math and science courses. However, the two items assessing if the participants were advised to take math and science have a sample size of only 17 participants. Responses to these two items for Black girls also show no variation, with 100% indicating that they were not encouraged to take advanced math or science courses (Table D3). There were no statistical or practical differences between Latinas and Black girls in their responses to these five

items (Table D1). The two items measuring if participants believed that boys were better at math and science than girls were related for Latina girls (46) = 0.62, $p < 0.01$ and Black girls, r(74) = 0.60, $p < 0.01$ (Table D4). Additionally, the item measuring if participants felt like a failure was significantly correlated with the item measuring if participants believed boys were better at math than girls for Black girl respondents, r(70) = 0.40 , $p < 0.01$, but these items were not significantly related for Latina respondents.

**Variability of the Trailblazing Aspect of STEM Identity**

Descriptive statistics for the trailblazing items indicate that Latinas participants believe it is important to pave the way for people in their community (Table E1). The trailblazing item participants found least important on average was being a leader in their community, but participants on average believe it is important to help their community, correct social and economic wrongs, and to use STEM to make a positive impact. In contrast to the sense of belonging items, the frequency distributions for Latinas shows that there was variation across all five trailblazing items (Table E2). Black girls generally indicated that they found making a positive impact to be important (Table E3). There was a statistically significant difference in how important Latina and Black girl participants found being a leader in their community to be. Black girls were more likely to indicate that this was very important to them compared to Latinas, $t(98) = -2.41$, $p < .05$. Additionally, there were three significant correlations between the first and second trailblazing items, the first and third items, and the second and third items for both Latina and Black girls (Table E4).

**Variability of Parental Support**

On average, participants reported that their parents are generally supportive of their education at least some of the time (Table F2). Frequency distributions for Black girls shows similar variation across the first three items, with "sometimes" also being the response with the highest frequency percentages (Table F3). Additionally, over half of the respondents for the fourth parental support item indicated that they believed their parents' encouragement to go to college to be very important, which is slightly more than the number of Latina respondents who found this item to be very important. There were no statistical or practical differences between Latinas' and Black girls' responses to any of these items (Table F1). There were five significant correlations between the parental support items for both Latina and Black girls (Table F4).

**Results of Dichotomous Data**

After performing descriptive statistics, t-tests, and between-item correlations analyses with the scaled data, the data was dichotomized to create composite scores for each of the five aspects of STEM identity. Responses that indicated participants had high levels of each aspect were coded as "1" and responses that indicated participants had average, low, or no levels of each aspect were coded as "0". Depending on the item, reverse coding was performed to ensure that each item was accurately dichotomized. For example, for the motivation item that stated that science and technology make our lives better, the "strongly agree" and "agree" responses were coded as 1 and the other three responses were coded as 0. Whereas for the motivation item that stated that math was more useful for boys than girls, the "strongly agree", "agree", and "Not sure" responses

were reverse coded as 0, and the "disagree" and "strongly disagree" responses were reverse coded as 1. After the items were dichotomized for both Latina and Black girls, descriptive statistics and correlation analyses were rerun using the dichotomized variables to confirm that the dichotomized data yielded results that were consistent with the results of the scaled data. To account for the dichotomized data when examining differences between Latina and Black girls dichotomized responses, Fisher's Exact test was performed.

Results for the dichotomous motivation items (Table B5; Table B6; Table B7) and results for the dichotomous sense of belonging items (Table D5; Table D6; Table D7) illustrated results that were consistent with the results of the scaled motivation and sense of belonging items. The dichotomous persistence items yielded similar descriptive statistics (Table B5) and a consistent lack of differences between Latina and Black girls (Table B6), but yielded no significant correlations between items whereas the scaled persistence items yielded one significant correlation (Table C7). Results for the trailblazing items showed consistent descriptive results (Table E5), consistent lack of differences between Latina and Black girls' responses (Table E6), and consistent correlations for Latinas' responses but showed two additional between item correlations for Black girls' responses (Table E7). Lastly, results for the dichotomous parental support items also showed consistent descriptive results (Table F5) and consistent lack of differences between Latina and Black girls' responses (Table F6) but yielded less correlations between items than the scaled parental support items did (Table F7).

### Aspects of STEM identity as Predictors of STEM Achievement and Entrance into a STEM Career

Composite scores for motivation, persistence, sense of belonging, trailblazing, and parental support were created using the dichotomous scores for each item. After composite scores were created, correlations were run between the aspects of STEM identity and the three STEM outcomes (math achievement, science achievement, and entrance into a STEM career). Correlation results demonstrated that science achievement and entrance into a STEM career were not related to any of the aspects of STEM identity (Table G1). However, there were two significant associations between math achievement and motivation, and between math achievement and sense of belonging. Based on these initial descriptive analyses and correlations between the STEM identity aspects and STEM outcomes, two simple linear regressions were conducted to examine if motivation and sense of belonging are strong predictors of math achievement. Regression analyses revealed that both motivation and sense of belonging were significantly positively related to math achievement (Table G2).

## Discussion

As the modern-day workforce continues to make significant global progress in STEM, leveraging diverse ideas and perspectives derived from different backgrounds, challenges, and experiences is necessary for sustaining and advancing this progress. This study aimed to understand the variability in Latina twelfth grade students' attitudes towards math and science to gain an understanding of the different ways Latina high school students may form a STEM identity. This study also sought to understand if the

variation in aspects of STEM identity in Latina students was unique in comparison to the variation of aspects of STEM identity in other girls of color. Lastly, this study examined the extent to which the five chosen aspects of STEM identity predicted STEM achievement and entrance into a STEM career. The three research questions that guided this examination were designed to provide insight into how Latina students' multidimensional experiences shape different STEM identities that may support Latinas' success in STEM.

The wider literature on STEM identity has identified numerous behaviors and characteristics that contribute towards one's STEM identity that may create different pathways to STEM success (Johnson, 2012; Rodriguez, Pilcher, & Garcia-Tellez, 2021; Dou & Cian, 2022). We chose to examine the five aspects of STEM identity that past studies have shown to support STEM identity in specifically Latina and Latinx students. Descriptive statistics indicate little variation in responses to the five aspects of STEM identity. At the item level, there was variation in responses to 14 items and moderate variation in responses to 7 items across the 5 aspects of STEM identity. Based on the frequency distributions of these five aspects of STEM identity, it can be inferred that there is no significant variation in the five aspects of STEM identity for Latinas in this dataset.

There were similar reported levels for most of the components of STEM identity between Latina and Black girls. Although one trailblazing item did have a significant difference in how Latina participants responded compared to how Black girls responded, the other four items for trailblazing showed no significant difference in how these two

minority subgroups responded. Therefore, it can be concluded that overall, there was no difference variation in the levels of motivation, persistence/resilience, sense of belonging, trailblazing, and parental support reported by Latina participants and Black girl participants.

