UNIVERSITY OF CALIFORNIA,
IRVINE

Examining Program Quality in an University-Community Math Afterschool Activity: Perspectives from Latinx Adolescents and Mentors

DISSERTATION

submitted in partial satisfaction of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

in Education

by

Stephanie Soto-Lara

Dissertation Committee:
Professor Sandra D. Simpkins, Chair
Professor Alessandra Pantano
Chancellor's Professor Emerita Deborah Vandell
Professor Kylie Peppler

2022

DEDICATION

Para

mis padres – Olga Lara Chavez y Jorge Soto.

Gracias por su apoyo incondicional y sus consejos.

To

my siblings – Jackie, Melissa, and Jason.

Thank you for always believing in me and giving me that extra push to move forward.

En memoria de

mi tío Mario que fue una fuente de luz y siempre me apoyo. Se que me estas echando porras desde el cielo.

This Ph.D. is for us. Este Doctorado es para nosotros.

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ACKNOWLEDGMENTS

First and foremost, I want to thank God for all his blessings and for giving me the strength to get this far. I would like to express my deepest gratitude to my advisors, Sandi Simpkins and Deborah Vandell, for your mentorship and guidance throughout my journey at UCI. Sandi, there are no words to describe how grateful I am for your support and encouragement. Thank you for always believing in me even during times when I did not believe in myself. Deborah, I am extremely grateful for all your words of wisdom and for providing me with opportunities to strengthen my research skills. I also appreciate all the moments that you made me laugh because they helped me get through difficult days. I am thankful to Kylie Peppler for serving on my dissertation committee and for providing me with encouragement. Kylie, thank you for picking at my brain when thinking about culture and context during your learning and development course. I am extremely thankful for the support I received from Alessandra Pantano. I am privileged to have worked with you and for providing me with opportunities to work with the adolescents, mentors, and parents at Math CEO. I am honored to have worked with these inspiring women in academia who have paved the path for other women not only through their scholarly work, but also through their genuine support of students.

I would like to thank the rest of my village. I am grateful to my colleagues, mentors, and friends who have provided me with a community to lean on at UCI. Yangyang Liu, Diane Hsieh, Kayla Puente, Su Jiang, Perla Ramos Carranza, Glona Lee, Fuko Kiyama, Nestor Tulagan, Mark Yu, Christy Starr, and Zehra Gülseven I couldn't have done it without your support. Thank you for being there during the highs and lows of navigating academia. I will forever cherish the moments we shared and look forward to continuing our relationships after the Ph.D. program. I would also like to thank my childhood friends who continue to encourage me to pursue my goals

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Lastly, I would like to thank all the communities that I have been a part of. A special thanks to the Math CEO adolescents, mentors, and parents for sharing your experiences with me during the interviews. I am also grateful to the people in my community where I grew up. Thank you for your encouragement throughout the years. I would also like to thank the LA's Best staff, students, and parents who I worked with before coming to graduate school. Your stories and experiences have inspired me to continue to do the work that I do.

VITA

Stephanie Soto-Lara

Education

2022 Ph. D. Education, University of California, Irvine, CA
Specialization: Human Development in Context

2019 M.A. Education, University of California, Irvine, CA

2016 B.A. Psychology, University of California, Los Angeles, CA

Research Interests

Qualitative and quantitative applied education researcher focused on human development; under-represented youth; parent support; family systems; organized afterschool activities; positive youth development; educational outcomes; equity, culture, race, ethnicity, and socioeconomic status.

Professional Experience

2021 Research Consultant
Search Institute, Minneapolis, MN
Lead Investigator: Dr. Ta-yang (Diane) Hsieh

- Provided feedback on quantitative survey on culturally responsive practices in math tutoring programs
- Provided feedback on project focused on translating research for practice

2020 – 2021 Research Assistant
UC Links, UC Irvine
Principal Investigator: Dr. Sandra Simpkins

- Sustained research-practice partnership between UCI School of Education and afterschool programs located in Orange County
- Collaborated on writing a grant proposal and grant report
- Updated program website

2020 – Present Research Collaborator
Family Math Involvement for Latinx Youth (FAMILY) study, UC Irvine
Principal Investigator: Dr. Nestor Tulagan and Dr. Sandra Simpkins

- Collaborated on writing grant proposal focused on family engagement through a research-practice partnership
- Co-developed qualitative parent interview scripts
- Translated interview scripts and research protocols into Spanish
- Co-developed research protocols to conduct a) qualitative data collection with a team of undergraduate and graduate students and b) semi-structured interviews with parents in both Spanish and English

- Conducted qualitative parent interviews using various platforms (e.g., phone and Zoom) in Spanish
- Co-developed, organized, and led research-based parent workshops
- Translated research for practice: Co-developed parent pamphlets/handouts

2019 – 2020 Research Assistant
Math CEO Afterschool Program, UC Irvine
Principal Investigator: Dr. Mark Yu and Dr. Sandra Simpkins

- Co-developed staff and youth quantitative surveys and qualitative interview scripts for an applied study on equity and diversity issues
- Contacted parents and conducted phone interviews in Spanish and English
- Conducted and led data collection with a team of undergraduate and graduate students
- Co-developed educational research-based videos to help train frontline staff
- Administered quantitative surveys and conducted qualitative semi-structured interviews with youth and frontline staff in Spanish and English

2017 – 2020 Research Assistant
Mott Synthesis Study and Meta-Analysis on Out-of-School Time, UC Irvine
Principal Investigator: Dr. Deborah Vandell and Dr. Sandra Simpkins

- Conducted searches of reports and evaluations on out-of-school time programs
- Screened reports and evaluations that fit our criteria to use for the synthesis study and meta-analysis on out-of-school time
- Coded reports and evaluations on specific outcomes: academic performance, physical health, psychosocial, and behavioral
- Co-developed presentations and reports highlighting findings on 21st Century Community Learning Programs

2017 – 2018 Research Assistant
NICHD Study of Early Child Care and Youth Development, UC Irvine
Principal Investigator: Dr. Deborah Vandell

- Co-developed survey for the age 26-27 follow-up study in both paper and online (via Qualtrics) formats
- Created Facebook page and logo for the 26-27 follow-up study
- Developed strategies to contact participants using social media and public records
- Led and coordinated a team of undergraduates: Organized and led trainings, coordinated meetings, and oversaw their projects
- Ran statistical analysis using STATA and MPlus

2016 – 2017 Research Assistant
Latino Families and Science Project, UC Irvine
Principal Investigator: Dr. Sandra Simpkins

- Developed video codes to examine how families support students' academic and science motivation
- Contacted previous participants who were part of the study
- Worked with a team of undergraduates in the lab: Organized and led trainings, facilitated reliability meetings, and created professional development workshops
- Data coding and entry: Record data and Roadmaps

2015 – 2016 Research Scholar
Ronald E. McNair, UCLA
Faculty Advisor: Dr. Sandra Graham

- Lead researcher on study focusing on victimization and participation in extracurricular activities among Latinx middle school students
- Research methodology: quantitative (descriptive & regression), survey data

2014 – 2016 Research Assistant
Middle School Diversity Project, UCLA
Principal Investigators: Dr. Sandra Graham and Dr. Janna Juvonen

- Conducted data collection at various school sites in Los Angeles
- Worked with a team and individually in various quantitative data cleaning and coding projects: Extracurricular Activities, Social Identity Complex, School Records, and Peer Nominations

2015 – 2016 Project Supervisor
Lost Student Project, Middle/High School Diversity Project, UCLA
Principal Investigators: Dr. Sandra Graham and Dr. Janna Juvonen

- Coordinated a team of students to contact difficult to reach participants who participated in the project previous years
- Mailed students surveys and honorariums

2014 Research Fellow
Summer Ronald E. McNair, UCLA
Faculty Advisor: Dr. Sandra Graham, Professor of Education

- Lead researcher on project focusing on the benefits associated with participation in extracurricular activities
- Received IRB certification to conduct study
- Developed and administered survey

Publications

Soto-Lara, S., Yu, M. V. B., Pantano, A., & Simpkins, S. D. (2021). How youth-staff relationships and program activities promote Latinx adolescent outcomes in a university-

community afterschool math enrichment activity. *Applied Developmental Science*, 1-19. https://doi.org/10.1080/10888691.2021.1945454

Soto-Lara, S., Yu, M. V. B., Liu, Y., Puente, K., Carranza, P., Pantano, A., & Simpkins, S. D. (2021, June). High-quality afterschool programs for Latinx Youth. Society for Community Research and Action (SCRA). https://www.communitypsychology.com/high-quality-afterschool-programs-for-latinx-youth/

Yu, M. V. B., Liu, Y., **Soto-Lara, S**., Puente, K., Carranza, P., Pantano, A., & Simpkins, S. D. (2021). Culturally responsive practices: Insights from a high-quality math afterschool program serving underprivileged Latinx youth. *American Journal of Community Psychology*, *68*(3-4), 323-339. https://doi.org/10.1002/ajcp.12518

Ma, T., Yu, M., **Soto-Lara, S.,** & Simpkins, S. (2021). Peer discrimination profiles of Latino adolescents' organized afterschool activities: The associations with activity engagement and experiences. *Journal of Youth Development.* Retrieved from http://jyd.pitt.edu/ojs/jyd/article/viewFile/2020-15-6-PA-1/1188

Soto-Lara, S. & Simpkins, S. (2020). Parent support of Mexican-descent high school adolescents' science education: A culturally-grounded framework. *Journal of Adolescent Research,* 1-30. Retrieved from https://doi.org/10.1177/0743558420942478

Soto-Lara, S., Yu, M. V. B., Pantano, A., & Simpkins, S. D. (under review). Changes in adolescents' motivational beliefs: Culturally responsive practices in an afterschool activity.

Soto-Lara, S., Yu, M. V. B., Pantano, A., & Simpkins, S. D. (under review). Adult mentors' challenges and strategies in a math afterschool program serving Latinx adolescents.

Presentations

Tulagan, N., **Soto-Lara, S.,** Ramos Carranza, P., Puente, k., Pantano, A., Simpkins, S. (2022, April). *Adaptive strategies against barriers to parents' math support: Leveraging Latinx parents' cultural funds of knowledge.* Paper accepted to the annual meeting of the American Educational Research Association Annual Meeting.

Soto-Lara, S., Yu, M., Simpkins, S. (2021, April). *Youth-staff relationships and program activities in a math afterschool activity serving Latinx middle-school students.* Paper accepted to the annual meeting of the American Educational Research Association Annual Meeting, Online Conference.

Soto-Lara, S., & Simpkins, S. (2020, March). Mexican-Descent mothers' support in their adolescents' science learning in spite of social, cultural, and structural barriers. In N. Tulagan (Chair), *Content and Correlates of Mexican- and African-American Parental Involvement in Adolescents' Academic and Developmental Wellbeing.* Symposium accepted at the biennial meeting for the Society for Research on Adolescence, San Diego, CA.[1]

Soto-Lara, S., Tulagan, N., & Simpkins, S. (2019, March). *Examining relations of Mexican-Descent adolescents' science achievement and engagement on mothers' use of navigational*

[1] Meeting cancelled due to the COVID-19 pandemic.

capital. Poster presented at the 2019 Society for Research in Child Development, Baltimore, Maryland.

Liu, Y., Simpkins, S., Vandell, D. L., Hsieh, T., **Soto-Lara, S**., & Luo, H. (2018, October) *Associations between organized activities and performance character: A critical review.* Poster presented at SRCD Character Development Special Topic Conference, Philadelphia, PA.

Soto-Lara, S. & Simpkins, S. (2018, April). *"Everything that is for her benefit, I do": Parental engagement in STEM among Mexican-descent families.* Poster presented at the 2018 Biennial Society for Research on Adolescence Meeting, Minneapolis, Minnesota.

Soto-Lara, S., Hsieh, T., & Simpkins, S. (2018, April). *Latina/o parents' positive and negative responsiveness and their adolescents' academic aspirations.* Poster presented at the 2018 Biennial Society for Research on Adolescence Meeting, Minneapolis, Minnesota.

Soto-Lara, S., Camacho, D., & Graham, S. (2016, March). *The role of extracurricular activity in peer victimization among Latina/o youth.* Poster presented at the Biennial Society for Research on Adolescence Meeting, Baltimore, Maryland.

Soto-Lara, S., Camacho, D., & Graham, S. (2015). *The effects of participation in extracurricular activities among victimized Latina/o middle school students.* Plenary presentation at UC Berkeley's 23th Annual McNair Symposium, Berkeley, CA.

Soto-Lara, S., Camacho, D., & Graham, S. (2015). *The role of extracurricular activities in the relationship between victimization and psychosocial outcomes among Latina/o middle school youth*. Oral presentation Presented at UCLA McNair Symposium, Los Angeles, CA.

Soto-Lara, S., Camacho, D., & Graham, S. (2015). *Engagement in extracurricular activities and psychosocial outcomes during middle school.* Poster presented at UCLA Undergraduate Research Week, Los Angeles, CA.

Soto-Lara, S. & Barbee, B. (2014). *With involvement comes success: Latino high school students and their path towards graduation*. Poster presented at UCLA Undergraduate Research Week, Los Angeles, CA.

Teaching Experience

University Teaching Assistant

School of Education, UC Irvine

2019
- Out-Of-School Learning
  Undergraduate course
- Learning Inside and Outside of School
  Graduate course for Master of Arts in Teaching Degree students

2020
- Theories and Pedagogy of Race
  Undergraduate course
- Issues in K-12 Education
  Undergraduate course

2022
- Child Development in Education
  Undergraduate course

K-12 Teaching Experience

2014 – 2015 Teaching Assistant
Vine Street Elementary, Los Angeles, CA

- Assisted fifth grade teacher with grading, supervising, and tutoring
- Worked with students in literacy circles to enhance their reading, comprehension, writing, and analyzing skills

2010 – 2016 Staff Assistant
LA's Best Afterschool Program, Los Angeles, CA

- Helped students with homework in different subjects
- Helped staff with supervising children and brainstorming ideas for developing enrichment activities
- Helped with parent workshops/events and interacted with families
- Completed paperwork, ran errands, and organized office with equipment

University Guest Lectures/Workshops

School of Education, UC Irvine

- Issues in K-12 Education, *2020*
- Peer Mentorship Workshops: UCI DECADE Program, *2018 - 2020*
- Parent Workshops: UCI Math CEO Afterschool Program, *2020 - present*
- Frontline Staff Workshops: UCI Math CEO Afterschool Program, *2021 - present*

Academic Service

Journals/Conferences

2020	Ad Hoc Manuscript Reviewer with Advisor, Journal of Adolescent Research (JAR)
2018	Student and Early-Career Committee Member, Society for Research on Child Development (SRCD)
2017	Ad Hoc Manuscript Reviewer with Advisor, Journal of Adolescent Research (JAR)
2017	Ad Hoc Manuscript Reviewer with Advisor, Journal of Research on Adolescence (JRA)
2016	Conference Proposal Reviewer with Advisor, Society for Research on Child Development (SRCD)

Invited Panelist

2018 – 2020	DECADE Cross-Cohort Conversations Panelist, School of Education, UC Irvine
2017	Graduate School Application Forum & Workshop, Sociology Department, California State University Los Angeles

Mentorship

2018 – Present	DECADE Peer Mentorship Program Coordinator, School of Education, UC Irvine
2017, 2020	Graduate Mentor for Latinx Undergraduate Student, Chican@/Latin@ Staff Association (CLSA) Undergraduate Mentorship Program, UC Irvine

2017 – Present	DECADE Peer Mentor for Under-represented Graduate Students, School of Education, UC Irvine
2016 – Present	Graduate Mentor for Undergraduate Students in Research, UC Irvine
2017	Graduate Mentor for Undergraduate Research Fellow, Summer Undergraduate Research Program (SURP), UC Irvine

Honors and Awards

2020	UC Irvine President's Dissertation Year Fellowship, Honorable Mention
2018	National Science Foundation (NSF) Graduate Research Fellowship Program, Honorable Mention
2018	UC Irvine Faculty Mentor Program Fellowship, Honorable Mention
2016	Society for Research on Adolescence (SRA), Undergraduate Scholars Program Recipient
2015	23rd UC Berkeley McNair Symposium Plenary Speaker, UC Berkeley

Professional Development

2019	Activate to Captivate Public Speaking course, UC Irvine
2019	Mentoring Excellence Program certificate, UC Irvine
2018	UC Adolescent Consortium Summer Institute, UCLA
2018	Society for Research on Child Development (SRCD) TriCaucus Preconference, 2018 Biennial Society for Research on Adolescence Meeting, Minneapolis, Minnesota.
2017	UC Adolescent Consortium Summer Institute, UCLA

