

**Blending academic and social support through
apoyo and consejos for mathematical success
among undergraduate Latinx students**



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Terms Defined



- ❧ **Latinx** (as opposed to *Latino*, *Latina/o*, or *Latin@*)
- ❧ **Apoyo**: moral support¹
- ❧ **Consejos**: culturally-specific forms of advice²
- ❧ **Familismo**: loyalty or responsibility to Latinx family³
- ❧ **Caballerismo**: Latinx masculinity characterized by family-centeredness⁴

1 Auerbach, 2006

2 Delgado-Gaitan, 1994

3 Marín & Marín, 1991; Suárez-Orozco & Suárez-Orozco, 1995

4 Arciniega, Anderson, Tovar-Blank, & Tracey, 2008; Torres, Solberg, & Carlstrom, 2002

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10:16 AM



Papi

Sun, Sep 24, 5:09 PM

Hoy antes que comiences la semana ten en cuenta : Se fuerte cuando estés débil. Valiente cuando tengas miedo. Y humilde cuando hayas triunfado. Te deseo una linda semana y recuerda: Te Quiero Mucho.

Gracias. Te quiero tambien.

Tue, Sep 26, 3:28 PM

Te quiero mucho. Te tengo presente en mis pensamientos

Gracias hijo

Sun, Sep 24, 5:09 PM

Dad:

Today, before you begin your week, bear this in mind: Be strong when you are weak. Be brave when you are scared. And humble when you have triumphed. I wish you a beautiful week and remember: I love you.

Me: Thank you. I love you, too.

Tues, Sept 26, 3:28 PM

Me: I love you very much. I have you present in my thoughts.

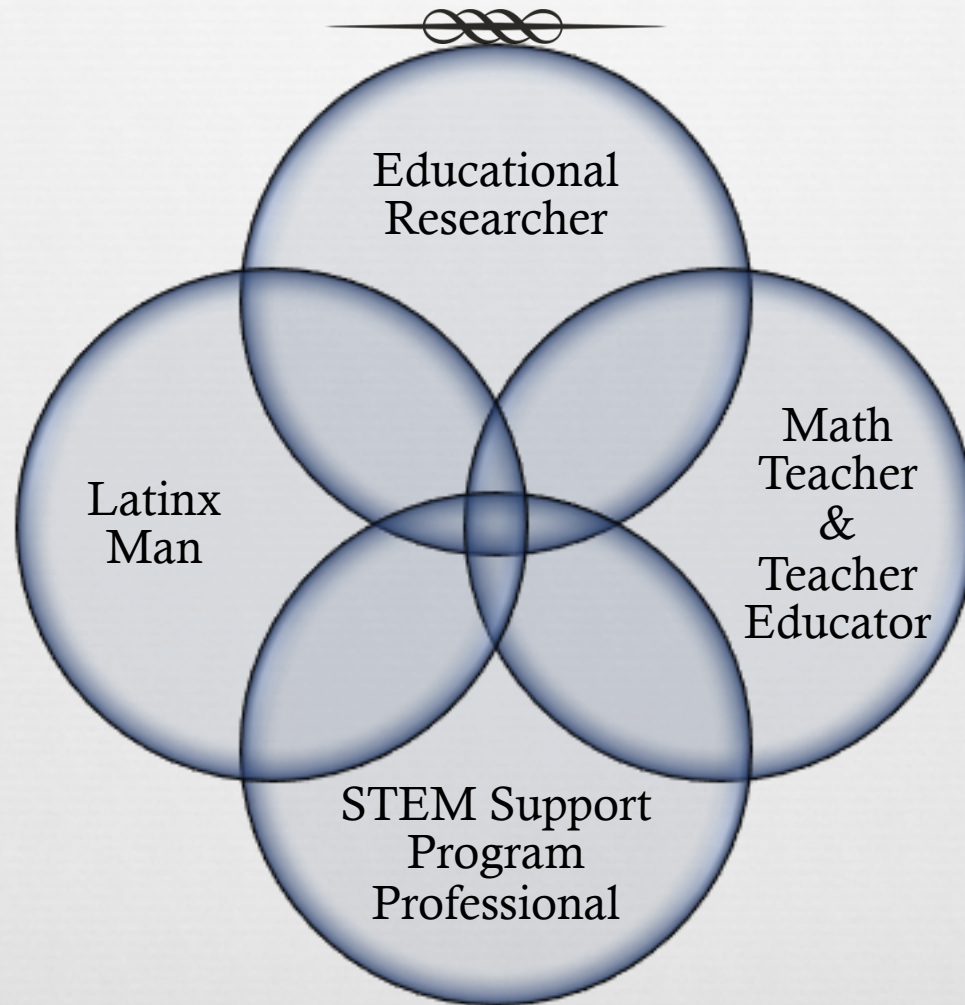
Dad: Thank you, son.