Additionally, results of the descriptive statistics for each aspect of STEM identity contrast with the wider literature on STEM identity. For example, the frequency distribution for motivation and sense of belonging suggests that both Latina participants and African American girl participants generally feel high STEM motivation and a high sense of belonging in STEM. However, there is immense research evidence on motivation and sense of belonging that demonstrates that Latinas and Black girls, as well as underrepresented students as a whole, experience significant barriers to STEM motivation and gaining a sense of belonging in STEM (Johnson, 2012; Rainey et al., 2018; Master & Meltzoff, 2020; Dorch & Patel, 2020). Research also shows that women of color in particular report higher instances of having their intelligence questioned, having their abilities challenged, having their strengths dismissed, and being discouraged from pursuing STEM by teachers (Crum, 2022; Ong et al., 2018; Rodriguez & Blaney, 2021). These experiences can create feelings of isolation and feeling invisible, which directly hinders sense of belonging and STEM motivation (Collins et al., 2020; Watson, 2022). This inconsistency between my results and the wider literature suggests that the items chosen from the LSAY dataset to measure motivation and sense of belonging may not fully capture the barriers Latinas and Black girls face in STEM, and therefore may not be adequate measures of these two constructs.

Results for the persistence/resilience, trailblazing, and parental support aspects are more consistent with the wider literature on these aspects of STEM identity. The descriptive statistics for the persistence/resilience aspect shows more variation in responses from Latina participants. One explanation for this variation that has been highlighted in recent research on grit asserts that the utility underrepresented minority students see in persisting through challenges could depend on the situation and the participants' unique experiences (Tewell, 2020; Pendyala & Vyas, 2023). For example, underrepresented minority students may be more inclined to persist through challenges they face with a specific lesson but may see less utility in persisting through unfair criticisms or microaggressions. Criticism of the concept of grit asserts that educators should not emphasize perseverance in circumstances where students are experiencing systematic racism, because this puts the responsibility to undo racial barriers on the individual student instead of on the educational institution that is perpetuating these barriers (Stitzlein, 2018). For Latina students specifically, the usefulness of persistence in forming their STEM identity may depend heavily on their individual differences (appearance, ESL, first generation, etc.) and their unique experiences in STEM learning environments.

The variation of participants' responses to the trailblazing items is consistent with recent qualitative research that has begun exploring this construct. Rodriguez & Blaney (2021) demonstrate that not all Latina students seek belonging in STEM to form a science identity. Rather, some Latinas view their marginalization as evidence that their pursuit of STEM is essential for increasing STEM equity and paving the way for future Latina

scientists. Whether Latinas seek out belonging to form their STEM identities or form their STEM identities by viewing themselves as "trailblazers" may depend on Latinas' specific individual differences. Lastly, the descriptive statistics for the parental support aspect shows that generally, Latina participants find their parents' support to be important, which is consistent with the research literature on the influence parents can have on Latina students' STEM decision making (Crisp & Nora, 2012; Castellanos, 2018; Rodriguez, Pilcher, & Garcia-Tellez, 2019).

Correlation analyses show that the persistence aspect of STEM identity is significantly correlated with motivation and trailblazing, which suggests that persistence may overlap with the motivation and trailblazing aspects of STEM identity. Results of correlation analyses between the items used to measure the five aspects of STEM identity highlighted that most of the items did not correlate with each other within the same aspect. This suggests that the five items chosen for each aspect of STEM identity may not be measuring the same construct, and therefore may not be strong measures of motivation, persistence, sense of belonging, trailblazing, and parental support.

Of the five aspects, only two were related to math achievement. None of the five aspects were related to science achievement or STEM career attainment. The lack of relationship to these STEM outcomes is inconsistent with the broader literature (Clark et al., 2016; Rodriguez & Blaney, 2021; Stringer et al., 2020). For example, there is robust research that has established that motivation, sense of belonging, and parental support are essential parts of STEM identity for Latina/Latinx students and underrepresented students as a whole (Gottfried, 2016; Lewis et al., 2016; Starr et al., 2020; Šimunović &

Babarović, 2020; Hansen et al., 2023). One potential explanation for why many of the results of this study contrasts the wider literature on STEM identity may be the small sample sizes for each item assessed in this study. The descriptive statistics reveal that less than half of the Latina girl participants in this study responded to each item, causing the data to potentially be unrepresentative of the participants in this dataset. Additionally, the sample size for Latinas and African American girls is very small considering LSAY collected data from 5,945 participants in total. Therefore, the sample size for Latinas in this dataset is at risk of potentially being too small to be generalizable. This small sample size combined with large amounts of missing data likely inhibits accurate and generalizable inferences to be drawn from the LSAY dataset.

## Conclusions

Evaluating large scale datasets from nationally representative longitudinal studies is essential for gaining a better understanding of Latina STEM identities. Without data from large nationally representative samples, evidence to support progress towards making STEM more accessible to Latinas is inhibited (Sablan, 2019; Stage and Wells, 2014; Stage, 2007). More importantly, if the variation among Latinas is not captured in these large-scale datasets, policies and practices may continue to rely on monolithic approaches to diversity that erase the complex nature of Latina identities (Cassellas-Connors, 2021; Mora, 2014; Taylor et al., 2012). In order for future STEM innovation to benefit from the diverse and intricate intersectional perspectives that Latinas can bring to the field, there must be approaches that promote the development of STEM identity that account for the multidimensional experiences Latina students have within and outside of

the classroom. Without such attention to the multidimensional experiences, Latinas may continue to not see themselves represented in STEM fields.

The inconsistencies between the results of this quantitative study and well-established literature on STEM identity (Abrica et al., 2022; Wilkins-Yel et al., 2022; Johnson, 2011), suggests several limitations. These inconsistencies could be due in part to the small sample sizes and missing data for both Latina and Black girls in this study. Without a sufficient sample size, it is not clear whether this subgroup actually represents the Latina population in the United States. In other words, although the data came from a national sample, the low sample size for this particular subgroup raises questions about how well we can generalize to the entire Latina twelfth grade population in the United States. Additionally, the surveys administered were designed to measure general student attitudes towards science and math and were not specific to Latinas. Thus, these items may not be measure motivation, persistence, sense of belonging, trailblazing, and parental support in ways that are aligned with the literature. Not having additional evidence to evaluate the extent to which these items were measuring the constructs as intended is another limitation of this study (Sondergeld, 2020; Plake & Wise, 2014). These limitations illuminate how the LSAY data may not provide an accurate empirical understanding of the variability in minority subgroups such as Latinas.