Professional Affiliations

Society for Research on Adolescence (SRA)
Society for Research on Child Development (SRCD)
American Educational Research Association (AERA)

Certifications and Skills

Collaborative Institutional Training Initiative (CITI Program)
Qualitative Methodology (interviews, observations, ethnography, thematic analysis, video analysis) – Dedoose, Microsoft Office
Quantitative Methodology: descriptives and inferential statistics (t-tests, chi-squares, ANOVA, regressions) –STATA, Mplus, SPSS

Languages

- English
- Spanish

ABSTRACT OF THE DISSERTATION

Examining Program Quality in an University-Community Math Afterschool Activity: Perspectives from Latinx Adolescents and Mentors

by

Stephanie Soto-Lara

Doctor of Philosophy in Education

University of California, Irvine, 2022

Professor Sandra D. Simpkins, Chair

Latinx adolescents face inequities in their math education that place them at a disadvantage for future STEM pursuits, where only 6% of math-related bachelor's degrees are earned by Latinx individuals. However, organized afterschool activities have the potential to serve as institutional supports to provide Latinx adolescents with high-quality science, technology, engineering, and mathematics (STEM) enrichment learning opportunities. Despite research suggesting that afterschool activities are linked with positive outcomes, meta-analyses have shown that not all afterschool programs are effective, especially for under-represented adolescents. In fact, only high-quality STEM afterschool programs are associated with positive outcomes for under-represented adolescents. Scholars argue that the two key indicators for program quality are youth-staff relationships and program activities. This three paper dissertation focuses on a high-quality math afterschool activity, Math CEO, as an exemplar to learn more about these two key aspects of high-quality programs and best practices utilized by frontline staff. Using quantitative data, Study 1 examined changes in Latinx adolescents' math motivational beliefs and the extent to which adolescents' motivational beliefs were associated

with their perceptions of culturally responsive practices. Results from multilevel models indicated that adolescents' math ability self-concept increased over the course of one year and their math interest and importance remained stable. Moreover, adolescents' perceptions of culturally responsive practices predicted their math ability self-concept and importance at the end of the school year, but did not predict changes over the course of a year. In Study 2, the aim was to qualitatively explore a wide range of adolescent outcomes and how specific aspects of program quality promoted these outcomes. Through Latinx adolescent interviews, findings revealed that adolescents perceived changes in their math-specific outcomes, future STEM pathways, and social-emotional skills. Findings also revealed that youth-staff relationships and program activities are important elements in supporting those changes, such that, incorporating advanced math concepts, engaging in collaborative learning, engaging in campus tours, having informal conversations, and using culturally responsive practices promoted specific adolescent outcomes. For Study 3, the aim was to better understand how to support high-quality frontline staff practices by describing their experiences, particularly the challenges they experienced and how they responded to those challenges. Interview findings from college student mentors, serving as frontline staff, suggested that mentors experienced specific challenges, such as difficulty with teaching math content, promoting motivation, navigating group instruction, developing connections with adolescents from diverse sociocultural backgrounds, and establishing authority and gaining respect. In response to the challenges, findings revealed that mentors leveraged support from other experienced mentors, attended weekly trainings, engaged in collaborative learning, utilized real-world examples in their teaching, provided non-math activities, engaged in informal and structured conversations, and leveraged adolescents' sociocultural assets. Given that frontline staff are the key to improving program quality, it is

important to consider their perspectives and strengthen the quality of programs by designing staff trainings that will better support frontline staff and all that they do. In order to support afterschool programs' efforts to serve under-represented adolescents, it is important to consider both adolescents' and frontline staff's perspectives. Together, this three paper dissertation provides evidence-based recommendations for how afterschool advocates, practitioners, and researchers can continue to design, implement, and improve afterschool program quality by understanding the key program elements and best practices that promote positive adolescent experiences and outcomes, specifically among under-represented adolescents.

Keywords. Latinx, adolescents, frontline staff, STEM, afterschool programs, outcomes

CHAPTER 1

Introduction to the Dissertation

Math education and motivation during adolescence serve as a gateway into all science, technology, engineering, and mathematics (STEM) domains (Miller & Kimmel, 2012; Trusty, 2002; Tyson et al., 2007; Morgan et al., 2013; Shernoff & Hoogstra, 2001; Watt et al., 2017). However, Latinx adolescents face numerous inequitable practices that place them at a disadvantage in math, such as academic tracking and attending under-resourced schools that do not meet the needs of underrepresented adolescents (Conchas, 2006; Flores, 2007; Gandara, 2006; Oakes, 1990; 2005; Valenzuela, 1999). These systemic inequities partly explain why underrepresented students including Latinx students have lower scores on math in middle school than their White counterparts (Granovskiy, 2018) and why Latinx individuals earn just 6% of math-related bachelor's degrees (National Science Foundation, 2019). One way to support Latinx adolescents' math education is through organized afterschool activities. Organized afterschool activities have the potential to provide adolescents with high-quality STEM enrichment learning activities and may serve as institutional supports against systemic inequities that exist in Latinx adolescents' STEM education (e.g., Calabrese Barton & Tan, 2010; Krishnamurthi et al., 2014; Lyon et al., 2012; Vandell et al., 2015).

However, meta-analyses have shown that not all afterschool programs are equally effective (Durlak & Weissberg, 2007; Durlak et al., 2010b). In fact, only high-quality STEM afterschool programs are associated with positive outcomes (Allen et al., 2019; Vandell et al., 2015b). Scholars suggest that two key indicators of program quality are youth-staff relationships and program activities (e.g., youth-centered, inquiry-based, collaborative learning) (Akiva & Horner, 2016; Deutsch & Jones, 2008; Hirsch et al., 2011; Hirsch, 2005; Jones & Deutsch, 2011;

Kataoka & Vandell, 2013; Pierce et al., 2010; Rhodes, 2004; Rhodes et al., 2000; Vandell & Lao, 2016; Vandell et al., 2012, 2014, 2015b). A study found that under-represented youth indicated program activities and staff as reasons for initial and continued interest in participating in the afterschool program (Akiva & Horner, 2016). First, when youth were asked to rate what was most important for why they participated in a program, they indicated program activities. However, when youth were asked to choose one reason over the other, they always chose staff over program activities and other reasons. The scholars also found a large correlation between program activities and staff, suggesting that both of these are key for why students participate in afterschool programs (Akiva & Horner, 2016). Therefore, this dissertation specifically focuses on youth-staff relationships and program activities as indicators of program quality.

Recent research also suggests that high-quality programs may not be as effective for Latinx adolescents if they are not sensitive and responsive to their sociocultural backgrounds (Eccles & Gootman, 2002; Simpkins et al., 2017). Some Latinx adolescents have reported experiencing discrimination and microaggressions in afterschool activities (e.g., Ettekal et al., 2015; Gutierrez et al., 2017; Lin et al., 2015; Simpkins et al., 2012). Therefore, central to high-quality programs is incorporating culturally responsive practices that focus on better supporting Latinx students by leveraging their sociocultural assets (e.g., Simpkins et al., 2017). Through a culturally responsive framework, where culture is defined as dynamic and not as a distal factor, culture is theorized to be embedded within every aspect of program quality, including youth-staff relationships and program activities.

The overall goal of this current dissertation is to examine two aspects of program quality, specifically youth-staff relationships and program activities, and to further explore how culture is embedded within these two aspects. Given the important trends and issues affecting afterschool

activities, the studies in this dissertation focus on a high-quality math afterschool activity, Math CEO, serving predominantly Latinx middle school students. Math CEO is an exemplar to learn more about aspects of high-quality programs and best practices that can help to better improve and design afterschool settings. The goals of the three studies are to (1) examine the extent to which program quality, measured as Latinx adolescents' perceptions of culturally responsive practices, is associated to changes in Latinx adolescents' math motivational beliefs, (2) document how youth-staff relationships and program activities promote math-specific outcomes, future STEM pathways, and social-emotional skills, and (3) understand the challenges frontline staff encounter when building relationships with adolescents and teaching program activities and the strategies they leverage to respond to the challenges, which will provide insights to better support frontline staff.

Overview of Organized Afterschool Activities

Organized afterschool activities[2] is a term used to define a wide range of out-of-school settings that include afterschool programs, extracurricular activities, summer camps, and programs offered by museums and libraries, but does not include tutoring and individual lessons (Mahoney et al., 2009a, 2009b; Vandell et al., 2015a). Organized afterschool activities are adult-supervised, structured, meet on a regular basis during non-school hours (e.g., after school, before school, weekends), and focus on group collaboration and skill-building (Gardner et al., 2009; Mahoney et al., 2005; Mahoney et al., 2009a, 2009b; Vandell et al., 2015a).

Historically, there have been different political and social changes that have shaped the focus of afterschool programming. The section below provides more insights on how such changes have impacted afterschool setting and the populations they serve. Additionally, it will

[2] Organized afterschool activities, afterschool activities, and afterschool programs are used interchangeably.

make clear why it is important to study the quality of adolescent experiences, specifically focusing on STEM afterschool activities and Latinx adolescents, who are under-represented in STEM domains. For this dissertation, my review drew on the literatures focused on afterschool programs and extracurricular activities.

The historical context of organized afterschool activities. The political, historical and social changes of the 1900s essentially triggered and were the driving force for the establishment of organized afterschool activities that focused on providing children with supervision and a safe place (Halpern, 2002; Durlak et al., 2010a). Afterschool activities first emerged in the 1900s as labor laws began to regulate child labor and educational laws began to place an emphasis on primary education (Halpern, 2002). With a decline in child labor, the amount of leisure time children had after school increased. Social changes during the years of World War II that increased employment rates among mothers, called for the need of child-care and afterschool activities (Mahoney et al., 2009a). Child-care and afterschool activities began to attract children by offering working parents a safe place for their children and offering children a place for "structured play activities" (Halpern, 2009; Mahoney et al., 2009a). Additionally, the expansion of urban areas in the 1960s brought much attention to concerns about child safety. For example, reports in the late 1900s suggested that the living and neighborhood conditions for some children in urban areas (e.g., sharing spaces, overcrowded apartments, street violence) were factors for why juvenile crimes peaked, especially during after school hours (Apsler, 2009; Halpern, 2002). Due to the increased unsupervised time and the idea that neighborhoods were unsafe for children, organized afterschool activities emerged to offer children a safe, supervised place during the afterschool hours (Apsler, 2009; Durlak et al., 2010a; Halpern, 2002).

Historical, social, and political changes after the 1990's led to a shift in the perceived role of afterschool activities to one that focused supporting low-income families and on academic achievement rather than on supervision (Halpern, 2009; Mahoney et al., 2005; Mahoney et al., 2009a; Vandell et al., 2015a). The first political event that brought much attention to afterschool activities focusing on low-income families was the 1990 Child Care Development and Block Grant. The block grant provided low-income families assistance with subsidized child-care services for school-aged children (Halpern, 2002; Mahoney et al., 2009a). Federal initiatives and funding for childcare sparked interest in providing funds for afterschool activities. As a result, more programs such as the Boys and Girls Club began to emerge in low-income communities (Halpern, 2002). The second event that shifted the attention to afterschool activities and the "achievement gap" was the release of the 1991 National Before and After School Study (Mahoney et al., 2009a; Vandell & Shumow, 1999). Findings from this study shed insight on the importance of participation in afterschool activities on children's academic, social, and health outcomes (Posner & Vandell, 1994; Mahoney et al., 2009a; Vandell & Shumow, 1999). Lastly, President Clinton's efforts to support child-care and afterschool programming led to the enactment of the 21st Century Community Learning Center's legislation that secured Federal funding for afterschool programs (Mahoney et al., 2009a). These changes lead to increased participation in afterschool activities and the need to document the positive outcomes related to participation for low-income children.

Currently, afterschool activities have broadened their focus from supporting low-income students to include serving underrepresented racial and ethnic minority (URM) students (e.g., Fredricks & Simpkins, 2012; Mahoney et al., 2009a; Strobel et al., 2006; Strobel et al., 2008; Williams & Deutsch, 2016). First, demographic shifts with the increase of URM students in the

U.S. population and schools have brought much attention to focusing on their academic trajectories (Fry & Lopez, 2012; Gandara & Mordechay, 2017). Afterschool activities are seen as contexts for promoting academic and socioemotional development for URM students (Fredricks & Simpkins, 2012; Peguero, 2010; Perkins et al., 2007; Riggs et al., 2010; Simpkins et al., 2012; Williams & Deutsch, 2016). This has led to an increased concern of high-quality and effective programs serving URM students (Apsler, 2009; Gast et al., 2017; Durlak & Weissberg, 2007; Fredricks & Simpkins, 2012; Lee et al., 2009; Vandell et al., 2014).

Even though one of the main foci of afterschool activities is on serving low-income, URM students, STEM learning in afterschool activities has continued to attract attention among afterschool advocates and policymakers (Afterschool Alliance, 2014, 2015; Krishnamurthi et al., 2014; Krishnamurthi et al., 2013; Lyon et al., 2012). Attention on offering enriching STEM activities in afterschool activities has gained momentum with the national interest in strengthening the STEM pipeline and closing the "achievement gap" for URM student populations (Afterschool Alliance, 2014, 2015; Krishnamurthi et al., 2014; Krishnamurthi et al., 2013; Lyon et al., 2012). Since the early 2000's, youth programs like 4-H and YMCA have made commitments to offering STEM enrichment afterschool activities, and many of these programs have targeted students from underrepresented populations in STEM (Krishnamurthi, 2017). In 2015, the Afterschool Alliance created the STEM Hub initiative that placed afterschool programs in partnership with STEM funding sources as well as in the conversations around equitable STEM education (Krishnamurthi, 2017). Given these and other initiatives, afterschool activities can provide hands-on, inquiry-based learning, and real-world applications to learning STEM that spark adolescents' interest and engagement in STEM that could supplement the STEM learning occurring in public schools (Krishnamurthi, 2017; Peppler & Glosson, 2013; Sahin et al., 2014).

Even though there is much support for STEM learning in afterschool activities, there has been efforts to eliminate funding initiatives for afterschool activities under various president administrations on the premise that they do not have positive effects on students' educational outcomes (Vandell, 2018). However, meta-analyses and other research findings have found that high-quality STEM afterschool activities are indeed successful in promoting positive educational outcomes among youth (Allen et al., 2019; Vandell et al., 2012, 2014, 2015b). Therefore, there is a push among scholars and policymakers to improve the quality of afterschool activities given their significant effects on students' development and achievement (e.g., Allen et al., 2019; Durlak, Weissberg, 2007; Durlak et al., 2010b).

Afterschool Activities through University-Community Partnerships

University-community partnerships provide community and university members a platform to co-collaborate in designing, planning, and implementing best practices in afterschool activities focused on offering additional support and resources to underrepresented populations (Mahoney et al., 2010; Underwood & Mahmood, 2021; Yu et al., 2020, 2021). The goal of university-community partnerships is to provide under-represented and low-income adolescents from under-resourced schools with enrichment activities that promote positive outcomes by leveraging university resources. Another component of university-community partnerships is to provide evidence-based, high-quality practices that have the potential to make direct impacts on the community while allowing the voices and perspectives of the community members to be heard (Cole & & Distributive Literacy Consortium, 2006; Underwood & Mahmood, 2021; Yu et al., 2020, 2021). Therefore, this dissertation focuses on a math afterschool activity that was created through a university-community partnership to use as an exemplar in understanding high-

quality programs and best practices based on Latinx adolescents' and frontline staff's perspectives.

University-community partnerships allow researchers and educators to design and implement practices that are youth-centered (Cole & Distributive Literacy Consortium, 2006; Sandy & Holland, 2006; Underwood & Mahmood, 2021). Through this approach, university-community partnerships have the potential to design and evaluate high-quality programs that address the needs of the students they serve (Cole & Distributive Literacy Consortium, 2006). At Math CEO, a group of experienced researchers who have years of professional experience in teaching, directing afterschool programs, and working with adolescents co-collaborate to design and improve the quality of the afterschool activity by documenting the experiences of Latinx adolescents, frontline staff (referred to college mentors), and session leaders (who have previously worked as frontline staff). By understanding the needs of under-privileged and low-income adolescents served in the afterschool activity and the college mentors that work with the adolescents, the main goal of Math CEO is to support under-represented student populations.