Overview of Talk



- ❧ Self-introduction
- ❧ Overarching research questions
- ❧ Previous and ongoing scholarship
- ❧ Study (including research questions, design, and findings)
- ❧ Discussion / Q&A

Self-Introduction



Overarching Research Questions



How does mathematics as a socially exclusionary space afford and constrain P-16 educational opportunities for marginalized populations that affirm their social selves at intersections of gender, race, and other identities?

In what ways does this inform the design of socially-affirming mathematics classroom teaching and STEM support programs to broaden marginalized students' participation and success across the P-16 mathematics pipeline?

Previous & Ongoing Scholarship



- ☞ Need for analyses of gender as **socially constructed** and **performed** at intersections with other identities¹

- ☞ Ideologies of **whiteness** and **heterosexism** that shape **institutional spaces** of STEM education²

- ☞ Negotiations of **racialized-gendered narratives** with pursuits of mathematics-intensive STEM majors²
 - ☞ Latinx women become young mothers & wives
 - ☞ Black women are better at “writing and cultural things”
 - ☞ Black men as Blerds (Black nerds)

¹ Leyva, 2017

² Battey & Leyva, 2016; Leyva, Massa, & Battey, 2016

³ Leyva, 2016; Leyva, under review; Leyva, in preparation

Theoretical Perspectives



- ☞ Gender as socially constructed and performative¹
- ☞ Intersectionality²
- ☞ Post-structural theory³
- ☞ Identity⁴

1 Butler, 1990; Connell, 1995; West & Zimmerman, 1987

2 Crenshaw, 1991

3 Foucault, 1980; Scott, 1988

4 Ernest, 1991; Gee, 2001; Holland, Lachiotte, Skinner, & Cain, 2001; Martin, 2009

Research Questions



- ❧ What university structures afforded or limited opportunities for mathematical success among the undergraduate Latinx engineering students?
- ❧ How did relationships and interactions in and out of the undergraduate mathematics classroom shape their success?
- ❧ To what extent did these students raise and/or respond to marginalizing discourses about mathematics and being Latinx? What strategies did they adopt to negotiate them with their academic pursuits as engineering majors?

Study Design



- ❧ Counter-storytelling¹
- ❧ Data sources
 - ❧ Mathematics autobiographies
 - ❧ Interviews
 - ❧ Survey
 - ❧ Field notes from classroom observations & departments
 - ❧ Focus group discussion²
- ❧ 3-tiered analytical framework³
 - ❧ Institutional
 - ❧ Interpersonal
 - ❧ Ideological

¹ Solórzano & Yosso, 2002

² Ericsson & Simon, 1993; Herbst & Chazan, 2011

³ Leyva, 2016

Study Context & Participants



- ❧ Large, public, four-year predominantly White university
- ❧ Fall 2014 and spring 2015
- ❧ 5 Latinx students pursuing engineering majors
 - 2 Latinx women
 - **3 Latinx men**
- ❧ Had taken at least second-semester calculus
- ❧ Members of university chapter of Society of Hispanic Professional Engineers (SHPE)

Participant Profiles



Participants	Ethnicity	Intended Major	Year of Study	High School Demographics	Undergraduate Math Course
Brian	Peruvian	Electrical engineering	4 (3 yrs. in community college)	Predominantly White and Asian/Pacific Islander	Differential Equations
Carlos	Guatemalan-American	Chemical engineering	2	Predominantly White and Asian/Pacific Islander	Multivariable Calculus
Daniel	Dominican- & Ecuadorean-American	Mechanical engineering	3	Predominantly White (Transferred from predom. Black & Latinx)	Advanced Calculus I for Engineers

Presentation of Findings



- ❧ Overview of Latinx men's counter-stories as K-16 mathematics students

- ❧ Defining *apoyo* and *consejos* from Latin American studies

- ❧ Themes from cross-case analysis of counter-stories
 - ❧ Institutional
 - ❧ Interpersonal
 - ❧ Ideological

Brian



- ☞ Immigrated to U.S. at 12 years old
- ☞ “Plainly bad at math” and felt abandoned in algebra
- ☞ “More connected” to community college instructors who were “more involved with helping their students”
- ☞ “Belonged to the university” through SHPE
- ☞ “Didn’t have the guts” to participate like other peers of “one of 3 races – white, Indian, or Asian”
- ☞ Engineering allows him to be “someone to look up to,” pursue a “good career,” and prove ability as Latinx man