Future directions could consider gathering such empirical evidence to better understand how well the data generalizes to the national population and to examine other national datasets to see if similar issues persist. In addition, future directions might consider creating new large scale, nationally representative data that purposefully focuses

on Latinas and other women of color. This sort of focused database could support critical, person-centered quantitative analyses that have the potential to effectively increase Latina students' access to and success in STEM. Researchers could gather large scale data on solely Latinas to comprehensively understand how multiple pathways to science identities for Latinas can be formed (Grauer et al., 2015; Sparks et al., 2021). Future research on the variability in Latinas' STEM identities should measure the aspects of STEM identity specifically in relation to participants' STEM identities, rather than using general measures of these aspects of STEM identity that evaluate these constructs as broad attitudes. Lastly, future researchers should assess variability in a different age group, such as students in middle (Kang et al., 2019: Aschbacher et al., 2014; Carlone et al., 2014; Kiran & Sungar, 2012) or elementary school (Cohen et al., 2021; Aschbacher & Ing, 2017; Archer et al., 2010; Pine et al., 2006). There could be different aspects of STEM identity that are more salient or malleable at particular ages that could be targeted with particular policies or practices. Research that attends to the multiple ways that one develops their STEM identities can support more students, particularly students who have been traditionally underrepresented in STEM fields.

# Appendix A

Table A1

*Items for Measuring 5 STEM Identity Aspects*

| Aspect | Items |
|---|---|
| Motivation (value-expectancy framework)<br><br>(Eccles & Wigfield, 2020) | 1. Science and technology are making our lives healthier, easier and more comfortable. (KA44B)<br>2. Math is generally more useful for boys than girl. (KA48A)<br>3. It is important to know science to get a good job. (KA46D)<br>4. I will not need advanced math for what I plan to do in the future. (KA47K)<br>5. I will not need advanced science for what I plan to do in the future. (KA45B) |
| Persistence/Resilience<br><br>(Duckworth et al., 2007) | 1. I would rather keep struggling with a problem than give up on it before I get the answer right. (KA43B)<br>2. I don't like to do more schoolwork than I have to. (KA41P)<br>3. People who accept their condition in life are happier than those try to change things. (KA43H)<br>4. Give up when I don't understand a problem right away. (KA41H)<br>5. Try harder if I get bad grades. (KA41O) |
| Sense of Belonging<br><br>(Rodriguez & Blaney, 2021) | 1. Boys are generally better at math than girls. (KA46J)<br>2. All in all, I am inclined to feel I am a failure. (KA41L)<br>3. Boys are generally better at science than girls. (KA47J)<br>4. I was advised that I do not need to take more science. (KA45E)<br>5. I was advised that I do not need to take more math. (KA44E) |
| Trailblazing<br><br>(Rodriguez & Blaney, 2021) | 1. Being a leader in my community is important. (KA7F)<br>2. Working to correct social and economic wrongs is important. (KA7H)<br>3. Helping other people in my community is important. (KA7L)<br>4. Scientific researchers are dedicated people who work for the good of humanity. (KA48O)<br>5. Overall, science and technology have caused more good than harm. (KA38A) |
| Parental Support<br><br>(Espinoza, 2010) | 1. I talk to my mother or father about your career and future plans (KA16B)<br>2. I talk to my parents about science/technology issues. (KA16C)<br>3. I talk to my parents about my school progress. (KA19I)<br>4. My parents want me to go to college. (KA16I)<br>5. My parents do not want me to go to college. (KA16A) |

## Appendix B

Table B1
*Descriptive Statistics for Scaled Motivation Items*

| | Latinas' | | | Black Girls | | | |
|---|---|---|---|---|---|---|---|
| *Item* | *N* | *M* | *SD* | *N* | *M* | *SD* | *t statistic* |
| Science and technology are making our lives healthier, easier and more comfortable. (KA48B) | 46 | 2.26 | 0.74 | 74 | 2.38 | 0.92 | -0.77 |
| Math is generally more useful for boys than girls. (KA46D) | 49 | 4.20 | 1.04 | 76 | 3.99 | 1.08 | 1.12 |
| It is important to know science to get a good job. (KA47K) | 48 | 3.02 | 0.93 | 75 | 2.73 | 1.14 | 1.52 |
| I will not need advanced math for what I plan to do in the future. (KA44B) | 8 | 1.00 | 0.00 | 15 | 1.00 | 0.00 | --- |
| I will not need advanced science for what I plan to do in the future. (KA45B) | 17 | 1.00 | 0.00 | 15 | 1.00 | 0.00 | --- |

Table B2
*Latinas' Frequency Distribution for Scaled Motivation Items*

| *Item* | *Strongly Agree* | *Agree* | *Not Sure* | *Disagree* | *Strongly Disagree* |
|---|---|---|---|---|---|
| Science and technology are making our lives healthier, easier and more comfortable. (KA48B) | 5 (11%) | 26 (57%) | 14 (30%) | --- | 1 (2%) |
| Math is generally more useful for boys than girls. (KA46D) | 1 (2%) | 4 (8%) | 4 (8%) | 15 (31%) | 25 (51%) |
| It is important to know science to get a good job. (KA47K) | 3 (6%) | 9 (19%) | 22 (46%) | 12 (25%) | 2 (4%) |
| | *Yes* | *No* | | | |
| I will not need advanced math for what I plan to do in the future. (KA44B) | 8 (100%) | --- | | | |
| I will not need advanced science for what I plan to do in the future. (KA45B) | 17 (100%) | --- | | | |

Table B3
*Black Girls' Frequency Distribution for Scaled Motivation Items*

| *Item* | *Strongly Agree* | *Agree* | *Not Sure* | *Disagree* | *Strongly Disagree* |
|---|---|---|---|---|---|
| Science and technology are making our lives healthier, easier and more comfortable. (KA48B) | 13 (18%) | 27 (36%) | 29 (39%) | 3 (4%) | 2 (3%) |
| Math is generally more useful for boys than girls. (KA46D) | 3 (4%) | 4 (5%) | 14 (18%) | 25 (33%) | 30 (39%) |
| It is important to know science to get a good job. (KA47K) | 13 (17%) | 18 (24%) | 24 (32%) | 16 (22%) | 4 (5%) |
| | *Yes* | *No* | | | |
| I will not need advanced math for what I plan to do in the future. (KA44B) | 15 (100%) | --- | | | |
| I will not need advanced science for what I plan to do in the future. (KA45B) | 15 (100%) | --- | | | |

Table B4
*Correlations for Scaled Motivation Items*

| *Variable* | Science and technology are making our lives healthier, easier and more comfortable. (KA48B) | Math is generally more useful for boys than girls. (KA46D) | It is important to know science to get a good job. (KA47K) | Science and technology are making our lives healthier, easier and more comfortable. (KA44B) | I will not need advanced science for what I plan to do in the future. (KA45B) |
|---|---|---|---|---|---|
| Science and technology are making our lives healthier, easier and more comfortable. (KA48B) | — | -0.09 | 0.04 | — | — |
| Math is generally more useful for boys than girls. (KA46D) | -0.20 | — | 0.06 | — | — |
| It is important to know science to get a good job. (KA47K) | 0.18 | 0.06 | — | — | — |
| Science and technology are making our lives healthier, easier and more comfortable. (KA44B) | — | — | — | — | — |
| I will not need advanced science for what I plan to do in the future. (KA45B) | — | — | — | — | — |