University-community partnerships serve as an avenue for training afterschool educators and promoting staff development (Celio et al., 2011; Mahoney et al., 2010; Vandell & Lao, 2016). In efforts to design high-quality afterschool programs, much attention has been placed on staff training and development (Hirsch et al., 2011; Pierce et al., 2010; Sheldon et al., 2010). Studies have found that staff education and training are essential aspects of program quality (Vandell & Pierce, 2001; Vandell et al., 2004; Yohalem & Wilson-Ahlstrom, 2010). At Math CEO, college mentors attend weekly trainings where they receive information on the math activities and can be helped by other staff on ways to teach adolescents the math concepts. While the trainings provide college mentors with helpful resources to teach and work with adolescents,

it is important to continue to improve training for mentors and understand how to better support them. In order to strengthen program quality, it is important to provide resources, training, and professional development to future afterschool educators who are crucial in promoting positive youth experiences in afterschool settings.

Theoretical Frameworks

This dissertation was guided by a set of theoretical frameworks that, when combined, allowed me to focus on highlighting the benefits of adolescent participation in afterschool activities while also taking into account adolescents' sociocultural backgrounds. First, I briefly introduce the bioecological model (Bronfenbrenner & Morris, 1998) to discuss the importance of afterschool contexts on youth development. Because this model is very broad and does not provide much detail on the processes within afterschool programs that influence youth development, I drew on frameworks that describe what aspects of program quality matter for adolescent development. These frameworks include the National Research Council's Committee's (NRCC) indicators of high-quality activities (Eccles & Gootman, 2002) and the Program-Activities-Relationships-Culture model (PARC) (Hirsch et al., 2011). Finally, given my focus on Latinx adolescents, I drew on other models to highlight the importance of considering adolescents' sociocultural backgrounds. Using sociocultural perspectives, I drew on culturally responsive frameworks (Simpkins et al., 2017; Williams & Deutsch, 2016) to define culture and discuss how culture is embedded in aspects of program quality that promote adolescent outcomes.

Bioecological Model

According to the bioecological theory (Bronfenbrenner & Morris, 1998), a developing individual is embedded within a developmental niche where s/he interacts with various social

settings and people (Super & Harkness, 1986). This theory delineates five distinct environmental contexts that influence the development of an individual: microsystem, mesosystem, exosystem, macrosystem, and chronosystem. Of these five main systems, the microsystem is described as the contexts that an individual directly interacts with and includes both physical settings and people, such as the afterschool program itself and the program staff (Bronfenbrenner & Morris, 1998). This theory can also be used to examine the proximal processes between afterschool staff and youth relationships as one of the mechanisms producing adolescent outcomes (Bronfenbrenner & Morris, 1998). Though bioecological theory (Bronfenbrenner & Morris, 1998) focuses on proximal processes, such as youth-staff relationships, that shape an individual's development, it does not provide a clear framework for *why* afterschool activities matter and *what* aspects of afterschool activities are linked with adolescents' experiences.

Frameworks on Quality of Afterschool Activities

In order describe what aspects of quality in afterschool activities matter, the National Research Council's Committee (NRC) on Community-Level Programs for Youth outlined eight indicators of high-quality activities (Eccles & Gootman, 2002). This research has provided scholars with a framework to establish and identify high-quality programs based on various characteristics: 1) physical and psychological safety, 2) appropriate structure, 3) supportive relationships, 4) opportunities to belong, 5) positive social norms, 6) support for efficacy and mattering, 7) opportunities for skill building, and 8) integration of family, school, and community efforts. Even though all of the eight indicators are important to consider, scholars have argued that staff play a pivotal role in youth's experiences at activities (Akiva & Horner, 2016; Borden et al., 2006; Halpern et al., 2000). Therefore, it is theorized that what staff do is important for all aspects of program quality highlighted by the NRC. While much of the

literature focuses specifically on how staff build supportive relationships with youth, it is also important to consider how staff provide program activities, which studies have shown to also shape youth's experiences (Akiva & Horner, 2016; Borden et al., 2005; Deutsch & Jones, 2008; DuBois et al., 2002; DuBois & Silverthorn, 2005; Kataoka & Vandell, 2013).

Hirsch and colleagues (2011) developed a framework named the Program-Activities-Relationships-Culture model (PARC) to help describe what aspects of activity contexts matter for you development. According to the PARC model, there are three main components: adolescents have opportunities to (a) form relationships with staff, (b) engage in various program activities, and (c) interact with the center's culture that promote a range of positive youth outcomes. These three components interrelate with each other, suggesting that it is crucial to examine how all three influence youth's experiences and outcomes. This model suggests that in order for youth to benefit from the afterschool activity, the quality of the youth-staff relationship matters. The quality of a program is also shaped by the types of programs and activities that are offered. In the literature, studies suggest that program activities promote adolescent outcomes, but less is clear about what aspects of program activities are related to these outcomes (Kataoka & Vandell, 2013; Vandell et al., 2012, 2014, 2015b). Lastly, the model suggests that the center culture is important in all aspects of quality and shapes how youth perceive and experience their environment (Hirsch et al., 2011).

Culturally Responsive Frameworks

The NRC suggest that "any [afterschool] program that is not sensitive to participants' culture is not likely to succeed" (Eccles & Gottman, 2002, p. 114). Although the bioecological model (Bronfenbrenner & Morris, 1998), the NRC framework (Eccles & Gootman, 2002) and the PARC model (Hirsch et al., 2011) suggest culture matters, they describe culture or the role it

plays in program quality in different ways (Hirsch et al., 2011; Williams & Deutsch, 2016). The bioecological model (Bronfenbrenner & Morris, 1998) and the NRC (Eccles & Gootman, 2002) both suggest that culture is a distal factor that may influence youth's experiences and outcomes. The PARC model (Hirsch et al., 2011) suggests that culture plays a role at the program level, but does not consider how culture is embedded in other aspects of program quality. To better understand how culture matters in all aspects of program quality, this dissertation uses a sociocultural lens to define culture as dynamic and embedded within everyday experiences, which challenge narrow and static views of culture (Gutierrez & Rogoff, 2003; Nasir & Hands, 2006; Velez-Agosto, et al., 2017; Vygotsky, 1978). Additionally, race, ethnicity, and culture are seen as separate constructs where race and ethnicity are socially constructed and culture is produced by people's interactions in cultural contexts (Nasir & Hands, 2006; Williams & Deutsch, 2016). As a result, culture and race/ethnicity are distinct, but race/ethnicity can inform culture and can be seen as a cultural context itself (Nasir & Hands, 2006; Williams & Deutsch, 2016). While research has generally focused on racial/ethnic culture in implementing culturally responsive practices, sociocultural perspectives expand this limited view to include other forms of culture that focus on cultural tools that individuals carry, such as language or ways of thinking (Cole & Wertsch, 1996; Gutierrez, 2002; Gutierrez & Rogoff, 2003; Vygotsky, 1978). Some scholars have defined this under the umbrella term vernacular culture, defined as the culture produced in specific settings and social networks, such as youth culture, identity, hip-hop, fashion, and video games (Eglash et al., 2013; Herrera, 2016; Scott et al., 2015). Extending culturally responsive frameworks to include sociocultural perspectives provides a more dynamic view of culture to examine the role it plays in all aspects of program quality.

To further understand the importance of culture and how it is embedded the indicators of program quality, Simpkins and colleagues (2017) developed a culturally responsive framework for organized afterschool activities that addresses various ways in which high-quality programming can benefit all students by being reflective of students' cultural experiences and backgrounds. This framework describes ways in which staff can engage in culturally responsive practices that align with the NRC's eight indictors of high-quality programs. This theory along with understanding culture through a sociocultural lens, suggests that culture is inseparable from the indicators of program quality. Therefore, it is important to understand how culturally responsive practices in afterschool settings are integral for improving and strengthening the quality of experiences in an afterschool activity.

First, culturally responsive frameworks offer insights into how staff can engage in culturally responsive practices that will motivate adolescents to learn a new content in afterschool activities or engage with the programs and activities offered (Ashcraft et al., 2017; Eglash et al., 2013; Lee et al., 2015; Scott & Garcia, 2016; Scott et al., 2015; Scott & White, 2013). A computer-technology based afterschool activity designed curriculum based on students' assets by including activities where they created virtual worlds to challenge classed, raced, and gendered representations of girls of color in technology (Lee et al., 2015; Scott & Garcia, 2016; Scott & White, 2013). The students who participated in this afterschool activity reported higher self-regulation, sense of empowerment, and sense of commitment to their communities (Lee et al., 2015; Scott & White, 2013). Another computing afterschool activity designed culturally responsive math curriculum where students had the opportunity to implement their vernacular culture into designing such that some students created designs inspired by cornrow hairstyles or graffiti (Eglash et al., 2013).

However, it is important to note that controversies exist when using culturally relevant curriculum that does not build on students' assets (Ettekal & Simpkins, 2019; Ettekal et al., 2020; Herrera, 2016; Lin et al., 2015). For example, learning enrichment activities based on staff's bleak or superficial definitions of culture, such as celebrating Cinco de Mayo, having multicultural day, positing "cultural" images, may be inaccurate representation of students' racial/ethnic culture who participate in the afterschool activity (e.g., Ettekal & Simpkins, 2019; Herrera, 2016). Latinx students who participated in afterschool activities where staff adhered to these inaccurate and stereotypical cultural representations experienced more negative feelings rather than becoming motivated or engaged in the activities (Ettekal & Simpkins, 2019; Ettekal et al., 2020; Lin et al., 2015). Therefore, culturally relevant content by definition is responsive to and builds on adolescents' cultural assets and allowing students to explore their own cultural identities rather than from staff's perspectives.

Secondly, culturally responsive frameworks offer ways in which staff can support and connect with adolescents by validating their experiences and considering their sociocultural backgrounds (Gutierrez et al., 2017; Lee & Hawkins, 2008; Lin et al., 2015; Ngo, 2017; Scott & Garcia, 2016; Scott et al., 2015; Simpkins et al., 2017; Ettekal et al., 2015). The ways in which staff play a central role in adolescents' program experience are by empowering youth from various sociocultural backgrounds, strengthening their ethnic identities, and helping them navigate situations that may marginalize youth (Gast et al., 2017; Gutierrez et al., 2017; McGovern et al., 2019). For example, staff serving predominantly Latinx students in an afterschool program created a safe place for adolescents to share their experiences of discrimination by sharing their own experiences to create trust. During these discussions, staff empowered youth by allowing them to exercise their agency as they found ways to approach

various situations and provided them with opportunities to strengthen their navigational skills (McGovern et al., 2019). Other ways in which afterschool activity staff connect with and empower youth, is by asking students to express themselves and share their experiences through the activities, such as acting, creative writing, and designing (Gast et al., 2017; Gutierrez et al., 2017; Ngo, 2017; Scott & Garcia, 2016). In some respects, strengthening youth's sociocultural identities serves as a protective factor for experiences that marginalize adolescents (e.g., Nesblett et al., 2012; Steele et al., 2002; Umana-Taylor, 2011).

Overview of the Three Dissertation Studies

This dissertation is composed of three studies that focus on program quality by examining the role of mentors in engaging in culturally responsive practices, facilitating programs and activities, and connecting with adolescents in a math afterschool activity using Latinx adolescent and mentor perspectives. Guiding my studies are the bioecological model (Bronfenbrenner & Morris, 1998), frameworks on quality of afterschool settings (Eccles & Gootman, 2002; Hirsch et al., 2011), and culturally responsive practices (Simpkins et al., 2017; Williams & Deutsch, 2016). Each study focuses on different aspects of program quality centered on what mentors do. These studies also focus on adolescent and mentors perspectives and much attention was placed on examining Latinx middle school students' and mentors' sociocultural backgrounds.

Study 1, which is under review at a journal, quantitatively examines changes in Latinx middle schoolers' math motivational beliefs and the associations between program quality and adolescents' math motivational beliefs. In this study, program quality was measure by focusing on adolescents' perspectives on culturally responsive practices. To our knowledge, this was one of the few existing studies that quantitatively examines culturally responsive practices. We found

evidence suggesting that examining the quality of adolescent experiences matters. However, with a quantitative study it is not clear *what* these practices look like, *why* they are important, and *how* they shape adolescents' outcomes. Therefore, Study 2 focused on addressing these questions.

Guided by the PARC model, Study 2, which is published in *Applied Developmental Science*, qualitatively focused on program activities, youth-staff relationships, and culture as important elements in high-quality afterschool activities that promoted math-specific outcomes, STEM pathways, and social-emotional skills among Latinx adolescents. Based on adolescent perspectives, this study provides insights into how specific high-quality program elements (i.e., program activities, youth-staff relationships, and culture) are related to specific outcomes. More importantly, it contributed to our understanding of what mentors' best practices look like and how mentors play a crucial role in promoting adolescent outcomes. This study provides applied implications for afterschool frontline staff who may work with students from diverse sociocultural backgrounds and would benefit from understanding specific culturally responsive practices and how they shape adolescents' outcomes. While the aim of Study 2 was to focus on best staff practices and how they relate to adolescent outcomes, it is also important to note that it is not always easy for frontline staff to implement or engage in these best practices. Therefore, it is important to understand their challenges based on their perspectives, which is the focus of Study 3.

Study 3, which is currently under review at a journal, explored the challenges that mentors encountered when teaching and forming relationships with Latinx adolescents and the strategies they used to respond to these challenges. Based on mentors' perspectives, the aim of this study was to contribute to the literature on staff education and training. Because staff play a crucial role in all aspects of program quality, it is important to understand how to better support

and prepare staff by documenting the challenges they encounter and the resources that helped them successfully address these challenges. The study not only highlights the importance of staff training, but it also provides insights on how certain challenges can be addressed and what trainings could potentially focus on to provide staff with more support. Overall, these three studies have implications for key stakeholders who are committed in supporting Latinx adolescents' math learning and the staff who work with adolescents in afterschool activities.

Research Setting: Math CEO

The Math Community Educational Outreach program (Math CEO) was created by Mathematics faculty at a Hispanic-serving institution through a university-community partnership with the mission to provide Latinx adolescents with math enrichment opportunities and to support undergraduate students' STEM pursuits. Math CEO started in 2014 serving low-income and under-represented Latinx adolescents from under-resourced middle schools in southern California. The math afterschool activity focuses on STEM enrichment activities and developing proficiency and dispositions in math. Students who participated in Math CEO were selected through an application process. Math middle school teachers played an important role in recruitment efforts by referring students who they believed would benefit from the program. Therefore, the program served a large proportion of students who would benefit from additional math support.

During the 2018-2019 school year, Math CEO served approximately 170 students from three low-performing middle schools. In School A[3], 99% identified as Latinx, 11% of Latinx students met or exceeded state standards for math, and 92% of all students received free or reduced lunch. In School B, 98% identified as Latinx, 15% of Latinx students met or exceeded

[3] Names of schools were not identified to ensure confidentiality under IRB guidelines.

state standards for math, and 89% of all students received free or reduced lunch. In School C, 64% identified as Latinx, 42% of all students met or exceeded state standards for math and among Latinx students 30% met or exceeded state standards for math, and 64% of all students received free or reduced lunch. In this dissertation, all the papers focused on Schools A and B and only Study 1 focused on School C.

Moreover, during the 2018-2019 academic year approximately 96 undergraduate college students (69% female) served as frontline staff and were referred to as mentors. Mentors participated in the afterschool activity either as volunteers or for course credit. Some mentors stayed in the program for as little as one academic term (approximately 8 weeks) and others stayed for more than one academic term (e.g., Fall, Winter, Spring). On average there were 20 mentors for each school for each academic term. Mentors came from various majors: math (40%), science (33%), education (30%), engineering (15%), and other (20%). Additionally, approximately 37% were first generation college students. Each quarter, mentors attended optional weekly training sessions that last approximately 60-90 minutes. In the training sessions, mentors received instruction on the math content materials that would be used during the afterschool sessions, learned about the math activities they would introduce to students, learned more about teaching skills, and received support on how to work with adolescents. Mentors also had the opportunity to collaborate with the leadership team on organizing STEM-focused fieldtrips and workshops for parents.

Middle school adolescents from Schools A and B took a school bus to the university campus immediately after school and adolescents from School C took a school bus to campus before school and attended 2-hour weekly math enrichment sessions each week. During the weekly sessions, 2-3 mentors worked collaboratively with 6-10 adolescents. In this dissertation, I

specifically selected Latinx adolescents and mentors who participated in the program for at least two academic terms, given that some mentors participated as little as a one academic term (e.g., 8 weeks). Furthermore, mentors who continued in the program for more than one academic term sometimes continued to work with the same adolescents. Mentors engaged in various hands-on math enrichment activities to introduce different math concepts (e.g., proportionality, geometry, and statistics).