Carlos



- ❧ Favorite math class was non-AP calculus with “buddy”
- ❧ Did not ask questions in high school pre-calculus that went too fast and was “stressful”
- ❧ University TAs and professors “should encourage... relationships to be able to form” with students
- ❧ “Not a huge impact” of being the only racially minoritized student in university math classes
- ❧ Would not have experienced STEM differently as a Latinx woman
- ❧ Passion for technology and family’s value of education

Daniel



- ⌘ Not one of the “smart kids” in accelerated algebra
- ⌘ Pre-calculus as “remedy” for math hatred through “brotherly relationship” with teacher
- ⌘ Failed calculus I twice and placed on academic probation (“lowest point in my life”)
- ⌘ Third calculus course was his math “metamorphosis”
- ⌘ University math classes are “fly or die” situations with “same kids who go above and beyond”
- ⌘ “Not being a statistic” and “guilt” to not let family down

Apoyo & Consejos



☞ **Apoyo:** moral support¹

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STEM support programs for academic enrichment and social affinity



I haven't built relationships with TAs, but I take advantage of **study groups and with the LAs [learning assistants]**... I've actually kinda developed similar relationships like this during the study groups... We would **exchange e-mails, too, about questions and help with other stuff**... **If it's a more relaxed environment, I feel it's easier to make those bonds.** But if it's a lecture hall, you're not gonna even be communicating at all with anybody so you can't even build bonds there.

(Carlos, Focus Group Discussion)

When I first went to SHE in freshman year, it felt like home... I remember when I was there, I felt **very comfortable like I was among family, like other Hispanics**, and we can just **tell jokes about Hispanic things** like parents throwing chancletas.

(Daniel, Interview #1)

Relational spaces in and beyond undergraduate math classrooms



And he had a big talk about... **how we Hispanics should strive to do better in colleges and graduate so we can...not be looked down upon in this society...He told me to be one of those persons who tries to make yourself look good and also your community** and he told me it's better to change the major now than wait later on and **that's when I decided to stay in community college for one more year so I keep studying mathematics and physics.**

(Brian, Interview #1)

After he started saying jokes and started being friendly, he looked like he kinda wanted to be there. That's when I started seeing him more. **He had more human traits. I'm not trying to dehumanize any other professors...** That's the way we perceived them, and I know it wasn't just me because other people started to come to class because they started enjoying it... **He was the coolest professor I've had.**

(Daniel, Interview #2)

Being a Latinx man pursuing STEM higher education



Most of the workers, they are all male. The ones that work outside... So whenever you're gonna stereotype, you look at the guys and say guys do all of this. But like a Latina, they have a little bit more slack ...whenever someone wants to insult someone, they're stereotyping with the male character, not the female. When you look at the female, it's like, "Oh, they're probably doing fine. They're going to school? Oh okay, that's totally acceptable."

(Brian, Interview #2)

His end goal for me is as long as I graduate and get a job, I'm successful for him... But I know some friends that whose families not only support them that way, but even also through some of their courses, their parents are professionals in some fields.... My dad hasn't been able to help me with math or anything beyond fourth grade so... But morally, they are very supportive.

(Carlos, Interview #2)

Discussion



- ☞ Design of STEM student programs that attend to **both** academic and social forms of support¹
- ☞ Blending of content learning and relational support from influential undergraduate math faculty²
- ☞ Awareness of Latinx men's negotiations of racialized-gendered discourses and familismo as STEM students

1 Allen & Joseph, in press; Cabrera, Rashwan-Soto, & Valencia, 2016

2 Battey, Neal, Leyva, & Adams-Wiggins, 2016; Borum & Walker, 2012

3 Oppland-Cordell, 2014; Sáenz, Bukoski, Lu, & Rodriguez, 2013; Sáenz, Mayo, Miller, & Rodriguez, 2015

Future Research Directions



NSF IUSE
Grant No.
1711553 &
1711712

- ∞ 3-year, mixed-methods collaborative research project
- ∞ How can undergraduate math instruction be improved to better meet marginalized groups' academic and social needs in STEM?

Queering Engineering

- ∞ Negotiations of engineering pursuits and social identities among LGBTQ+ students, including LGBTQ+ students of color
- ∞ Detailing of experiences across undergraduate math classrooms and STEM support programs (e.g., Out in STEM)

Thank you for your time!



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Questions? Comments?

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