*Note: Correlations for Latinas are below the diagonal. Correlations for Black girls are above the diagonal. *p* < 0.05

Table B5
*Descriptive Statistics for Dichotomous Motivation Items*

| | Latinas | | | Black Girls | | | |
|---|---|---|---|---|---|---|---|
| *Item* | *N* | *M* | *SD* | *N* | *M* | *SD* | *t statistic* |
| Science and technology are making our lives healthier, easier and more comfortable. (KA48B) | 46 | 0.67 | 0.47 | 74 | 0.54 | 0.50 | 1.47 |
| Math is generally more useful for boys than girls. (KA46D) | 49 | 0.82 | 0.39 | 76 | 0.72 | 0.45 | 1.22 |
| It is important to know science to get a good job. (KA47K) | 48 | 0.25 | 0.44 | 75 | 0.41 | 0.50 | -1.92 |
| I will not need advanced math for what I plan to do in the future. (KA44B) | 8 | 1.00 | 0.00 | 8 | 1.00 | 0.00 | — |
| I will not need advanced science for what I plan to do in the future. (KA45B) | 17 | 1.00 | 0.00 | 15 | 1.00 | 0.00 | — |

Table B6
*Frequency Distributions for Dichotomous Motivation Items*

| | Latinas | | Black Girls | | |
|---|---|---|---|---|---|
| *Item* | *High Motivation* | *Low Motivation* | *High Motivation* | *Low Motivation* | *Fisher's Exact Test Statistic* |
| Science and technology are making our lives healthier, easier and more comfortable. (KA48B) | 31 (67%) | 15 (33%) | 40 (54%) | 34 (46%) | 0.30 |
| Math is generally more useful for boys than girls. (KA46D) | 9 (18%) | 40 (82%) | 55 (72%) | 21 (28%) | 1 |
| It is important to know science to get a good job. (KA47K) | 36 (75%) | 12 (25%) | 31 (41%) | 44 (59%) | 1 |
| I will not need advanced math for what I plan to do in the future. (KA44B) | — | 8 (100%) | — | 15 (100%) | — |
| I will not need advanced science for what I plan to do in the future. (KA45B) | — | 17 (100%) | — | 15 (100%) | — |

Table B7
*Correlations for Dichotomous Motivation Items*

| *Variable* | Science and technology are making our lives healthier, easier and more comfortable. (KA48B) | Math is generally more useful for boys than girls. (KA46D) | It is important to know science to get a good job. (KA47K) | Science and technology are making our lives healthier, easier and more comfortable. (KA44B) | I will not need advanced science for what I plan to do in the future. (KA45B) |
|---|---|---|---|---|---|
| Science and technology are making our lives healthier, easier and more comfortable. (KA48B) | — | 0.10 | 0.15 | — | — |
| Math is generally more useful for boys than girls. (KA46D) | 0.38 | — | 0.14 | — | — |
| It is important to know science to get a good job. (KA47K) | 0.16 | 0.03 | — | — | — |
| Science and technology are making our lives healthier, easier and more comfortable. (KA44B) | — | — | — | — | — |
| I will not need advanced science for what I plan to do in the future. (KA45B) | — | — | — | — | — |

*Note: Correlations for Latinas are below the diagonal. Correlations for Black girls are above the diagonal. *p* < 0.05.

# Appendix C

Table C1
*Descriptive Statistics for Persistence*

| | Latinas | | | Black Girls | | | |
|---|---|---|---|---|---|---|---|
| *Item* | *N* | *M* | *SD* | *N* | *M* | *SD* | *t statistic* |
| I would rather keep struggling with a problem than give up on it before I get the answer right. (KA41P) | 50 | 2.50 | 0.71 | 74 | 2.46 | 1.10 | 1.21 |
| I don't like to do more schoolwork than I have to. (KA41O) | 49 | 2.67 | 1.14 | 74 | 2.84 | 1.11 | -0.79 |
| People who accept their condition in life are happier than those who try to change things. (KA41H) | 50 | 2.88 | 1.26 | 74 | 3.01 | 1.31 | -0.57 |
| Give up when I don't understand a problem right away. (KA43B) | 50 | 2.70 | 1.07 | 76 | 2.28 | 0.92 | 1.54 |
| Try harder if I get bad grades. (KA43H) | 49 | 4.12 | 1.01 | 76 | 4.37 | 1.11 | 1.28 |

Table C2
*Latinas' Frequency Distribution for Persistence Items*

| *Item* | *Strongly Agree* | *Agree* | *Not Sure* | *Disagree* | *Strongly Disagree* |
|---|---|---|---|---|---|
| I would rather keep struggling with a problem than give up on it before I get the answer right. (KA41P) | 5 (10%) | 21 (42%) | 10 (20%) | 12 (24%) | 2 (4%) |
| I don't like to do more schoolwork than I have to. (KA41O) | 6 (12%) | 22 (44%) | 5 (10%) | 14 (29%) | 2 (4%) |
| People who accept their condition in life are happier than those try to change things. (KA41H) | 9 (18%) | 12 (24%) | 8 (16%) | 18 (36%) | 3 (6%) |
| | Never | Rarely | *Some-times* | *Often* | Always |
| Give up when I don't understand a problem right away. (KA43B) | 3 (6%) | 22 (44%) | 22 (44%) | 3 (6%) | --- |
| Try harder if I get bad grades. (KA43H) | 2 (4%) | 1 (2%) | 7 (14%) | 18 (37%) | 21 (43%) |

Table C3
*Black girls' Frequency Distribution for Persistence Items*

| *Item* | *Strongly Agree* | *Agree* | *Not Sure* | *Disagree* | *Strongly Disagree* |
|---|---|---|---|---|---|
| I would rather keep struggling with a problem than give up on it before I get the answer right. (KA41P) | 14 (19%) | 30 (41%) | 15 (20%) | 12 (16%) | 3 (4%) |
| I don't like to do more schoolwork than I have to. (KA41O) | 5 (7%) | 32 (43%) | 12 (16%) | 20 (27%) | 5 (7%) |
| People who accept their condition in life are happier than those try to change things. (KA41H) | 10 (14%) | 19 (26%) | 18 (24%) | 14 (19%) | 13 (17%) |
| | Never | Rarely | *Some-times* | *Often* | Always |
| Give up when I don't understand a problem right away. (KA43B) | 16 (21%) | 31 (40%) | 21 (28%) | 8 (11%) | --- |
| Try harder if I get bad grades. (KA43H) | 4 (5%) | 2 (3%) | 7 (9%) | 12 (16%) | 51 (67%) |

Table C4
*Correlations for Scaled Persistence Items*

| *Variable* | I would rather keep struggling with a problem than give up on it before I get the answer right. (KA41P) | I don't like to do more schoolwork than I have to. (KA41O) | People who accept their condition in life are happier than those who try to change things.(KA41H) | Give up when I don't understand a problem right away. (KA43B) | Try harder if I get bad grades. (KA43H) |
|---|---|---|---|---|---|
| I would rather keep struggling with a problem than give up on it before I get the answer right. (KA41P) | — | 0.04 | 0.09 | 0.27 | -0.07 |
| I don't like to do more schoolwork than I have to. (KA41O) | -0.16 | — | 0.15 | -0.17 | 0.04 |
| People who accept their condition in life are happier than those who try to change things. (KA41H) | 0.03 | 0.10 | — | -0.08 | 0.11 |
| Give up when I don't understand a problem right away. (KA43B) | 0.13 | 0.06 | -0.07 | — | -0.14 |
| Try harder if I get bad grades. (KA43H) | -0.23 | 0.07 | 0.42* | -0.09 | — |

*Note: Correlations for Latinas below the diagonal. Correlation for Black girls above the diagonal. *p* < 0.05.