The goal of Math CEO is to support and spark adolescents' math interests, to increase their math ability self-concept, to build their math skills, to strengthen adolescents' critical thinking skills, to bolster their familiarity with college environment, and to help them navigate college pathways. The curriculum developed for Math CEO is based on Common Core Mathematical Standards that challenge students to think about various mathematical approaches. Mathematical concepts that are introduced are numerical sense, fractions, ratios, proportionality, percentages, geometry, and statistics. These concepts were selected based the math standards for middle school and for their importance on learning more advanced topics in high school (e.g., algebra). To learn these concepts, the program activities designed involved scaffolding introductions to expose students to new concepts, guided problem solving based on abstract and real-life applications, and problem sets that encouraged students to gain mastery of a concept. In these activities, mentors used various teaching techniques that include manipulatives, visual aids, body movement, team discussions, abstract reasoning and inquiry, mental experiments, analogies, and real-world scenarios. Students and mentors were seated in small groups to allow for collaboration and discussions. Each activity session was designed to introduce adolescents to new mathematical learning skills, strengthen their critical thinking skills, and encourage

collaboration. Additionally, adolescents attended university campus field trips where they visit a lab or learn about exciting research in the field.

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CHAPTER 2

Changes in Adolescents' Motivational Beliefs: Culturally Responsive Practices in an Afterschool Activity

(Under review at *Journal of Youth Development)*

Abstract

Math motivational beliefs tend to decline during adolescence. However, participation in afterschool activities has the potential to support adolescents' math motivational beliefs. This study examined (a) the changes in Latinx middle-schoolers' math motivational beliefs over the course of one school year and (b) the associations between culturally responsive practices and adolescents' math motivational beliefs. Latinx adolescents (N = 146; grade levels: 6^{th} – 8^{th} grades; M_{age} = 11.8; girls = 55%) from three middle schools attending a math afterschool activity were recruited in the fall during the 2018-2019 academic year. Multilevel models were estimated using STATA to examine changes in their math motivational beliefs over time and their associations with culturally responsive practices. Adolescents' math ability self-concept increased from fall to spring, but their math interest and importance remained stable. Adolescents' perceptions of culturally responsive practices positively predicted their math ability self-concept and importance at the end of the school year, but did not predict changes in adolescents' motivational beliefs. Our findings suggest that adolescents' motivational beliefs remain stable or increase over time and culturally responsive practices predict their motivational beliefs at the end of the school year. This work helps build on our limited knowledge about culturally responsive practices in afterschool activities and suggests it is important for afterschool advocates and researchers to understand the potential that these practices have in shaping adolescent development.

Keywords

Afterschool activities, Latinx, development, motivational beliefs, culturally responsive, math

Changes in Adolescents' Motivational Beliefs: Culturally Responsive Practices in an Afterschool Activity

Adolescents' math motivational beliefs are a critical asset for their pursuit of science, technology, engineering, and mathematics (STEM) educational and career opportunities (Morgan et al., 2013; Shernoff & Hoogstra, 2001; Watt et al., 2017). However, Latinx adolescents experience systemic inequities and barriers, such as academic tracking, that decrease their motivational beliefs and hinder their access to high-quality STEM curriculum (Conchas, 2006; Gandara, 2006; Valenzuela, 1999). Though organized afterschool activities can serve as positive institutional supports that counter existing persistent systemic inequities, there is little evidence on how Latinx students' math motivational beliefs change over time while participating in an afterschool activity (Niehaus et al., 2012). Moreover, not all afterschool activities are equally effective; in fact, the quality of adolescents' experiences in afterschool activities matters greatly for their adjustment (Durlak & Weissberg, 2007; Durlak et al., 2010). One way to address the quality of adolescents' experiences is by focusing on culturally responsive practices that can foster positive experiences within an afterschool activity (e.g., Simpkins et al., 2017). Thus, the aim of this study is to examine (a) the changes in Latinx middle-schoolers' math motivational beliefs over the course of one school year and (b) the associations between culturally responsive practices and adolescents' math motivational beliefs.

Motivational Beliefs

According to the situated expectancy-value theory (Eccles & Wigfield, 2020), one of the strongest predictors of students' pursuit, persistence, and performance in STEM fields is their motivational beliefs. According to the theory, there are two broad types of motivational beliefs: expectancies and values. Expectancies are defined as beliefs about how individuals think they

will do on different tasks; expectancies about the future are largely determined by individuals' current ability self-concept, which is the dominant measure in the literature. Values focus on the extent to which individuals feel the task is interesting and important (Eccles & Wigfiled, 2002; 2020). Empirical evidence suggests that adolescents' math motivational beliefs predict STEM outcomes in high school and beyond including course selection, college plans, and career plans even after controlling for indicators of math achievement and performance (Jiang et al., 2020; Morgan et al., 2013; Shernoff & Hoogstra, 2001; Simpkins et al., 2006; Simpkins et al., 2015; Watt et al., 2017).

Adolescents' motivational beliefs change from kindergarten through high school (Fredricks & Eccles, 2002; Gottfried et al., 2001; Jacobs et al., 2002; Pintrich et al., 1994; Rosenzweig & Wigfield, 2016: Wang & Eccles, 2013; Wigfield & Eccles, 2002). During adolescence, youth's motivational beliefs in a variety of subjects including math typically decline (e.g., Gottfried et al., 2001; Lazarides et al., 2020; Pintrich et al., 1994; Rosenzweig & Wigfield, 2016). Even though scholars suggest that there may be sharper declines during high school (Fredricks & Eccles, 2002; Jacobs et al., 2002), Lazarides and colleagues (2020) found that low interest values in middle school predicted low motivational beliefs in high school, which underscores the importance of supporting students' motivational beliefs early on, particularly in middle school. Though contextual factors (e.g., teacher support) shape adolescents' motivational beliefs (Hsieh et la., 2019; Lazarides et al., 2020), there is less research on potential supports for Latinx adolescents. Given the literature largely focuses on barriers and challenges Latinx adolescents experience in school and in STEM (e.g., Gandara, 2006), more work is needed that documents the positive supports that help Latinx adolescents. Therefore, it is important to understand how Latinx adolescents' math motivational beliefs may be positively supported by

contextual factors, such as participation in organized afterschool activities (Wigfield & Eccles, 2002).

Organized Afterschool Activities

To fully understand students' math motivational beliefs, it is important to take an ecological approach in understanding how contextual factors and the settings in which adolescents are embedded shape their motivational beliefs. The situated expectancy-value theory suggests that contextual factors (e.g., families, classrooms, teachers) play a key role in adolescents' motivational beliefs, and that settings, like afterschool activities, can influence their motivational beliefs (Eccles, 1993; Wang, 2012). Afterschool activities provide hands-on, inquiry-based learning, and real-world applications to learning STEM, which may help spark adolescents' motivation to pursue STEM. In fact, studies have found that afterschool activities have the potential to increase youth's motivational beliefs in STEM (Allen et al., 2019; Chittum et al., 2017; Krishnamurthi et al., 2014). For example, participation in a science afterschool program for K-7 students was related to increases in science motivational beliefs compared with students who did not attend the science afterschool program (Chittum et al., 2017). Although afterschool activities can have a positive impact on adolescents' motivational beliefs, not all activities are equally effective and in fact quality of experiences in these contexts matters. Allen and colleagues (2019) found that Latinx students attending high-quality STEM programs reported more positive STEM outcomes compared with students in low-quality programs. Meta-analyses have also found that only children in high-quality afterschool activities demonstrate significant positive outcomes (Durlak & Weissberg, 2007; Durlak et al., 2010).

Scholars have identified various features of high-quality afterschool programs, highlighting the importance of centering students' voice, needs, and sociocultural backgrounds

(Eccles & Gootman, 2002; Simpkins et al., 2017; Yu et al., 2021). Scholars have argued that, in order for high-quality afterschool programs to be effective, they need to be responsive to adolescents' cultural backgrounds (Gutierrez et al., 2017; Simpkins et al., 2017; Williams & Deutsch, 2016; Yu et al., 2021). Simpkins and colleagues' (2017) culturally responsive framework for afterschool activities highlights various culturally responsive practices that integrate adolescents' culture, race, and ethnicity in every aspect of program quality. Researchers have conceptualized culturally responsive practices to include practices such as promoting an inclusive, safe, and respectful program climate, providing opportunities to learn about diverse cultures, using diverse teaching strategies to facilitate learning (e.g., collaborative learning), and using examples from students' cultural backgrounds and perspectives (Dickson et al., 2016; Ngo, 2017; Scott et al., 2015; Yu et al., 2020; 2021). Implementing culturally responsive practices that address students' sociocultural assets and needs may be especially important for Latinx adolescents as some have reported negative ethnically- and racially-based experiences in activities (e.g., discrimination and microaggressions) (e.g., Ettekal et al., 2015; Gutierrez et al., 2017; Lin et al., 2015; Simpkins et al., 2012). In order for adolescents to benefit from participating in afterschool activities, these settings must be supportive in culturally responsive ways (Ettekal et al., 2019; Gutierrez et al., 2017; Ngo, 2017; Simpkins et al., 2017). For example, Yu and colleagues (2021) found that when Latinx adolescents were qualitatively interviewed about their experiences in an afterschool program, they emphasized the importance of culturally responsive practices (e.g., creating an inclusive environment) in promoting engagement, facilitating learning, and fostering positive experiences within the afterschool program. Similarly, other studies have documented the importance of culturally responsive practices in promoting positive experiences in a broad array of non-STEM afterschool activities

among Latinx adolescents (Ettekal et al., 2015; Gutierrez et al., 2017; Lin et al., 2015; Ngo, 2017; Scott & Garcia, 2016; Scott et al., 2015; Simpkins et al., 2017; Yu et al., 2021).

Culturally responsive practices take into consideration adolescents' sociocultural assets; therefore, it is important to assess and measure these practices and consider adolescents' perspectives (Yu et al., 2021). Aligned with the situated expectancy-value theory, an individual's perception or interpretation of their experiences is essential in examining how settings influence their motivational beliefs (Eccles & Wigfield, 2020). Although there is little research on culturally responsive practices in afterschool settings, one study found that although staff had good intentions to incorporate "cultural activities," they often had superficial and inaccurate representations of students' racial/ethnic culture, such as celebrating Cinco de Mayo (Ettekal et al., 2019). Adolescents in the study felt disengaged and misunderstood by the "cultural activities" that were based on narrow and traditional notions of culture (Ettekal et al., 2019). This underscores why it is critical to measure adolescents' interpretations of culturally responsive practices, especially if settings are designed to meet the needs of the students they serve (Liu et al., 2018; Ngo, 2017; Yu et al., 2021). Given the limited research on culturally responsive practices in afterschool activities, more research is warranted to examine culturally responsive practices based on adolescents' perspectives.

Stemming from Gay's (2002) culturally responsive teaching pedagogy and Ladson-Billings' (2014) notion of culturally relevant pedagogy, scholars have examined and measured culturally responsiveness in the classroom setting focused on teaching and learning (Dickson et al., 2016; Siwatu, 2007, 2011). One study that measured culturally responsive teaching practices in a robotics afterschool program focused on teachers' perspectives and found gains over the course of three years (Leonard et al., 2018). Most studies often focus on teacher perspectives and

less on the student perspective in assessing culturally responsive practices (Leonard et al., 2018; Siwatu 2007, 2011). However, Dickson and colleagues (2016) developed a student measure of culturally responsive teaching (SMCRT) which considers students' cultural backgrounds and perspectives when assessing culturally responsive practices in an environment. This measure allows scholars to quantitatively explore how culturally responsive practices relate to student outcomes as well as finding ways to improve student experiences in a setting (Garcia & Chun, 2016). Specifically, SMCRT measures diverse teaching practices, cultural engagement, and diverse language affirmation which together are used to conceptualize culturally responsive practices (Dickson et al., 2016). In this study, we will specifically focus on perceived culturally responsive practices in order to best capture adolescents' quality of experiences in a math afterschool activity.

Current study

Drawing on the situated expectancy-value theory and culturally responsive activities (Eccles & Wigfield, 2020; Simpkins et al., 2017), this study examined changes in Latinx middle-schoolers' math motivational beliefs over the course of an academic year. Additionally, this study took into account contextual factors present in a math afterschool activity. First, we expected Latinx math motivational beliefs to be stable over time, given that there is literature suggesting that afterschool activities have the potential to influence students' motivational beliefs, buffering the declining tendency of motivational beliefs typical of the age group. We also expected our findings to align with previous studies suggesting that the quality of experiences in afterschool activities may lead to positive outcomes. Therefore, we expected that perceived culturally responsive practices would predict higher math motivational beliefs over time and that

culturally responsive practices would predict higher motivational levels at the end of the program.

Study Context

This study was executed within a math afterschool activity, which was created by mathematics faculty at a Hispanic-serving university institution through a University-Community partnership. The mission of the afterschool activity was to serve middle school students in nearby under-resourced schools in southern California. Students were recruited from the local middle schools and selected through an application process. Middle school math teachers played an important role in recruiting and selecting participants as they often referred students to the afterschool activity who they thought would benefit from participating in the afterschool activity because they either needed more math support or needed additional challenges to stimulate their math learning.

The data in this study were collected when the math afterschool activity served approximately 170 students from three low-performing schools. The percentage of students who met or exceeded state standards for math were 11% in School A[4], 15% in School B, and 42% in School C. Middle school adolescents from these three schools took a bus to the university campus and attended one 2-hour weekly math enrichment session each week. During the weekly sessions, 2-3 undergraduate mentors worked collaboratively with a group of 6-10 adolescents. Undergraduate mentors played an important role in shaping how the math activities were introduced to students; in particular, they were tasked with engaging students in collaborative learning and making the content relevant to them. They also attended 2-hour weekly training sessions, where they were trained on the math activities before they implemented them at the

[4] Names of schools were not identified to ensure confidentiality under IRB guidelines.

weekly math enrichment sessions. Undergraduate mentors were encouraged to form positive relationships with adolescents and to share their experiences as college students with their mentees.

The program curriculum included a wide range of real-world activities that were designed to promote collaborative work and introduced adolescents to different math concepts designed to strengthen their math skills. The math enrichment activities were designed to involve scaffolding to expose students to math concepts through abstract and real-world applications. For example, one activity focused on developing students' skills in using ratios, fractions, and percentages as they worked together to manage a hotel, where they had to calculate profit, sales, and expenses. Another activity used real-world applications of the stock market in an effort to help students develop their algebra skills. As part of the program, students participated in STEM-focused field trips where they visited science labs at the university campus and learned about different majors. The program also organized bilingual college workshops to provide families with information on STEM and college pathways. During these workshops, mentors spoke about their own experiences in attending college.

Method

Participants and Procedures

Middle school students (N = 146; grade levels: 6th – 8th grades; M_{age} = 11.8; girls = 55%) attending the math afterschool activity were recruited in the fall during the 2018-2019 academic year. Demographic data revealed that the majority of the 146 students self-identified as Latinx (91%) of which 95% self-identified of Mexican-descent followed by 3% who only self-identified as Latinx/Hispanic and 2% who self-identified as Central or South American (e.g., Guatemalan, Bolivian). Moreover, 96% of the students qualified for free or reduced lunch price, 79% lived in

a household with an income below $35,000, and 77% were potential future first-generation college students.

Following IRB protocols, middle school students were eligible to participate in the study if they assented and their parents consented. Throughout the academic year, students were surveyed four times: fall pre survey in October (Time 1), fall post survey in November (Time 2), winter post survey in March (Time 3), and spring post survey in May (Time 4). Surveys were administered by a research team of graduate and undergraduate students during the program. Though surveys were available in both English and Spanish, all participants completed the surveys in English. The surveys took approximately 15 to 20 minutes to complete. Students received a $5 honorarium for each survey that they completed.

Measures

Measures on math motivational beliefs are described first followed by our predictor variable and covariates. A list of all the items for each measure are reported in Appendix 2.1.

Math motivational beliefs. Based on the situated expectancy-value theory (Eccles & Wigfield, 2020), students' math ability self-concept, interest, and importance were measured throughout the academic year (all four time periods). These math scales have been used in several prior studies and have excellent validity and reliability (Jacobs et al., 2002; Simpkins et al., 2018; Simpkins et al., 2015). Math ability self-concept measures adolescents' perceptions of their competency compared to others. This measure includes four items, such as "How good at math are you?" on a 7-point Likert scale (1 = *Not at all good*, 7 = *Very good*) (α = .84 - .87). Math interest measures adolescents' perceptions on how enjoyable math is and includes two items: "I find doing math…" on a 7-point Likert scale (1 = *Very boring*, 7 = *Very interesting*) and "How much do you like math?" on a 7-point Likert scale (1 = *A little*, 7 = *A lot*) (α = .82 -

.87). Math importance measures adolescents' perceptions of how important math is to them. This subscale includes three items, such as "For me, being good in math is" on a 7-point Likert scale (1 = *Not at all important*, 7 = *Very important*) (α = .77 - .80).