Table C5
*Descriptive Statistics for Dichotomous Persistence Items*

| | Latinas | | | Black Girls | | | |
|---|---|---|---|---|---|---|---|
| *Item* | *N* | *M* | *SD* | *N* | *M* | *SD* | *t statistic* |
| I would rather keep struggling with a problem than give up on it before I get the answer right. (KA41P) | 50 | 0.52 | 0.50 | 74 | 0.59 | 0.49 | -0.81 |
| I don't like to do more schoolwork than I have to. (KA41O) | 49 | 0.33 | 0.47 | 74 | 0.34 | 0.48 | -0.13 |
| People who accept their condition in life are happier than those who try to change things. (KA41H) | 50 | 0.42 | 0.50 | 74 | 0.36 | 0.48 | 0.61 |
| Give up when I don't understand a problem right away. (KA43B) | 50 | 0.50 | 0.51 | 76 | 0.62 | 0.49 | -1.30 |
| Try harder if I get bad grades. (KA43H) | 49 | 0.80 | 0.41 | 76 | 0.83 | 0.38 | -0.45 |

Table C6
*Frequency Distributions for Dichotomized Persistence Items*

| | Latinas | | Black Girls | | |
|---|---|---|---|---|---|
| *Item* | *High Persistence* | *Low Persistence* | *High Persistence* | *Low Persistence* | *Fisher's Exact Test* |
| I would rather keep struggling with a problem than give up on it before I get the answer right. (KA41P) | 26 (52%) | 24 (48%) | 44 (59%) | 30 (41%) | 0.64 |
| I don't like to do more schoolwork than I have to. (KA41O) | 16 (33%) | 33 (67%) | 25 (34%) | 49 (66%) | 1 |
| People who accept their condition in life are happier than those who try to change things. (KA41H) | 21 (42%) | 29 (58%) | 27 (36%) | 47 (64%) | 0.13 |
| Give up when I don't understand a problem right away. (KA43B) | 25 (50%) | 25 (50%) | 47 (62%) | 29 (38%) | 0.32 |
| Try harder if I get bad grades. (KA43H) | 39 (80%) | 10 (20%) | 63 (83%) | 13 (17%) | 1 |

Table C7

*Correlations for Dichotomous Persistence Items*

| *Variable* | I would rather keep struggling with a problem than give up on it before I get the answer right. (KA41P) | I don't like to do more schoolwork than I have to. (KA41O) | People who accept their condition in life are happier than those who try to change things.(KA41H) | Give up when I don't understand a problem right away. (KA43B) | Try harder if I get bad grades. (KA43H) |
|---|---|---|---|---|---|
| I would rather keep struggling with a problem than give up on it before I get the answer right. (KA41P) | —- | 0.18 | 0.11 | 0.23 | 0.08 |
| I don't like to do more schoolwork than I have to. (KA41O) | 0.25 | — | 0.17 | 0.07 | 0.09 |
| People who accept their condition in life are happier than those who try to change things. (KA41H) | 0.01 | 0.10 | — | -0.06 | 0.03 |
| Give up when I don't understand a problem right away. (KA43B) | 0.27 | 0.07 | -0.06 | — | 0.15 |
| Try harder if I get bad grades. (KA43H) | 0.03 | 0.09 | 0.03 | 0.15 | — |

*Note: Correlations for Latinas below the diagonal. Correlation for Black girls above the diagonal. *p* < 0.05.

## Appendix D

Table D1
*Descriptive Statistics for Scaled Sense of Belonging Items*

| | Latinas | | | Black Girls | | | |
|---|---|---|---|---|---|---|---|
| *Item* | *N* | *M* | *SD* | *N* | *M* | *SD* | *t statistic* |
| Boys are generally better at math than girls. (KA46J) | 49 | 4.35 | 0.99 | 76 | 4.09 | 1.11 | 1.34 |
| All in all, I am inclined to feel I am a failure. (KA41L) | 49 | 4.10 | 1.08 | 73 | 4.07 | 1.08 | 0.17 |
| Boys are generally better at science than girls. (KA47J) | 48 | 4.35 | 0.96 | 76 | 3.99 | 1.17 | 1.91 |
| I was advised that I do not need to take more science. (KA45E) | 17 | 1.00 | 0.00 | 20 | 1.00 | 0.00 | --- |
| I was advised that I do not need to take more math. (KA44E) | 17 | 1.00 | 0.00 | 16 | 1.00 | 0.00 | --- |

Table D2
*Latinas' Frequency Distribution for Sense of Belonging Items*

| *Item* | *Strongly Agree* | *Agree* | *Not Sure* | *Disagree* | *Strongly Disagree* |
|---|---|---|---|---|---|
| Boys are generally better at math than girls. (KA46J) | --- | 5 (10%) | 3 (7%) | 11 (22%) | 30 (61%) |
| All in all, I am inclined to feel I am a failure. (KA41L) | 2 (4%) | 3 (6%) | 5 (10%) | 17 (35%) | 22 (45%) |
| Boys are generally better at science than girls. (KA47J) | --- | 3 (6%) | 7 (15%) | 8 (17%) | 30 (62%) |
| | *Yes* | *No* | | | |
| I was advised that I do not need to take more science.(KA45E) | 17 (100%) | --- | | | |
| I was advised that I do not need to take more math. (KA44E) | 17 (100%) | --- | | | |

Table D3
*Black Girls' Frequency Dichotomous for Sense of Belonging Items*

| *Item* | *Strongly Agree* | *Agree* | *Not Sure* | *Disagree* | *Strongly Disagree* |
|---|---|---|---|---|---|
| Boys are generally better at math than girls. (KA46J) | 3 (4%) | 5 (7%) | 10 (13%) | 22 (29%) | 36 (47%) |
| All in all, I am inclined to feel I am a failure. (KA41L) | 1 (1%) | 9 (12%) | 7 (9%) | 23 (32%) | 33 (46%) |
| Boys are generally better at science than girls. (KA47J) | 4 (5%) | 5 (7%) | 13 (17%) | 20 (26%) | 34 (45%) |
| | *Yes* | *No* | | | |
| I was advised that I do not need to take more advanced science. (KA45E) | 20 (100%) | --- | | | |
| I was advised that I do not need to take more advanced math. (KA44E) | 16 (100%) | --- | | | |