Culturally responsive practices. Adolescent perceptions of culturally responsive practices were adapted from a version of the Student Measure of Culturally Responsive Teaching (SMCRT: Dickson et al., 2016) and included in the fall post survey. Given our research question, measuring culturally responsive practices in November (Time 2) was important because it was near the beginning, but gave adolescents enough time to get familiar with their mentors and the program. These scales have been tested across subgroups of gender, immigration status, and Latinx and non-Latinx middle schoolers and have shown strong measurement invariance and good validity (Dickson et al., 2016). The culturally responsive practices measure includes three topics: diverse teaching practices, cultural engagement, and language affirmation. Diverse teaching practices includes seven items, such as "Mentors and adults explain things in different ways to help me learn." Cultural engagement includes five items, such as "Mentors and adults are interested in my cultural traditions (like language and family traditions)." Language affirmation includes two items, such as "Mentors and adults allow students to speak a language other than English (for example Spanish)." These items are on a 5-point Likert scale (1 = *Never*, 5 = *Always*). A composite variable measuring student perceptions of culturally responsive practices in the fall was created using the 14 items across the three topics for culturally responsive practices (α = .85).

Covariates. In the analyses, parent education level, adolescent grade level, and school sites were used as controls. Grade level was used as a continuous variable, where 6th grade was coded as 0, 7th grade as 1, and 8th grade as 2. School site was coded with two dichotomous

codes with School C as the reference group. Parent education level was collected from parent phone interviews. Parents were asked "How many years of school did you complete?" and coded into 8 categories: Less than high school diploma, high school degree or equivalent, some college, Associate degree, Bachelor's degree, Master's degree, Professional degree, and Doctorate. Given that the majority of the parents (81%) reported high school as their highest educational degree, parent education was dichotomized (1 = *high school education*, 0 = *not a high school education*).

Analysis Plan

Multilevel models (MLM) were estimated using STATA to examine the two research questions. For research question 1, we examined changes in Latinx adolescent math motivational beliefs from fall to spring by estimating an unconditional MLM with time nested within person. Three separate models were estimated – one for each motivational belief: ability self-concept, interest, and importance. We set the intercept to be the spring time point (Time 4), which is the last time point, to focus on adolescents' motivational beliefs at the end of the academic year.

For research question 2, we examined whether perceived culturally responsive practices predicted changes in adolescents' math motivational beliefs from fall to spring and their motivational levels at the end of the program in the spring (Time 4). To address this, we estimated two models for each motivational belief. In the first model, we added the time-invariant predictor, perceived culturally responsive practices, that was assessed in the fall (Time 2). Measuring culturally responsive practices in the fall (Time 2) was an optimal time because it was close to the beginning of the program and students had time to learn more about the program and be familiar with their mentors. In the second model, we added covariates (i.e., grade level, school site, and parent education) to each model.

Of the 146 students that were recruited in the fall, 95 had missing data at two or less time points and 51 had missing data on across the four time points. We examined if students without complete data at two or less time points and without compete data across the four time points differed on parent education level, student grade level, school site, culturally responsive practices, and motivation beliefs across the four time points. Results indicated no significant differences between the two groups on parent education level ($X^2(1) = 1.25$, $p = 0.26$, Cramer's $V = 0.09$), student grade level ($X^2(2) = 3.00$, $p = 0.22$, Cramer's $V = 0.14$), culturally responsive practices ($t(110) = 0.78$, $p = 0.44$, Cohen's $d = 0.20$), and the three motivational beliefs across the four time points: Math ability self-concept ($t(108 - 128) = 0.13 - 0.72$, $p = 0.47 - 0.90$, Cohen's $d = 0.14$), math interest ($t(108 - 128) = 0.52 - 0.88$, $p = 0.39 - 0.60$, Cohen's $d = 0.17$), and math importance ($t(108 -128) = 0.40 - 1.23$, $p = 0.22 - 0.69$, Cohen's $d = 0.18$). There was a difference in school sites, where students with no data were more likely to be enrolled in Schools A or B ($X^2(2) = 8.64$, $p = 0.01$, Cramer's $V = 0.24$). Multiple imputation was used for students missing data at two or less time points for the math motivational beliefs ($n = 95$). Percent of missing data ranged from <1% to 2% and 50 datasets were imputed.

Results

Tables 2.1 and 2.2 show the descriptive statistics for and correlations among all the variables. Descriptive statistics show that the mean levels for ability self-concept, interest, and importance are above the mid-point on the 7-point Likert scale. The correlation table also shows that perceived culturally responsive practices were positively correlated with adolescents' math ability self-concept and interest.

For our first research question, we asked whether there were changes in Latinx math motivational beliefs from fall to spring. Results from the unconditional MLMs are presented in

Table 2.3. Results show that the mean of Latinx adolescents' math motivational beliefs at the last time point (which was set as the intercept) in spring were significant and fell between 5.12 and 5.98, which is above the mid-point on the 7-point Likert scale. However, the slope (rate of change over time) was only statistically significant for math ability self-concept. The slope was positive suggesting an increase at a rate of 0.06 points in math ability self-concept over time. Non-significant slope values for interest and importance suggest stability or no significant change over time. There were significant variances around the intercept of each of the three motivational beliefs, suggesting there were significant interindividual differences among Latinx adolescents in their math motivational beliefs (i.e., self-concept, interest, importance) in spring at the end of the program. Moreover, there were significant variances of the slopes for ability self-concept and importance, suggesting adolescents differed from each other in the rate of change, but not for interest. Although the means of the slope were not significant, which suggests adolescents' motivational beliefs did not significantly change on average, the variances suggest that there was variability around this average. Finally, there was a significant covariance between the slope and intercept for importance, but not for ability self-concept and interest. Given that the variances are significant in our model, we may explore the effects of a predictor, in our study we tested culturally responsive practices as our predictor to address our next research question.

For our second research question, we analyzed whether perceived culturally responsive practices predicted changes in Latinx adolescents' math motivational beliefs from fall to spring as well as their motivational beliefs in spring (Table 2.4). First, we found that culturally responsive practices did not predict changes in Latinx adolescents' math motivational beliefs from fall to spring. Second, we found marginally significance for culturally responsive practices positively predicting ability self-concept and importance in the spring, but not interest. These

relations held in our models when we added covariates. Specifically, culturally responsive practices positively predicted ability self-concept and importance in spring, but did not predict change over time for all motivational beliefs.

Discussion

Existing literature suggests that STEM afterschool programs have the potential to support adolescents' motivational beliefs (e.g., Chittum et al., 2017; Krishnamurthi et al., 2014; Niehaus et al., 2012). However, much of the literature focuses on science afterschool programs with little attention to math despite that math is a gateway to several STEM pursuits (Chittum et al., 2017; Watt et al., 2017). Additionally, not all afterschool activities are equally effective and few researchers have addressed how to make these programs more effective for underrepresented adolescents (Durlak & Weissberg, 2007; Durlak et al., 2010; Eccles & Gootman, 2002). To address these gaps, our goal was to examine the changes in Latinx adolescents' math motivational beliefs and the extent to which culturally responsive practices predicted those changes. We expected that Latinx math motivational beliefs would be stable over time and that culturally responsive practices would predict those changes.

The present study contributes to previous research on the changes in adolescents' math motivational beliefs. In contrast to the general declining trend found during adolescence (e.g., Fredricks & Eccles, 2002; Lazarides et al., 2020), we found that math ability self-concept increased during the year Latinx adolescents participated in a math enrichment afterschool activity. To our knowledge, such increases are not typical, but increases in Latinx students' ability self-concept for biology have been found as well as stability in students' math interest and importance for chemistry, physics, and biology have been found (Hsieh et al., 2019). Our study found that Latinx adolescents' math interest and math importance remained stable.

The findings also highlight the variability that exists among Latinx adolescents in terms of their motivational beliefs. We found that Latinx adolescents significantly varied in terms of how much their math motivational beliefs changed over time and the level of their beliefs at the end of the program in the spring. This variability is important to discuss because it suggests that variation exists among Latinx adolescents and among adolescents who attend the same program, meaning that not all students have the same levels of motivational beliefs. Hsieh and colleagues (2021) found that Latinx 9th graders had different patterns in their math and science motivational beliefs (i.e., overall low, not science maybe math, not who I am, overall high), providing additional evidence that Latinx adolescents are not homogenous and have unique patterns of motivational beliefs. Not only is it important to look at the variability that exists among Latinx adolescents in their motivational beliefs, it is also important to understand what influences Latinx adolescents' beliefs to increase, decline, or remain stable. Little research documents the importance of afterschool activities that might predict stability or positive changes in Latinx adolescents' motivational beliefs (Niehaus et al., 2012). Thus, this study focuses on an afterschool activity and culturally responsive practices that may serve as institutional supports.

The situated expectancy-value theory (Eccles and Wigfield, 2020), postulates that the settings in which adolescents are embedded influence their motivational beliefs. The prior literature demonstrates that high-quality programs have a stronger influence on youth than other programs (e.g., Allen et al., 2019; Durlak & Weissberg, 2007). More importantly, programs that take into account students' sociocultural assets by implementing culturally responsive practices have positive effects on adolescents (Liu et al., 2018; Ngo, 2017; Yu et al., 2021). Even though our study did not find perceived culturally responsive practices to predict changes in adolescents' motivational beliefs, we did find that culturally responsive practices positively predicted math

ability self-concept and math importance in the spring. This means that Latinx adolescents who perceived higher culturally responsive practices also reported higher levels of math ability self-concept and math importance six months later than Latinx adolescents in the same program who felt the program was less responsive. We also found variability in Latinx adolescents' perceptions of culturally responsive practices within the same program. Therefore, adolescents may experience the program differently, which underscores the importance of measuring adolescents' perceptions of culturally responsive practices. This has applied implications suggesting that youth perspectives are crucial in implementing and designing culturally responsive practices in afterschool activities and should be taken into consideration.

Limitations and Future Directions

Although this study contributes to our understanding of the changes in adolescents' math motivational beliefs among an underrepresented group of students during a crucial developmental period, limitations remain. Our study findings suggest adolescents experience stability or increases in their math motivational beliefs; however, it is unclear from the current findings if these changes describe these adolescents' trajectories over longer time periods or when they transition to high school. Another key future direction is to test how long these potential effects might last or if they fade out.

To quantitatively examine culturally responsive practices, we used the SMCRT measure that was originally developed to measure culturally responsive practices in the classroom setting. Even though afterschool and classroom settings share some commonalities, it is important to further understand how afterschool activities are unique contexts in which other important processes can be considered when examining culturally responsive practices. For example, scholars have examined how students are exposed to culturally responsive practices through

collaborative learning and sharing about one's cultural backgrounds can occur through personal conversations between adolescents and afterschool mentors (e.g., Soto-Lara et al., 2021; Yu et al., 2020; 2021). However, these processes are only beginning to be observed qualitatively and to our knowledge the only quantitative measure that exists to assess culturally responsive practices is the SMCRT measure (Dickson et al., 2016).

Though there was variability among adolescents in their perceptions of cultural responsiveness, there may have been a restricted range because we focused on a high-quality afterschool activity. Thus, our findings may underestimate the effects of culturally responsive practices. However, research is warranted to examine the effects of program quality in various afterschool settings. Though our study examined the extent to which culturally responsive practices were associated with adolescents' math motivational beliefs, it is also equally important to understand *what* these practices look like, *why* they are important, and *how* they influence adolescents. These qualitative questions in combination with the findings from this study can help better design afterschool activities that address the needs of adolescents who attend them. Therefore, our study highlights the importance of culturally responsive practices and afterschool activities in influencing adolescents' motivational beliefs over time and can prompt further exploration of what these practices entail.

Conclusion

The present study has theoretical and practical implications for afterschool researchers and advocates. First, this study contributes to our understanding of culturally responsive practices within an afterschool activity and how these contextual factors may influence adolescent motivational beliefs over time (e.g., Soto-Lara et al., 2021). The findings underscore the potential of afterschool activities in buffering against the typical developmental declines in

youth's motivational beliefs (Lazarides et al., 2020; Niehaus et al., 2012). Secondly, our findings contribute to the importance of quality of experiences. Though culturally responsive practices remain understudied in the literature of afterschool activities, it is important for afterschool advocates and researchers to understand the potential that these practices have in shaping adolescents' experiences in an afterschool setting, and, ultimately, the developmental benefits they take away. Thus, to better design afterschool activities where adolescents can reap the benefits of participating in these settings, it is important to continue to research and implement culturally responsive practices in STEM afterschool activities that meet the needs of the adolescents that are served.

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Appendix 2.1

Items of Motivational Beliefs and Culturally Responsive Practices

Ability self-concept

- How good at math are you? (1 = *Not at all good*, 4 = *Somewhat good*, 7 = *Very good*)
- How good would you be at learning something new in math? (1 = *Not very good*, 4 = *Somewhat good*, 7 = *Very good*)
- Compared to other students in your grade level, how good are you at math? (1 = *A lot worse*, 4 = *About the same*, 7 = *A lot better*)
- If you were to list all of the students in your grade level from best to worst in math, where are you? (1 = *One of the worst*, 4 = *In the middle*, 7 = *One of the best*)

Interest

- I find doing math (1 = *Very boring*, 4 = *Neither boring nor interesting*, 7 =*Very interesting*)
- How much do you like math? (1 = *A little*, 4 = *Somewhat*, 7 = *A lot*)

Importance

- For me, being good in math is (1 = *Not at all important*, 4 = *Somewhat important*, 7 = *Very important*)
- Compared to other subjects, how important is it to be good at math? (1 = *Not at all important*, 4 = *Somewhat important*, 7 = *Very important*)
- How useful is what you learn in math? (1 = *Not at all useful*, 4 = *Somewhat useful*, 7 = *Very useful*)

Culturally Responsive Practices: [Afterschool activity name] mentors and adults …
(1 = *Never*, 3 = *Sometimes*, 5 = *Always*)

- Explain to me what we are learning in different ways to help me learn.
- Use examples from my culture when teaching.
- Ask about my school and home life.
- Are interested in my culture.
- Provide me with visual examples (like pictures) when explaining things.
- Speak about contributions that my culture has made to Science, Technology, Engineering and Math.
- Have spoken to me or to other students who speak another language (for example Spanish).
- Help me learn about other people and their culture.
- Want students from different cultures to respect one another.
- Use what I already know to help me understand new ideas.
- Treat all students like they are important members of [the afterschool activity].
- Try to find out what interests me.
- Use real-life examples to help explain things.
- Allow students to speak another language (for example Spanish) at times during [the afterschool activity] sessions.

Table 2.1

Descriptive Statistics of Study Variables

Indicator	*M*	*SD*
Math motivational belief		
Ability self-concept T1	4.86	1.08
Ability self-concept T2	5.13	1.03
Ability self-concept T3	5.06	0.95
Ability self-concept T4	5.06	0.94
Interest T1	5.54	1.30
Interest T2	5.54	1.43
Interest T3	5.46	1.18
Interest T4	5.42	1.25
Importance T1	6.12	0.90
Importance T2	6.02	0.91
Importance T3	5.99	0.88
Importance T4	6.00	0.90
Predictor		
Culturally responsive practices T2	3.44	0.75
Covariates	%	
School		
School A	0.37	
School B	0.38	
School C	0.25	
Grade level		
Grade 6th	0.47	
Grade 7th	0.37	
Grade 8th	0.16	
Parent education level (1 = high school education)	0.81	

Note. T1 indicates fall pre survey (October), T2 indicates fall post survey (November), T3 indicates winter post survey (March), and T4 indicates spring post survey (May).

Table 2.2
Bivariate Correlations Between Study Variables

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. Ability self-concept T1	1.00												
2. Ability self-concept T2	0.78***	1.00											
3. Ability self-concept T3	0.76***	0.77***	1.00										
4. Ability self-concept T4	0.78***	0.74***	0.80***	1.00									
5. Interest T1	0.60***	0.37***	0.45***	0.51***	1.00								
6. Interest T2	0.54***	0.60***	0.60***	0.54***	0.61***	1.00							
7. Interest T3	0.45***	0.49***	0.64***	0.52***	0.48***	0.76***	1.00						
8. Interest T4	0.44***	0.46***	0.52***	0.54***	0.55***	0.72***	0.78***	1.00					
9. Importance T1	0.39***	0.37***	0.37***	0.44***	0.49***	0.49***	0.34***	0.41***	1.00				
10. Importance T2	0.29**	0.41***	0.38***	0.38***	0.42***	0.63***	0.46***	0.44***	0.55***	1.00			
11. Importance T3	0.12	0.21*	0.28**	0.30**	0.33**	0.49***	0.50***	0.44***	0.49***	0.66***	1.00		
12. Importance T4	0.16	0.20	0.15	0.27*	0.35***	0.40***	0.31**	0.48***	0.34***	0.58***	0.61***	1.00	
13. Culturally responsive practices	0.24*	0.15	0.17	0.19	0.18	0.24*	0.14	0.11	0.03	0.13	0.12	0.16	1.00

Note. * p<0.05. ** p<0.01. *** p<0.001. T1 indicates fall pre survey (October), T2 indicates fall post survey (November), T3 indicates winter post survey (March), and T4 indicates spring post survey (May).