Table D4
*Correlations for Scaled Sense of Belonging Items*

| *Variable* | Boys are generally better at math than girls. (KA46J) | All in all, I am inclined to feel I am a failure. (KA41L) | Boys are generally better at science than girls. (KA47J) | I was advised that I do not need to take more science. (KA45E) | I was advised that I do not need to take more math. (KA44E) |
|---|---|---|---|---|---|
| Boys are generally better at math than girls. (KA46J) | — | 0.40* | 0.60* | — | — |
| All in all, I am inclined to feel I am a failure. (KA41L) | 0.22 | — | 0.25 | — | —- |
| Boys are generally better at science than girls. (KA47J) | 0.62* | 0.27 | — | — | —- |
| I was advised that I do not need to take more science. (KA45E) | — | — | — | —- | — |
| I was advised that I do not need to take more math. (KA44E) | — | — | — | —- | —- |

*Note: Correlations for Latina girls below the diagonal. Correlation for Black girls above the diagonal. *p* < 0.05.

Table D5
*Descriptive Statistics for Dichotomous Sense of Belonging Items*

| | Latinas | | | Black Girls | | | |
|---|---|---|---|---|---|---|---|
| *Item* | *N* | *M* | *SD* | *N* | *M* | *SD* | *t statistic* |
| Boys are generally better at math than girls. (KA46J) | 49 | 0.84 | 0.37 | 76 | 0.76 | 0.43 | 1.01 |
| All in all, I am inclined to feel I am a failure. (KA41L) | 49 | 0.80 | 0.41 | 73 | 0.77 | 0.43 | 0.38 |
| Boys are generally better at science than girls. (KA47J) | 48 | 0.79 | 0.41 | 76 | 0.71 | 0.46 | 1.03 |
| I was advised that I do not need to take more science. (KA45E) | 17 | 0.00 | 0.00 | 20 | 0.00 | 0.00 | — |
| I was advised that I do not need to take more math. (KA44E) | 17 | 0.00 | 0.00 | 16 | 0.00 | 0.00 | — |

Table D6
*Frequency Distributions for Dichotomous Sense of Belonging Items*

| | Latinas | | Black Girls | | |
|---|---|---|---|---|---|
| *Item* | *High Sense of Belonging* | *Low Sense of Belonging* | *High Sense of Belonging* | *Low Sense of Belonging* | *Fisher's Exact Test* |
| Boys are generally better at math than girls. (KA46J) | 41 (84%) | 8 (16%) | 58 (76%) | 18 (24%) | 0.06 |
| All in all, I am inclined to feel I am a failure. (KA41L) | 39 (80%) | 10 (20%) | 56 (77%) | 17 (23%) | 1 |
| Boys are generally better at science than girls. (KA47J) | 38 (79%) | 10 (21%) | 54 (71%) | 22 (29%) | 0.05 |
| I was advised that I do not need to take more science. (KA45E) | — | 17 (100%) | — | 20 (100%) | — |
| I was advised that I do not need to take more math. (KA44E) | — | 17 (100%) | — | 16 (100%) | — |

Table D7
*Correlations for Dichotomous Sense of Belonging Items*

| *Variable* | Boys are generally better at math than girls. (KA46J) | All in all, I am inclined to feel I am a failure. (KA41L) | Boys are generally better at science than girls. (KA47J) | I was advised that I do not need to take more science. (KA45E) | I was advised that I do not need to take more math. (KA44E) |
|---|---|---|---|---|---|
| Boys are generally better at math than girls. (KA46J) | — | 0.55* | 0.60* | — | — |
| All in all, I am inclined to feel I am a failure. (KA41L) | -0.08 | — | 0.29 | — | — |
| Boys are generally better at science than girls. (KA47J) | 0.66* | 0.03 | — | — | — |
| I was advised that I do not need to take more science. (KA45E) | — | — | — | — | — |
| I was advised that I do not need to take more math. (KA44E) | — | — | — | — | — |

*Note: Correlations for Latinas below the diagonal. Correlation for Black girls above the diagonal. *p* < 0.05.

# Appendix E

Table E1
*Descriptive Statistics for Scaled Trailblazing Items*

| | Latinas | | | Black Girls | | | |
|---|---|---|---|---|---|---|---|
| *Item* | *N* | *M* | *SD* | *N* | *M* | *SD* | *t statistic* |
| Being a leader in my community is important. (KA7F) | 52 | 1.75 | 0.79 | 79 | 2.06 | 0.65 | -2.38 |
| Working to correct social and economic wrongs is important. (KA7H) | 52 | 2.10 | 0.69 | 79 | 2.15 | 0.64 | -0.46 |
| Helping other people in my community is important. (KA7L) | 52 | 2.37 | 0.69 | 79 | 2.46 | 0.55 | -0.80 |
| Scientific researchers are dedicated people who work for the good of humanity. (KA48O) | 46 | 2.54 | 0.86 | 73 | 2.58 | 0.82 | -0.20 |
| Overall, science and technology have caused more good than harm. (KA38A) | 52 | 2.90 | 1.14 | 78 | 2.58 | 0.90 | 1.73 |

Table E2
*Latinas Frequency Distribution for Trailblazing Items*

| *Item* | *Not Important* | *Important* | *Very Important* | | |
|---|---|---|---|---|---|
| Being a leader in my community is important. (KA7F) | 24 (46%) | 17 (32%) | 11 (21%) | | |
| Working to correct social and economic wrongs is important. (KA7H) | 10 (19%) | 27 (52%) | 15 (29%) | | |
| Helping other people in my community is important. (KA7L) | 6 (12%) | 21 (40%) | 25 (48%) | | |
| | *Strongly Agree* | *Agree* | *Not Sure* | *Disagree* | *Strongly Disagree* |
| Scientific researchers are dedicated people who work for the good of humanity. (KA48O) | 5 (11%) | 16 (35%) | 21 (45%) | 3 (7%) | 1 (2%) |
| Overall, science and technology have caused more good than harm. (KA38A) | 5 (10%) | 17 (33%) | 12 (23%) | 14 (27%) | 4 (7%) |

Table E3
*Black Girls' Frequency Distribution for Trailblazing Items*

| *Item* | *Not Important* | *Somewhat Important* | *Very Important* |
|---|---|---|---|
| Being a leader in my community is important. (KA7F) | 14 (18%) | 46 (58%) | 19 (24%) |
| Working to correct social and economic wrongs is important. (KA7H) | 11 (14%) | 45 (57%) | 23 (29%) |
| Helping other people in my community is important. (KA7L) | 2 (3%) | 39 (49%) | 38 (48%) |

| | *Strongly Agree* | *Agree* | *Not Sure* | *Disagree* | *Strongly Disagree* |
|---|---|---|---|---|---|
| Scientific researchers are dedicated people who work for the good of humanity. (KA48O) | 7 (10%) | 23 (32%) | 39 (53%) | 2 (3%) | 2 (2%) |
| Overall, science and technology have caused more good than harm. (KA38A) | 11 (14%) | 21 (27%) | 37 (48%) | 8 (10%) | 1 (1%) |

Table E4
*Correlations for Scaled Trailblazing Items*

| *Variable* | Being a leader in my community is important. (KA7F) | Working to correct social and economic wrongs is important. (KA7H) | Helping other people in my community is important. (KA7L) | Scientific researchers are dedicated people who work for the good of humanity. (KA48O) | Overall, science and technology have caused more good than harm. (KA38A) |
|---|---|---|---|---|---|
| Being a leader in my community is important. (KA7F) | — | 0.56* | 0.49* | -0.22 | -0.17 |
| Working to correct social and economic wrongs is important. (KA7H) | 0.58* | — | 0.49* | -0.18 | -0.03 |
| Helping other people in my community is important. (KA7L) | 0.53* | 0.50* | — | 0.01 | -0.07 |
| Scientific researchers are dedicated people who work for the good of humanity. (KA48O) | 0.12 | 0.14 | -0.01 | — | 0.19 |
| Overall, science and technology have caused more good than harm. (KA38A) | 0.02 | 0.23 | 0.05 | 0.01 | — |

*Note: Correlations for Latina girls below the diagonal. Correlation for Black girls above the diagonal. *p* < 0.05.

Table E5
*Descriptive Statistics for Scaled Trailblazing Items*

| | Latinas | | | Black Girls | | | |
|---|---|---|---|---|---|---|---|
| *Item* | *N* | *M* | *SD* | *N* | *M* | *SD* | *t statistic* |
| Being a leader in my community is important. (KA7F) | 52 | 0.21 | 0.41 | 79 | 0.24 | 0.43 | 0.39 |
| Working to correct social and economic wrongs is important. (KA7H) | 52 | 0.29 | 0.46 | 79 | 0.29 | 0.46 | -0.03 |
| Helping other people in my community is important. (KA7L) | 52 | 0.48 | 0.50 | 79 | 0.48 | 0.50 | -0.002 |
| Scientific researchers are dedicated people who work for the good of humanity. (KA48O) | 46 | 0.46 | 0.50 | 73 | 0.41 | 0.50 | 0.48 |
| Overall, science and technology have caused more good than harm. (KA38A) | 52 | 0.42 | 0.50 | 78 | 0.41 | 0.50 | 0.14 |

Table E6
*Frequency Distributions for Dichotomous Trailblazing Items*

| | Latinas | | Black Girls | | |
|---|---|---|---|---|---|
| *Item* | *High Trailblazing* | *Low Trailblazing* | *High Trailblazing* | *Low Trailblazing* | *Fisher's Exact Test Statistic* |
| Being a leader in my community is important. (KA7F) | 11 (21%) | 41 (79%) | 19 (24%) | 60 (76%) | 1 |
| Working to correct social and economic wrongs is important. (KA7H) | 15 (29%) | 37 (71%) | 23 (29%) | 56 (71%) | 1 |
| Helping other people in my community is important. (KA7L) | 25 (48%) | 27 (52%) | 38 (48%) | 41 (52%) | 0.37 |
| Scientific researchers are dedicated people who work for the good of humanity. (KA48O) | 21 (46%) | 25 (54%) | 30 (41%) | 43 (59%) | 0.19 |
| Overall, science and technology have caused more good than harm. (KA38A) | 22 (42%) | 30 (58%) | 32 (41%) | 46 (59%) | 0.91 |

Table E7
*Correlations for Dichotomous Trailblazing Items*

| *Variable* | Being a leader in my community is important. (KA7F) | Working to correct social and economic wrongs is important. (KA7H) | Helping other people in my community is important. (KA7L) | Scientific researchers are dedicated people who work for the good of humanity. (KA48O) | Overall, science and technology have caused more good than harm. (KA38A) |
|---|---|---|---|---|---|
| Being a leader in my community is important. (KA7F) | — | 0.49* | 0.47* | 0.23* | 0.26 |
| Working to correct social and economic wrongs is important. (KA7H) | 0.40* | — | 0.44* | 0.17 | 0.20 |
| Helping other people in my community is important. (KA7L) | 0.35* | 0.32* | — | 0.08 | 0.18 |
| Scientific researchers are dedicated people who work for the good of humanity. (KA48O) | -0.19 | 0.01 | 0.08 | — | 0.31* |
| Overall, science and technology have caused better than harm. (KA38A) | 0.22 | -0.03 | 0.03 | 0.16 | — |

*Note: Correlations for Latinas below the diagonal. Correlation for Black girls above the diagonal. *p* < 0.05.

## Appendix F

Table F1

*Descriptive Statistics for Scaled Parental Support Items*

| | Latinas | | | Black Girls | | | |
|---|---|---|---|---|---|---|---|
| *Item* | *N* | *M* | *SD* | *N* | *M* | *SD* | *t statistic* |
| My parents insist I do my homework. (KA16C) | 51 | 1.65 | 0.66 | 78 | 1.76 | 0.69 | -0.91 |
| I talk to my parents about science/technology issues. (KA16I) | 51 | 2.43 | 0.64 | 78 | 2.47 | 0.62 | -0.38 |
| I talk to my parents about my school progress. (KA16A) | 51 | 1.47 | 0.58 | 79 | 1.44 | 0.55 | 0.27 |
| I talk to my mother or father about my career and future plans. (KA16B) | 51 | 1.47 | 0.54 | 78 | 1.46 | 0.53 | 0.09 |
| My parents want me to go to college. (KA19I) | 38 | 1.74 | 0.76 | 62 | 1.61 | 0.75 | 0.79 |

Table F2

*Latinas' Frequency Distribution for Parental Support Items*

| *Item* | *Often* | *Some-times* | *Never* |
|---|---|---|---|
| My parents insist I do my homework. (KA16C) | 23 (45%) | 23 (45%) | 5 (10%) |
| I talk to my parents about science/technology issues. (KA16I) | 4 (8%) | 21 (41%) | 26 (51%) |
| I talk to my parents about my school progress. (KA16A) | 29 (57%) | 20 (39%) | 2 (4%) |
| I talk to my mother or father about my career and future plans. (KA16B) | 28 (55%) | 22 (43%) | 1 (2%) |
| | *Very Important* | *Important* | *Not Important* |
| My parents want me to go to college. (KA19I) | 17 (45%) | 14 (37%) | 7 (18%) |