Table 2.3

Trajectories of Math Motivational Beliefs (Unconditional Model)

	Ability self-concept	Interest	Importance
	B (*SE*)	*B* (*SE*)	*B* (*SE*)
Fixed Effects			
Intercept	5.11***	5.42***	5.98***
	(0.09)	(0.13)	(0.09)
Time (slope)	0.06*	-0.05	-0.04
	(.02)	(0.04)	(0.03)
Random Effects (Variances)			
Intercept	0.01***	0.05***	0.04***
	(0.01)	(0.03)	(0.02)
Slope	0.65*	1.21	0.54**
	(0.12)	(0.23)	(0.11)
Covariance, slope and intercept	-0.20	0.07	0.07**
	(0.02)	(0.06)	(0.04)
Model fit			
ICC	0.73	0.71	0.63

Note. *p<0.05. ** p<0.01. *** p<0.001. Intercept = Time 4.

Table 2.4

Trajectories of Math Motivational Beliefs with Predictor

	Unconditional Model + Predictor Model 1			Unconditional + Predictor + covariates Model 2		
	Ability self-concept	Interest	Importance	Ability self-concept	Interest	Importance
	B (*SE*)	*B* (*SE*)	*B* (*SE*)	*B* (*SE*)	*B* (*SE*)	*B* (*SE*)
Fixed Effects						
Intercept	4.31*** (0.45)	4.72*** (0.61)	5.19*** (0.43)	3.83*** (0.58)	4.90*** (0.75)	4.83*** (0.50)
Culturally responsive practices	0.24† (0.13)	0.21 (0.17)	0.23† (0.12)	0.31* (0.14)	0.23 (0.18)	0.29* (0.12)
Time (slope)	0.16 (0.12)	0.17 (0.19)	-0.20 (0.16)	0.16 (0.12)	0.17 (0.19)	-0.20 (0.16)
Culturally responsive practices (time X culturally responsive practices)	-0.03 (0.03)	-0.06 (0.05)	0.05 (0.05)	-0.03 (0.03)	-0.06 (0.05)	0.05 (0.05)
Covariates						
School A				0.00 (0.20)	0.13 (0.25)	0.09 (0.17)
School B				0.47 (0.28)	0.29 (0.34)	0.51* (0.22)
Grade Level				0.23 (0.15)	-0.19 (0.18)	0.00 (0.12)
Parent education (high school =1)				-0.02 (0.23)	-0.29 (0.29)	-0.04 (0.19)
Random Effects (Variances)						
Intercept Constant	0.01*** (0.01)	0.05*** (0.03)	0.04*** (0.02)	0.01*** (0.01)	0.05*** (0.03)	0.04*** (0.02)
Slope Constant	0.59** (0.11)	1.15 (0.22)	0.53** (0.11)	0.56** (0.11)	1.10 (0.23)	0.45*** (0.10)
Covariance, slope and intercept	-0.03 (0.03)	0.08† (0.06)	0.06* (0.03)	-0.03 (0.05)	0.08 (0.06)	0.05* (0.03)
Model fit						
ICC	0.71	0.70	0.63	0.70	0.69	0.59

Note. †p<0.10. * p<0.05. ** p<0.01. *** p<0.001. Intercept = Time 4.

CHAPTER 3

How Youth-Staff Relationships and Program Activities Promote Latinx Adolescent Outcomes in an University-Community Afterschool Math Enrichment Activity

(Accepted at *Applied Developmental Science*)

Abstract

Youth-staff relationships and program activities are important elements in designing high-quality afterschool activities that promote a broad range of outcomes. Using a qualitative approach, Latinx adolescents were interviewed (*n*=28, 50% girls) about their experiences in a university-based afterschool math enrichment activity. Findings under the first goal of the study suggest that Latinx adolescents perceived changes in their math-specific outcomes (e.g., problem-solving skills), future science, technology, engineering, and mathematics (STEM) pathways (e.g., envisioning a future career), and social-emotional skills (e.g., relationship skills) as a result of participating in the activity. Under the second goal of the study, findings identified the specific practices that adolescents thought promoted those outcomes, including incorporating advanced math concepts and engaging in collaborative learning, engaging in campus tours and informal conversations, and using culturally responsive practices. The findings from this study can be leveraged by scholars and educators to design, further strengthen, and evaluate high-quality afterschool activities.

Keywords: Afterschool activity, adolescence, youth-staff relationships, math, quality, Latinx

How Youth-Staff Relationships and Program Activities Promote Latinx Adolescent Outcomes in an University-Community Afterschool Math Enrichment Activity

Even though the population of college-age Latinx students has increased in recent years, the percentage among Latinx individuals with a bachelor's degree (15%) remains low compared to White (41%), Black (22%) and Asian (63%) US populations (Chapa & De La Rosa, 2006; Cole & Espinoza, 2008; Krogstad, 2016). The numbers are particularly alarming in science, technology, engineering, and mathematics (STEM) where Latinx individuals earned 14% of science bachelor's degrees and just 6% of math-related bachelor's degrees (i.e., engineering and mathematics) (National Science Foundation [NSF], 2019). Scholars argue that these dismal statistics are partly due to K-12 institutional inequalities, such as academic tracking that may hinder Latinx students' access to high-quality STEM curriculum (Conchas, 2001; Flores, 2007; Gandara, 2006).

One way to help Latinx adolescents succeed in their K-12 STEM learning and to prepare them for STEM college or career pathways is through university-community partnerships where local universities and communities can work together to provide enriching STEM afterschool activities for Latinx adolescents attending under-resourced schools (Mahoney, Levine, & Hinga, 2010; Yu et al., 2020; Yu et al., 2021). University-community partnerships serve as a way to tap into the resources of local universities to support the needs of the community, in this case to offer STEM resources via an afterschool activity (Mahoney et al., 2010). STEM afterschool activities have the potential to spark adolescents' interest in STEM and strengthen their skills (e.g., Calabrese Barton & Tan, 2010; Lyon et al., 2012; Vandell et al., 2015).

Little research examines whether afterschool activities developed through university-

community partnerships provide additional enriching experiences that are associated with adolescents' STEM outcomes as well as a broader array of outcomes that will help them for future STEM careers (Cole, 2006; Deutsch et al., 2017; Rhodes et al., 2006). Most of the existing research on STEM afterschool activities focuses on science and on outcomes that closely align to the activity content, such as changes in science motivation for youth at a science camp (Krishnamurthi et al., 2014; Rahm, Martel-Reny, & Moore, 2005). Adolescents not only need to gain skills in STEM areas, but also need to have knowledge about different STEM pathways and learn how to work with people to thrive in STEM careers. University-community partnerships provide adolescents with opportunities to interact with undergraduate mentors and campus resources that can support these broader outcomes (Cole, 2006; Mahoney et al., 2010; Yu et al., 2021). For example, adolescents can gain knowledge about college and social-emotional skills as they interact with diverse undergraduates who can expose them to potential STEM pathways (e.g., Cole, 2006).

The goal of the current study is to explore how participation in a university-community math afterschool activity benefited Latinx adolescents and what practices can be leveraged to design high-quality afterschool activities based on adolescents' voices and perspectives. This study specifically focuses on a math afterschool activity as scholars argue math is a gateway subject to a variety of STEM domains and Latinx individuals are underrepresented in math degrees (e.g., Gottfried, 2015; Maass et al., 2019; NSF; 2019; Watt et al., 2017). First, it is important to examine whether Latinx adolescents perceive that participation changed their math outcomes, future STEM pathways, and social-emotional skills. Secondly, in order to help design afterschool activities and continue to improve these contexts for underserved populations, it is

important to understand what specific practices in an afterschool activity support these adolescent outcomes.

STEM Organized Afterschool Activities and Adolescent Outcomes

Given that few studies focus on math organized afterschool activities, we draw on the broader STEM afterschool activities literature to provide an overview of how participation is associated with various adolescent outcomes. Our study focuses on three adolescent outcomes: math outcomes, future STEM pathways, and social-emotional skills. First, we focus on math outcomes as prior research suggests that afterschool activities promote skills related to the focus or content area of the activity, in this case we are focusing on a math outcomes in a math afterschool activity (e.g., Krishnamurthi et al., 2014). Secondly, we focus on future STEM pathways to examine whether afterschool activities have the potential to change adolescents' perspectives about their future career pathways. This is important because one reason why few Latinx students persist in the STEM pipeline is because they are not exposed to possible STEM careers (e.g., Gandara, 2006). Lastly, we focus on social-emotional skills as we believe that these are crucial to navigating and succeeding in STEM pathways and afterschool activities have the potential to promote these skills (Garner et al., 2018; National Research Council, 2015). For Latinx adolescents to thrive in a STEM-oriented 21st century, it is important to strengthen their math skills, help them learn about future STEM pathways, and help them develop social-emotional skills to thrive in a STEM field.

First, STEM afterschool programs can help adolescents thrive in STEM by bolstering their STEM skills, such as strengthening the math skills of adolescents who participate in programs that provide math enriching activities (Krishnamurthi et al., 2013; Krishnamurthi et al., 2014; Lyon et al., 2012). STEM afterschool activities that offer both science and math

enrichment activities have been shown to increase adolescents' math achievement and motivation (Assouline et al., 2017; Duran et al., 2014; Morales et al., 2011) as well as promote a strong STEM identity (Calabrese Barton & Tan, 2010; Kang et al., 2018; Krishnamurthi et al., 2014). However, because afterschool programs typically focus on a wide range of STEM enrichment activities (e.g., technology, math, science), it is not clear the extent to which activities focus on math enrichment promote students' math outcomes (e.g., Assouline et al., 2017; Duran et al., 2014; Krishnamurthi et al., 2013). Moreover, studies often focus on general STEM outcomes (combining math and science outcomes) or science outcomes with less work focusing on math outcomes specifically (e.g., Chittum et al., 2017; Morales et al., 2011; Nation et al., 2019).

Secondly, in order for adolescents to pursue STEM, it is important to bolster their STEM college and career knowledge and interest, which is particularly important to increase the representation of Latinx individuals in STEM (Afterschool Alliance, 2011; Aschbacher et al., 2010; Dabney et al., 2012; Kitchen, Sonnert, & Sadler, 2018; Krishnamurthi et al., 2013; National Research Council, 2015). A longitudinal study focusing on robotics afterschool programs for middle- and high-schoolers found that participants were more likely to develop STEM college and career interests and more likely to enroll in STEM majors compared with non-participants (Burack, Melchior, & Hoover, 2019). Retrospective studies have also shown that college students in STEM majors often credit afterschool activities for their interest to enroll in college and pursue a STEM career (Dabney et al., 2012; Maltese & Tai, 2011; Price et al., 2019; Wai et al., 2010). For under-represented minority (URM) adolescents, afterschool activities may provide them with opportunities to gain knowledge and explore different career pathways as they interact with adults (National Research Council, 2015).

Lastly, afterschool activities also have the potential to promote social-emotional skills that prepare adolescents to succeed in school and the workforce (Durlak et al., 2010; Durlak & Weissberg, 2007; Hansen et al., 2003; Shernoff, 2010). Scholars have identified the importance of developing core competencies, such as relationship skills (e.g., working well with others) and social awareness (e.g., showing empathy for others), to succeed in life (Durlak et al., 2015; Wallace & Palmer, 2018). Studies have found that adolescents who participate in afterschool programs strengthen their social and emotional skills while interacting with diverse individuals and can apply these skills to other contexts (e.g., school) (e.g., Fredricks et al., 2017; Hurd & Deutsch, 2017; Yu et al., 2021). In this study, adolescents in the university-community math afterschool activity engage in group-based work that fosters collaboration with diverse individuals and may promote adolescents' social-emotional skills.

Youth-Staff Relationships and Program Activities as Mechanisms of Change

Hirsch and colleagues' (2011) Program-Activities-Relationships-Culture (PARC) model suggests that within afterschool activities, adolescents have opportunities to form relationships with staff and engage in various program activities that promote a range of positive outcomes. In fact, studies have found that Latinx adolescents often attribute their participation in afterschool activities to their interest in the program activities and strong relationships with program staff (Akiva & Horner, 2016; Fredricks et al., 2010). This is consistent with the National Research Council's Committee's (NRCC) indicators of high-quality activities which include program activities and youth-staff relationships as core indicators of program quality (Eccles & Gootman, 2002).

Though the literature suggests that youth-staff relationships and program activities are important aspects of high-quality afterschool activities for positive youth development (e.g.,

Deutsch & Spencer, 2009; Hirsch et al., 2011; Rhodes et al., 2006), it is unclear how they matter and for which specific outcomes. Several studies, for instance, have demonstrated that general youth-staff relationship quality, that encompasses a wide range of features (e.g., building trust and providing support), is positively associated with academic and social outcomes (Deutsch & Jones, 2008; Deutsch & Spencer, 2009; Deutsch et al., 2017; Ettekal et al., 2015; Kataoka & Vandell, 2013; Price et al., 2019; Rhodes et al., 2006). Similarly, studies highlight that academic outcomes are supported by various program activities, such as learning environment (e.g., collaborative learning), curriculum (e.g., real-world activities), and activity structure (e.g., youth-focused) (Krishnamurthi et al., 2014; Lyon et al., 2012; National Research Council, 2015; Yu et al., 2020). However there is little research examining what specific features of youth-staff relationships and program activities are related to which outcomes. Complementary findings are needed that identify specifically what staff can do on a day-to-day basis to support adolescent development, such as making flashcards to help build adolescent study skills (Deutsch et al., 2017). Because youth-staff relationships and program activities have often been conceptualized more broadly in the literature, the field has limited concrete advice to best prepare staff, improve activities, or design activities to promote specific outcomes.

Another important aspect of the PARC model is culture; specifically, the model suggests that programs designed for low-income and URM adolescents need to be responsive to adolescents' cultural backgrounds and their needs in order to be effective (Hirsch et al., 2011). Simpkins and colleagues (2017) conceptual framework of culturally responsive practices in afterschool activities describes ways in which staff can engage in practices at the program level and when developing relationships with adolescents, such as having relationship-building activities where adolescents and staff can learn about each other and having positive attitudes

about diverse individuals. Though this culturally responsive framework provides a general layout addressing the importance of staff practices that are responsive to adolescents' culture, it does not provide specific practices that staff engage in. Moreover, little empirical work exists on culturally responsive practices and the extent to which they promote positive development. Additionally, studies often focus on racial and ethnic culture (Ettekal et al., 2015; Gutierrez et al., 2017; Lin et al., 2015; Simpkins et al., 2017) and only a few studies focus on other aspects of culture that are also salient to adolescents such as youth culture (e.g., hip hop trends) (Eglash et al., 2013; Peppler & Kafai, 2007a, 2007b). Therefore, this study will focus on a broader dynamic view of culture that considers other aspects of youth identities (e.g., interests) in addition to Latinx students' ethnic identities (e.g., traditions, values, language). With a more dynamic view of culture, we will focus on youth-staff relationships and program activities and the mechanisms by which cultural features may lead to adolescent outcomes in order to understand *why* they matter and *how* we can leverage these features to design more effective and responsive STEM afterschool programs and practices.

Current Study

Drawing on the PARC model (Hirsch et al., 2011), the aim of this exploratory qualitative study is to examine how Latinx adolescents benefit from participating in a university-community math enrichment activity and identify practices that can be implemented to design high-quality afterschool activities. We utilized qualitative data to provide a more in-depth understanding of what specific program elements and practices can be leveraged to help provide high-quality, effective afterschool activities. This study explores (a) adolescents' perceived changes in math outcomes, future STEM pathways, and social-emotional skills and (b) specific practices that promoted these changes. Qualitative interview methods allow adolescent participants to describe

their perspectives and experiences in their own words that can help us better improve the quality of afterschool activities based on adolescents' voices.

Study Context

The math afterschool activity, Math Community Educational Outreach (Math CEO), was created by Mathematics faculty at a Hispanic-serving university institution through a university-community partnership. The mission of the afterschool activity is to serve middle school students in nearby under-resourced schools in southern California. Students were recruited from local middle schools and were selected through an application process. Middle school math teachers played an important role in recruiting and selecting participants as they often referred students to Math CEO who they thought would benefit from participating in the afterschool activity. Therefore, a large proportion of participants who attended Math CEO were students who teachers thought would benefit from more math support.

The data in this study were collected during the 2018-2019 school year when Math CEO served approximately 120 students from two lower-performing schools. In School A[5], only 11% of the students met or exceeded state standards for math and in School B, only 15% of the students met or exceeded state standards for math. Demographic data revealed that the majority of the 120 students self-identified as Latinx (90%) of which 95% self-identified of Mexican-descent followed by multiracial (5%), Asian (2%), Black (1%), and White (1%). Moreover, 98% qualified for free or reduced lunch price, 71% lived in a household with an income below $35,000, and 87% were potential first-generation college students as none of the parents earned a college degree.

[5] Names of schools were not identified to ensure confidentiality under IRB guidelines.

Approximately 80 college undergraduate students (69% female) served as staff working with middle schoolers and are referred to as mentors in the program. Mentors came from various majors: math (40%), science (33%), education (30%), engineering (15%), and other (20%). Additionally, 55% percent of mentors were Asian and/or Pacific Islander, 25% Latinx, 14% White and 14% mixed race/ethnicity or other; approximately 40% were first-generation college students. The undergraduate mentors attended 2-hour weekly training sessions, where they learned about the math content and activities for the week before they implemented them at the weekly math enrichment sessions. The undergraduate mentors were encouraged to form positive relationships with the adolescent mentees and to share their experiences as college students with their mentees.

Each week, middle school adolescents from these two schools took a bus to the university campus immediately after school and attended a 2-hour math enrichment session after school. During the weekly sessions, 2-3 mentors worked collaboratively with a group of 6-10 adolescents. Mentors played an important role in shaping how the math activities were introduced to students; in particular, they were tasked with engaging students in collaborative learning and making the content relevant to them.

The program curriculum included a wide range of real-world activities that promote collaborative work as adolescents were introduced to different math concepts to strengthen their math skills as well as workshops to provide students with information on STEM and college pathways. The math enrichment activities were designed to involve scaffolding to expose students to math concepts through abstract and real-world applications. For example, one activity focused on developing students' skills in using ratios, fractions, and percentages as they worked together to manage a hotel, where they had to calculate profit, sales, and expenses. Another

activity focused on using real-world applications of the stock market to help students develop skills in algebra. As part of the program, students also took STEM-focused field trips where they visited university science labs and learned about different majors. Mentors also organized college workshops where they spoke about their own experiences attending college.

Method

Research Design and Participants

Interview data were drawn from a larger mixed-methods study examining high-quality culturally responsive practices in a math afterschool activity. For this study, 28 Latinx adolescents (Female: 50%; grade levels: 6^{th} – 8^{th} grades) were purposively selected to participate in qualitative in-depth interviews during the spring quarter based on (a) how long they have been in the program (at least two quarters), (b) changes in their perceptions of program quality, and (c) a range of student demographics so that they were representative of the larger program population. Our approach to selecting 28 participants was also based on reaching saturation – when no new data emerged from the interviews and themes were consistent across the interviews, continuing to interview was no longer needed (Saldaña, 2016). All of the participants selected for the interviews identified as Latinx, 25 (89%) self-identified as Mexican-descent, one as "American Indian and Mexican," one as "Guatemalan", and one as "Latino." The majority of the students who were interviewed (82%) had a household income of less than $35,000. For participating in the interviews, each participant received $10 honorariums.

Interview Procedures

The semi-structured interview scripts contained multiple open-ended questions to elicit conversations around adolescents' experiences and perspectives of the math afterschool activity and lasted an average of 60 minutes (ranged 45 to 85 minutes long). Interviews were conducted

in participants' preferred language. One interview was conducted in Spanish and translated by a bilingual research assistant; all other interviews were conducted in English. Interviews were audiotaped and transcribed verbatim by the interviewer in the language in which the interview was conducted. All transcribed interviews went through secondary checks, where a research assistant inspected the work of the first transcriber. The interview protocol contained sections on adolescents' general background information, adolescents' perspectives and experiences in the math afterschool activity, youth-staff relationships, cultural responsiveness, and their perspectives on what they have learned or gained (see Appendix 3.1).

When coding the interviews, all of the interview sections were read and coded in their entirety. However, for the first research question, particular attention was placed on three questions from the section on what they have learned or gained: "How has Math CEO changed the way you a) think or feel about math, b) think about things or the way you act in school, c) think about your future?" For the second research question, particular attention was placed on three questions from the sections on adolescents' experiences in the math afterschool activity and youth-staff relationships: "What is the best part of Math CEO for you?", "What are your favorite activities and why?", and "Can you tell me something you think you have learned from your mentor?" Research assistants used both standard probes that were developed with the interview script (e.g., "Why" and "In what ways?", see Appendix 3.1 for the standard probes) and personalized probes tailored to elaborate on participants' specific experiences and to obtain detailed responses from participants.

Four main steps were taken to ensure trustworthiness, which is a standard of quality for qualitative research also referred to as validity, credibility, and rigor (Morrow, 2005). First, to ensure that the interview protocols were consistently followed, all research assistants attended a

training session to help them become familiar with the interview script, practice interview skills, have questions answered, receive feedback, and learn how to effectively probe during the interview. All research assistants also observed an interview session before they conducted their first interview and received feedback on their first interview from the principal investigator to strengthen their interview skills. Second, meetings were held during data collection to provide the team with the opportunity to debrief and talk about any issues or concerns with the interviews. Third, analytical memos (i.e., a collection of the first author's notes, queries, interpretations, perspectives) were written and reviewed frequently during coding and analysis (Morrow, 2005; Saldaña, 2016). Lastly, in addition to discussion between the authors, the larger research team was consulted during coding and analysis.

Researchers' Positionality and Reflexivity

It is important for researchers to discuss their experiences, perspectives, and biases and how they may be operating in the research process to control for potential biases influencing data analysis (Hill et al., 2005; Morrow, 2005). The lead author is a bilingual, second-generation Latina raised in California who has worked with adolescents in afterschool settings. She used her experiences and cultural knowledge to examine interviews and to interpret participants' responses to gain as many insights as possible from the interviews. The second author is an Asian and Pacific Islander male from Guam who has had several years of professional experience working with youth, and who has research interests related to STEM afterschool programs. The third co-author is a White, female raised in Italy with expertise in pure mathematics and in the teaching of mathematics. Finally, the last co-author is a White, female raised in California whose research expertise is on organized afterschool activities. The data collection team consisted of bilingual research assistants from different racial and ethnic

backgrounds and at different education levels (e.g., graduate students and a postdoctoral researcher). Research assistants who spoke Spanish conducted the interviews when participants preferred to speak in Spanish. Additionally, the data collection team had general knowledge about the program but were not involved with program planning or mentoring. Taking an outsider perspective ensured confidentiality and that adolescent participants were comfortable in sharing their experiences in the program. The rest of the research team involved with coding and analysis consisted of the authors of this study.

Coding and Analysis

The present study utilized a thematic analysis to qualitatively analyze, interpret, and report findings from the interview data. Coding of the interviews occurred in multiple iterative stages where both inductive and deductive approaches were utilized to identify patterns in the data (Saldaña, 2016). We used Microsoft excel spreadsheets to assist in data analysis (Meyer & Avery, 2008; Ose, 2016). The interviews were broken down into segments by each section of the interview protocol. Codes and categories were developed by considering each line, as well as the words or phrases of the segments in the interview transcripts. Coding and analyzing the interviews occurred in three stages described below.

In the first stage of coding, the first author addressed the first research question by reviewing each entire interview and focusing on specific questions that probed what adolescents had learned or gained from participating in Math CEO. Separate codes and categories were developed for each outcome (i.e., math outcomes, relationship skills, and future STEM pathways). A set of codes were developed using inductive and deductive approaches, where keywords and phrases from participants' own words were used to summarize topics (in-vivo codes) or keywords and phrases from prior literature were created to summarize topics

(descriptive codes) (Saldaña, 2016). For each of the three outcomes, a preliminary coding framework was developed and refined by returning to the data, using prior literature, reviewing memos, and using codes that reoccurred in the data (Saldaña, 2016).

In the second stage of coding, the author addressed the second research question by reviewing adolescents' responses to the three interview questions on outcomes and their responses to other sections in the interview where they were asked about their experiences with mentors and the program activities, such as "What is the best part of Math CEO for you?", "What are your favorite activities and why?", "Can you tell me something you learned from your mentor?" Separate codes and categories were developed for the second research question and the preliminary coding framework was further refined after having discussions with the co-authors, reviewing memos, and returning to the data. This process yielded a stronger coding framework that captured the mechanisms by which youth-staff relationships and program activities shape adolescents' outcomes. All authors discussed and reached consensus on issues such as whether the categories captured content of all of the codes and whether codes fell under multiple categories.

The final step in analyzing the data was to create themes for each outcome (research question 1) and the specific practices related to the outcomes (research question 2). Themes were developed using the coded interviews, the coding framework, and existing literature. For example, the theme on gaining new math skills was developed from prior literature suggesting that STEM afterschool activities promote STEM skills and competences (e.g., Krishnamurthi et al., 2014). They were further refined through conversations among the co-authors. As a diverse team, we discussed our perspectives and checked our biases throughout the research process (Hill et al., 2005). Questions and concerns were discussed in group meetings. When there were

disagreements, the themes were discussed until consensus was reached. The final themes discussed in this paper were common themes across the adolescent interviews (Ryan & Bernard, 2003). Table 1 outlines the themes with examples for both research questions. This is further addressed in the Results section with selected excerpts.

Results

Research Question 1 Findings: Outcomes that Adolescents Reported in the Program

This section addresses our first research question on whether Latinx adolescents perceived changes in their math outcomes, future STEM pathways, and social-emotional skills as a result of participating in the math afterschool activity. Responses from adolescents revealed that they perceived changes in their math outcomes (i.e., gaining math skills and math concepts, problem-solving skills, math interest), future STEM pathways (i.e., gaining knowledge about college/careers, gaining interest, and exploring future careers), and relationship skills (i.e., social skills and interacting with diverse individuals). Interview excerpts are used to illustrate each theme within the corresponding outcome (Table 3.1).

Math-related outcomes. Latinx adolescents felt that participating in Math CEO changed their math outcomes in three ways including 1) improving their math problem-solving skills, 2) strengthening their math skills and concept knowledge, and 3) helping to develop their math interest. First, Latinx adolescents described acquiring various skills to help them solve different math problems. As stated by the following students:

> Adam: Pretty much new ways of solving problems. They have cool tricks that they've explained to me on how to do certain things.
>
> Teresa: …seeing that there are more than like one solution.

Salvador: The way I think about things, because before, I used to always need a piece of paper. Now, I can just do mental math. That actually helps me because every time I'm in the test and they forget to give me paper, I can just do it in my mind instead of actually writing it down.

Developing problem-solving skills is important given that in mathematics conceptual understanding and applied knowledge often build on each other; learning how to use different strategies to solve new problems will allow Latinx students to do well in math. As mentioned by Adam, the 'cool tricks' that he learned will eventually help him solve math problems that he may encounter in the future.

For the second theme under math outcomes, students mentioned gaining math skills and concept knowledge (e.g., concepts related to fractions) while attending Math CEO. Some adolescents spoke about the importance of learning similar or more challenging mathematics than what they normally were exposed to at school. Several adolescents gave specific examples:

Ramon: It has changed me a lot at school because now that I'm here, I know more – the same - sometimes we use the same subject, so now I know more when I'm in math class. Now I know more math than I knew before.

Adrian: I like how it challenges us a bit more than what we are usually used to. Meaning like to what our grade level is…the type of math is a little bit more advanced and well [it] helps us learn a bit more.

Via: I also like the new math that I learned that's above my grade level.

The math skills and concepts that adolescents are learning at Math CEO reinforces or supplements the knowledge that they are gaining at schools. Several students mentioned learning

new advanced math concepts at Math CEO which better prepared them for their math classes at school.

For the third theme under math outcomes, some adolescents mentioned that they began attending Math CEO because they had an initial interest in mathematics and that after attending Math CEO their interest in the subject was sustained because they learned that math could be fun. For students who had very limited initial interest in mathematics, attending the math afterschool activity sparked their interest in math. This is indicated in the following statements made by adolescents:

> Jasmine: This year …I wouldn't really like math, it would be the worst subject, in like, school. Then, coming to like the program, um, it helped me a lot, like, showed me that like math was actually fun.
>
> Santiago: I'm starting to come back to math again. Originally it was my favorite subject, but I didn't like it anymore, but now I'm starting to respect it.

Overall, adolescents described making changes in various math-related outcomes including their problem-solving skills, math skills, and math interests. These outcomes are consistent across adolescents' experiences in our study. In addition, adolescents alluded to the relevance of these outcomes across different settings, such as at school. The following are specific statements made by adolescents:

> Alex: Most of this math that I'm getting from Math CEO, I am applying it to my math classes and even my English classes. And it helps me a lot to know this knowledge now than if I would have learned it afterwards in school.

Kassandra: I pay more attention in my math class and my grade is going up. And questions that they have asked here are sometimes asked in school and when other people don't know it, then I could answer it.

Being able to apply these math-related outcomes to other contexts is very important because it may lead to long-term effects. If students are able to transfer their math interests, knowledge, and skills to other settings, they will be able to continue to build on these outcomes. Overall, the themes support the goals of the afterschool activity in helping adolescents gain problem-solving skills, math skills and knowledge, and math interest to excel in the subject.

Future STEM pathways. In the interviews, Latinx adolescents were asked to reflect on how Math CEO has changed how they think about their future plans and aspirations. Adolescents revealed not only developing future plans, but how their plans had been changed as they gained more insights and knowledge about various STEM pathways. Latinx adolescents mentioned gaining more knowledge about various STEM and non-STEM college and career pathways which helped them have a better idea of the possible range of choices for the future. At the same time, adolescents mentioned gaining interest in and being able to explore future college/career pathways that they may or may not have been familiar with before participating in Math CEO. For example, adolescents discussed gaining interest in attending college and described the type of information they learned about college.

Via: I've been here like a year--almost two years now, and it's been something great and at the end since we get to learn more about how the college campuses is, especially here now, and I think that it's amazing.

Vanessa: Um, you get to know little bit more about the school [university] so like maybe I could join later on in the years.

In terms of career pathways, adolescents mentioned that gaining more knowledge helped them envision what they could become in the future. In other words, they could explore new careers and had more options they could choose from. Although the majority of Latinx adolescents described math-related careers some mentioned other STEM careers, such as becoming a scientist. As described in the following statements:

> Amy: When I know math, maybe in my future, I could become a math teacher or when I'm somewhere in the future, I could know how to do math.
>
> Kassandra: …after I've been here I want to do more math-related careers or also engineering or a scientist.

The themes reveal that Latinx adolescents thought they gained insight into different STEM pathways. This is important as Latinx individuals remain underrepresented in colleges and in STEM careers (NSF, 2019). For many adolescents, who may come from lower-income backgrounds, attending Math CEO might be the first time they are introduced to a university campus where they can interact with college students and learn about different majors and careers. Although students specifically mentioned their interest in STEM majors and careers, adolescents may also interact with undergraduate mentors who come from non-STEM majors, providing them with the opportunity to learn about other majors in college.

Relationship skills. In order for Latinx adolescents to succeed academically, it is important that afterschool activities also strengthen adolescents' social-emotional skills (Hurd & Deutsch, 2017). In the Collaborative for Academic, Social and Emotional Learning (CASEL) (2020) framework there are five core competencies that adolescents can develop. Of these five, relationship skills were the main competency that was highlighted in adolescents' responses. Relationship skills involve gaining social skills, developing positive relationships, and

interacting with diverse individuals or groups (CASEL, 2020). The first theme under relationship skills describes the ways in which adolescents gained social skills and confidence in interacting with their peers. This is indicated in the following statements:

> Karen: How I talk here and anywhere else, I get to express myself more in school how I do here, because in school I really don't talk a lot. They [are] teaching me new things and making me be not that scared as how I used to be in cases.
>
> Interviewer: Scared about Math? Or talking in general? What did you mean?
>
> Karen: Talking
>
> Via: Yeah because now that I socialize a bit more here. I know how to socialize a bit more at school too.