Table F3
*Black girls' Frequency Distribution for Parental Support Items*

| *Item* | *Often* | *Some-times* | *Never* |
|---|---|---|---|
| My parents insist I do my homework. (KA16C) | 30 (38%) | 37 (48%) | 11 (14%) |
| I talk to my parents about science/technology issues. (KA16I) | 5 (6%) | 31 (40%) | 42 (54%) |
| I talk to my parents about my school progress. (KA16A) | 46 (58%) | 31 (39%) | 2 (3%) |
| I talk to my mother or father about my career and future plans. (KA16B) | 43 (55%) | 34 (44%) | 1 (1%) |
| | *Very Important* | *Important* | *Not Important* |
| My parents want me to go to college. (KA19I) | 34 (55%) | 18 (29%) | 10 (16%) |

Table F4
*Correlations for Scaled Parental Support Items*

| *Variable* | My parents insist I do my homework. (KA16C) | I talk to my parents about science /technology issues. (KA16I) | I talk to my parents about my school progress. (KA16A) | I talk to my mother or father about my career and future plans. (KA16B) | I talk to my parents about my school progress. (KA19I) |
|---|---|---|---|---|---|
| My parents insist I do my homework. (KA16C) | — | 0.43* | 0.46 | 0.60* | -0.04 |
| I talk to my parents about science/technology issues. (KA16I) | 0.71* | — | 0.32* | 0.40* | 0.09 |
| talk to my parents about my school progress. (KA16A) | 0.24* | 0.25 | — | 0.62* | -0.10 |
| I talk to my mother or father about my career and future plans. (KA16B) | 0.64* | 0.09 | 0.62* | —- | 0.04 |
| I talk to my parents about my school progress. (KA19I) | -0.15 | 0.37* | 0.06 | -0.19 | — |

*Note: Correlations for Latinas are below the diagonal. Correlation for Black girls above the diagonal. *p* < 0.05.

Table F5
*Descriptive Statistics for Dichotomous Parental Support Items*

| | Latinas | | | Black Girls | | | |
|---|---|---|---|---|---|---|---|
| *Item* | *N* | *M* | *SD* | *N* | *M* | *SD* | *t statistic* |
| My parents insist I do my homework. (KA16C) | 51 | 0.55 | 0.50 | 78 | 0.53 | 0.50 | 0.26 |
| I talk to my parents about science/technology issues. (KA16I) | 51 | 2.43 | 0.64 | 78 | 2.47 | 0.62 | 0.38 |
| I talk to my parents about my school progress. (KA16A) | 51 | 0.04 | 0.20 | 79 | 0.03 | 0.16 | 0.42 |
| I talk to my mother or father about my career and future plans. (KA16B) | 51 | 0.02 | 0.14 | 78 | 0.01 | 0.11 | 0.29 |
| My parents want me to go to college. (KA19I) | 38 | 1.74 | 0.76 | 62 | 1.161 | 0.75 | 0.79 |

Table F6
*Frequency Distributions for Dichotomous Parental Support Items*

| | Latinas | | Black Girls | | |
|---|---|---|---|---|---|
| *Item* | *High Parental Support* | *Low Parental Support* | *High Parental Support* | *Low Parental Support* | *Fisher's Exact Test* |
| My parents insist I do my homework. (KA16C) | 23 (45%) | 22 (55%) | 30 (38%) | 48 (62%) | 0.67 |
| I talk to my parents about science/technology issues. (KA16I) | 4 (8%) | 47 (92%) | 5 (6%) | 73 (94%) | 1 |
| I talk to my parents about my school progress. (KA16A) | 2 (4%) | 49 (96%) | 2 (3%) | 77 (97%) | 1 |
| I talk to my mother or father about my career and future plans. (KA16B) | 1 (2%) | 50 (98%) | 1 (1%) | 77 (99%) | 1 |
| My parents want me to go to college. (KA19I) | 17 (45%) | 21 (55%) | 34 (55%) | 28 (45%) | 0.06 |

Table F7
*Correlations for Dichotomous Parental Support Items*

| *Variable* | My parents insist I do my homework. (KA16C) | I talk to my parents about science /technology issues. (KA16I) | I talk to my parents about my school progress. (KA16A) | I talk to my mother or father about my career and future plans. (KA16B) | I talk to my parents about my school progress. (KA19I) |
|---|---|---|---|---|---|
| My parents insist I do my homework. (KA16C) | — | 0.33* | -0.13 | -0.09 | -0.07 |
| I talk to my parents about science/technology issues. (KA16I) | 0.32 | — | -0.04 | -0.03 | 0.12 |
| I talk to my parents about my school progress. (KA16A) | -0.18 | -0.06 | — | 0.70* | 0.12 |
| I talk to my mother or father about my career and future plans. (KA16B) | -0.13 | -0.04 | -0.03 | — | — |
| I talk to my parents about my school progress. (KA19I) | -0.19 | 0.34* | -0.15 | 0.19 | — |

*Note: Correlations for Latinas below the diagonal. Correlation for Black girls above the diagonal. *p* < 0.05.

# Appendix G

Table G1

*Descriptive Statistics and Correlations for Composite Scores and Outcome Variables*

| *Variable* | *n* | Mean | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.Motivation | 57 | 0.66 | 0.29 | — | 0.41* | 0.12 | 0.22 | -0.03 | 0.30* | 0.20 | 0.11 |
| 2.Persistence | 51 | 0.52 | 0.28 | — | —- | 0.38* | 0.31* | 0.04 | 0.26 | 0.23 | -0.06 |
| 3.Sense of Belonging | 63 | 0.58 | 0.38 | — | — | — | 0.05 | -0.34 | 0.57* | 0.33 | 0.15 |
| 4.Trailblazing | 52 | 0.37 | 0.27 | — | — | — | — | 0.36 | -0.17 | 0.13 | 0.04 |
| 5..Parental Support | 52 | 0.20 | 0.20 | — | — | — | — | — | -0.32 | -0.18 | 0.02 |
| 6.Math Achievement | 38 | 63.06 | 15.20 | — | — | — | — | — | — | 0.76* | -0.04 |
| 7.Science Achievement | 65 | 59.77 | 12.25 | — | — | — | — | — | — | — | 0 |
| 8.Entrance into STEM Career | 90 | 9.44 | 1.56 | — | — | — | — | — | — | — | — |

*Note: *p* < 0.05

Table G2

*Sense of Belonging and Motivation as Predictors of Math Achievement Linear Regression Model*

| | | | 95% CI | | |
|---|---|---|---|---|---|
| STEM Identity Aspect | Estimate | *SE* | *LL* | *UL* | *p* |
| Intercept | 38.458 | 6.223 | 25.79 | 51.13 | 5.18e-07 *** |
| Motivation | 10.898 | 7.174 | -3.68 | 25.48 | 0.000457 *** |
| Sense of Belonging | 25.518 | 6.577 | 12.15 | 38.88 | 0.000457 *** |

*Note: ***p* < 0

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