For the second theme under relationship skills, adolescents perceived that their relationships skills were strengthened as they learned more about diverse groups. When asked what they have learned or gained from working with mentors, they highlight having the opportunity to interact with diverse mentors when learning about their mentors' culture as well as when sharing their own culture with their mentors. As described in the following statements:

> Evelyn: It just helps me know more things about other people's cultures and that I don't know.
>
> Juanita: Pretty interesting because sometimes if they're the same [cultural background] we could relate but if they're different, I learn things about the culture… like the things they celebrate, that they don't celebrate.

Students responses revealed that Latinx students felt that their relationship skills were strengthened in a context where they felt comfortable interacting with diverse individuals. Moreover, they highlighted how these interactions do not occur in settings they are normally in,

such as in their schools or neighborhoods. Math CEO provided a space for Latinx adolescents to interact and form relationships with individuals form diverse sociocultural backgrounds. For example, Juanita mentioned the ability to create co-ethnic and cross-ethnic relationships with her mentors and learned to value their similarities and differences.

Research Question 2 Findings: Specific Practices by Which Youth-Staff Relationships and Program Activities Shaped Adolescent Outcomes in the Program

To address our second research question, we examined Latinx adolescents' interview responses to understand the specific practices by which youth-staff relationships and program activities Latinx adolescents believed supported their development. The goal was to better understand the practices mentors engage in and the specific program activities that may lead to specific outcomes. In this section, specific practices are organized by the outcomes mentioned in the prior section. Latinx adolescents revealed specific practices that they thought mattered for these areas of development (see Figure 1)

Math-related outcomes: Incorporating advanced math concepts and real-world examples. When describing the math activities, adolescents consistently mentioned that activities were fun and engaging because they dealt with real-world problems and situations (e.g., learning about the stock market, identifying mathematical tessellation patterns using nature). As stated by the following student:

> Izzy: When they use examples like real life, it makes me think that you don't have to do the way they teach you, that you can also use other examples that you think might help you understand it more clearly.

Although the mentors played a role in the learning process by leading and facilitating these program activities (e.g., providing real-life examples during activities), the activities themselves served a specific role in promoting adolescent outcomes.

In addition to the real-world applications, adolescents described the significance of the program activities incorporating advanced math concepts. Adolescents mentioned that they gained new math skills when they struggled to solve a problem or complete an activity.

> Jennifer: When we do the little puzzles and try to solve the answers and in general, everything. It just helps you in math and you get to learn new ways to solve equations. I'm more advanced in math now. I got my math test higher and I'm better at math. I like them [puzzles] because they're kind of hard, but in the end, it all ties up to one big thing and you understand what it is.
>
> Kassandra: Some of my favorite activities [are] … when the problems are difficult so we could challenge ourselves and in order to learn and not like easy with the stuff you already know and you don't learn anything.
>
> Alex: Mostly my favorite activity in Math CEO has been Contigo…to me it's like bingo with more of a math twist…you actually have to think about what you are doing, before you do it, because you need to think about all the possibilities that could happen afterwards in your next roll.

At Math CEO, adolescents were introduced to advanced concepts in math through real-world and engaging activities. Additionally, incorporating advanced concepts allowed students to develop math skills as they tried to solve problems they had not encountered at school. In the interviews, adolescents described how these activities helped them improve because they had to use different problem-solving skills and incorporate different math skills and concepts.

Engaging in collaborative learning. Collaborative learning scholars argue that learning is a social, relational process where learning occurs between a group of learners working together (Johnson & Johnson, 2009; Laal & Ghodsi, 2012; Yu et al., 2020). Some elements of collaborative learning highlighted in the adolescent responses were (a) promotive youth-staff interactions (e.g., encouragement), and (b) using teamwork to engage in program activities. The elements of collaborative learning share similar dimensions as those emphasized with social-emotional learning, such that they both highlight the importance of teamwork in learning and gaining math and relationship skills. In this section, we focus on the math skills Latinx adolescents perceived to gain through collaborative learning.

As described above, one element of collaborative learning is engaging in promotive interactions. This was highlighted in the responses when Latinx adolescents mentioned that their undergraduate mentors used moral support (e.g., encouragement) to build their confidence in math which allowed them to feel more comfortable with learning new math skills. Two adolescents stated:

> Leslie: They, like, if I don't understand a problem, they help me, and they're like 'you got this.' Like Amy, she was also one of my mentors. And like, she [would say], 'Oh, you got this, you know how to do this,' and stuff and I guess that's the way they help me.
>
> Kassandra: I think something I've learned is to not give up when problems might be difficult because when he [mentor] sees that we're not getting really into the problem because we don't understand it and when we want to quit, he goes over and he tells us to try our best. To not worry if we get the wrong answer…it could benefit you and you need to try your best in order to do the best you can.

When students have the opportunity to work together or engage in collaborative activities, adolescents are not just learning from the activities, but also from the undergraduate mentors and peers who are also engaged in the activities. More specifically, adolescents perceived gaining new math skills and confidence when their undergraduate mentors provided them with encouragement to move forward or try their best. This is different from schoolwork because at Math CEO, both the mentors and adolescents were working together and, at school, teachers may not necessarily work with the students and instead just show them what to do.

Future STEM pathways: Engaging in informal conversations with mentors and participating in campus tours. Youth-staff relationships, specifically engaging in informal conversations with mentors, played a role in adolescents' future aspirations. Latinx adolescents and undergraduate mentors engaged in conversations on a variety of topics related to college (e.g., applying, student life, courses). Adolescents described being able to talk to their mentors about college, given that they were undergraduate students, and learning more about what being a college student looked like based on their mentors' experiences. Students also mentioned learning more about colleges by attending campus tours organized by Math CEO where they had the opportunity to observe things on campus and ask their undergraduate mentors questions about college. As described by several adolescents:

> Juanita: And they talk about college sometimes…I ask them questions. They tell me like how expensive it is and all the things they need to pay and all that. I'm like "oof. I need to save money." Well I know what to do like if I asked them about this college especially, they will tell me oh this and they tell me what courses they are so like if I want to apply here in the future something like that.

Belen: Every once in a while, he will go up to the front and he'll say, "College tip of the day," then he'll give us a tip… some of the people here have experiences because, well, they're in college. If we ask, they'll tell us.

Eduardo: Yeah they kind of talk about how being in college is different and how you could find [studies] that pay you. For example, when they said in the tour, if you sleep and then do some kind of—like there's this [study] where you can sleep and then you earn money, that's something I never knew that they did here [at the university].

The quotes describe in detail how the conversations between youth and undergraduate mentors might look like in regard to proving adolescents with information about college. Mentors at Math CEO are undergraduates who have first-hand experience with navigating higher education and can impart some of the knowledge they have acquired to the adolescents. This is important as many Latinx adolescents come from under-resourced schools and underprivileged communities where knowledge about college and STEM careers might not be readily accessible (Conchas, 2001; Gandara, 2006).

Relationship skills: Engaging in informal conversations. During informal conversations, youth and undergraduate mentors shared various things about their sociocultural backgrounds, allowing the Latinx adolescents to learn more about diverse individuals. At Math CEO, adolescents were more likely to engage with mentors that come from a different racial or ethnic background than theirs, therefore it is important to understand how undergraduate mentors were connecting with adolescents in more nuanced ways. Latinx adolescents said they learned how to interact with others that may not look like them or that may have different interests by learning about their undergraduate mentors' sociocultural backgrounds. Additionally, for the informal conversations to be beneficial for Latinx adolescents, undergraduate mentors had to be

open and responsive to adolescents' sociocultural backgrounds as well. Simpkins and colleagues (2017) emphasize the importance of being responsive to adolescents' cultural backgrounds in order for them to have positive and meaningful experiences in afterschool activities. In this case, undergraduate mentors were responsive to Latinx adolescents' sociocultural backgrounds by engaging in conversations where adolescents and undergraduate mentors learned more about each other where adolescents perceived to learn how to communicate and interact with diverse individuals. As described in the following statements:

> Olivero: I think he's learned, of course since we're younger than he is, we've taught him other things like things that kids do different. You don't say 'that's hip' or 'that's on fleek' like we taught him new things and stuff. One time he dabbed and we're all like, 'No. Don't do that. It's cringey.'
>
> Adam: The one that stood out to me was probably…we were talking about…I think it was about how other people grow up because it gave me new sights on how actually other people grow up. Like some people grow up poor, they grow up rich, and how that affects the way they talk to people or the way that they actually act towards other people. He actually told me about how he used to live and then that made me understand him more.

The mentors were responsive to adolescents' sociocultural backgrounds as they embraced learning new things from their students as well as sharing their own sociocultural backgrounds. Particularly for Olivero, it was important that their mentors connected with them by embracing youth culture and learning what topics and interests were relevant to adolescents. Through these informal conversations, adolescents learned how to respect and connect with diverse individuals. Just like another adolescent mentioned, "I learned how to respect people more." Adam's mentor

also engaged in culturally responsive interactions by sharing his life experiences and strengthening his social awareness of people's varying socioeconomic status and how that may play a role in communicating with individuals that come from similar or different socioeconomic backgrounds.

Engaging in collaborative learning. As presented in the section on math outcomes, through collaborative learning Latinx adolescents have the ability to learn how to work well with others. Another element of collaborative learning is using teamwork to engage in program activities, thus placing an emphasis on developing teamwork and relationship skills. During group-based activities, Latinx adolescents believed they gained relationships skills. As described in the statement:

> Olivero: Getting to do problems with teams, and the partners, and the mentors. When we had the puzzle activities…everyone gets involved and you help one another…they help you get better…When you have to figure out other ways to do stuff. If there's one really easy way and one really hard way to do it, but then the mentor shows us, "this is a shorter and easier way." Learning shortcuts to math and stuff.

The quotation describes the importance collaborating on an activity as a way to learn how to work well with others and how to interact with undergraduate mentors and peers. Engaging in teamwork and collaborative learning also allows adolescents to have the opportunity to learn from others in the group. This is important in order for Latinx adolescents to succeed and navigate contexts where relationship skills are needed to interact with diverse individuals.

Discussion

Drawing from the PARC model (Hirsch et al., 2011), this study examined Latinx adolescents' perceptions on how youth-staff relationships and program activities in a university-

community based math afterschool activity supported their development. First, we explored whether Latinx adolescents' perceived changes in their math-specific outcomes, future STEM pathways, and social-emotional skills. Second, we documented the specific mentor practices and program activities adolescents thought supported those outcomes. Figure 3.1 showcases the specific practices and mechanisms that may lead to the outcomes described by Latinx adolescents. Moreover, it highlights how mentors and program activities play a role in promoting various outcomes. While contributing to the growing literature on STEM afterschool activities, our findings have direct applied implications concerning what specific practices matter and how they may be implemented to design and further strengthen high-quality culturally responsive afterschool activities.

Perceived Activity Impacts on Adolescents' Math Development and Beyond

This study revealed the extent to which adolescents felt participating in a math enrichment activity promoted a wide range of outcomes. Prior research, suggests that STEM afterschool activities, typically focused on science or a wide range of STEM enrichment activities, promote adolescents' performance, achievement, and motivation in those domains and in math as well (Assouline et al., 2017; Morales et al., 2011). These findings extend the literature by examining a math afterschool enrichment activity and by looking at a broad range of outcomes. Starting with outcomes aligned with the math activity curriculum, adolescents felt the activity helped them with their math problem-solving skills, math skills and concept knowledge, and math interest. It is possible that changes in these fundamental math skills and motivational beliefs provide the foundation for program gains in adolescents' math performance and achievement demonstrated in prior research (e.g., Morales et al., 2011; Krishnamurthi et al., 2013). Indeed, adolescents commented that they felt the skills they learned at the activity helped

them in a variety of contexts, including school. Therefore, afterschool activities have the potential to strengthening adolescents' math skills and motivation as well as to further support adolescents' learning in schools.

The findings also suggest that adolescents are not only strengthening their math skills, but are gaining new perspectives into future STEM pathways and social-emotional skills. Generally, studies on STEM afterschool activities typically focus on outcomes related to the activity content, in this case STEM outcomes, and less on broader outcomes that will help adolescents succeed in STEM careers (e.g., Afterschool Alliance, 2011; National Research Council, 2015; Krishnamurthi et al., 2014). As revealed by the findings, participating in a math afterschool activity helps adolescents gain knowledge and interest about college and STEM careers. Such knowledge and motivation is vital for potential first generation college students like the majority of students in this activity to be able to envision a wide range of future possibilities. For many of these students, this activity can provide information and resources that may not be readily available at their under-resourced schools or among their family members who have more limited STEM and college experience (e.g., Gandara, 2006). In this regard, afterschool activities like this one serve as a structural resource that could counter some of the structural barriers students face at school.

Another important aspect in supporting Latinx adolescents' STEM pursuits is learning how to navigate and succeed in STEM pathways. Although scholars agree that it is important to promote social-emotional skills to better prepare adolescents to succeed at school and in the workforce (e.g., CASEL, 2020, Durlak et al., 2010; Hansen et al., 2003; Shernoff, 2010), few studies focus on social-emotional skills within the context of a STEM afterschool activity (Fredricks et al., 2017; Garner et al., 2018). Aligned with CASEL's (2005) social and emotional

framework on the key core competencies that adults can help adolescents cultivate, our study found evidence for strengthening adolescents' relationship skills. As mentioned by adolescents, participating in the afterschool activity helped them gain confidence in interacting with their peers and adults across a variety of contexts. Another important element of developing relationship skills, is learning how to interact with diverse individuals and showing cultural competency (e.g., CASEL, 2020; Yu et al., 2021). Our findings reveal how adolescents gained these skills when interacting with their mentors and learning about each other's interests and racial/ethnic backgrounds. These social-emotional skills can help adolescents successfully navigate various STEM opportunities (Fredricks et al., 2017; Garner et al., 2018).

Best Practices to Support Adolescent Development

Our second goal for this study was to identify the specific best practices that promote adolescent development. Aligned with the PARC model (Hirsch et al., 2011) and the framework of culturally responsive practices in afterschool activities (Simpkins et al., 2017), youth-staff relationships and program activities serve as two core aspects of high-quality afterschool activities. The current findings extend prior work by identifying the specific practices and program activities that helped promote adolescents' outcomes. Such information is critical to help support staff on the ground working with youth. First, we found that there are specific practices through which Latinx adolescents felt undergraduate mentors influenced them, which to our knowledge has not been addressed by prior literature. Much of the prior literature on youth-staff relationships, for example, demonstrates that the quality of youth-staff relationships are associated with youth's academic outcomes and social development (e.g., Kataoka & Vandell, 2013); however, these studies provide less insight into what specific practices or interactions help foster those outcomes. One simple but critical best practice was youth engaging

in informal conversations with their undergraduate mentors who had many insights about college and careers in STEM and non-STEM fields. Within afterschool activities, it is important to allocate time for these informal conversations to occur between undergraduate mentors who have the potential to inspire future college students. A second critical best practice for mentors is being responsive to adolescents' sociocultural backgrounds to effectively cultivate positive youth-staff relationships and help adolescent gain relationship skills (e.g., Eglash et al., 2013; Yu et al., 2021). By highlighting these practices, we found that undergraduate mentors were not only responsive to adolescents' racial or ethnic backgrounds, but also to other sociocultural aspects (e.g., youth culture) that adolescents bring with them. Prior literature focusing on undergraduate mentor and mentee relationships, reveal similar findings in that they emphasize the importance of fostering these relationships where adolescents interact with diverse individuals through culturally responsive practices (Yu et al., 2020; Yu et al., 2021).

Contributing to the literature on program quality (e.g., Hirsch et al., 2011), our findings reveal that specific practices in terms of program activities help promote math outcomes, future STEM pathways, and social-emotional skills. Literature suggests that program activities matter because they promote academic outcomes (Lyon et al., 2012; National Research Council, 2015; Yu et al., 2020), however it is less clear what aspects of program activities matter and for which outcomes. Research suggests that group-based learning or collaborative learning helps support adolescents skills and development (e.g., Duran et al., 2014; Yu et al., 2020). Our study found that collaborative learning provides adolescents with many opportunities to develop relationship skills and strengthen their math skills. Particularly, while working in a group setting, youth reported learning how to work well with diverse individuals as they tried to solve a problem. As a result, it is important to think about the learning environment when designing afterschool

activities and understanding what adolescents might gain from group-based learning compared to other forms of learning. Another aspect of program activities that we found to promote adolescents' math skills and future STEM pathways was curriculum. Studies suggest that designing curriculum to meet students' academic needs further supports their learning (e.g., Morales et al., 2011). We found that in addition to designing math content that used real-world examples, adolescents benefitted from being exposed to possible STEM careers by learning about them through campus tours or having conversations about them with their mentors. These findings reveal the importance of designing programs that are intentional in providing adolescents with more resources and opportunities that will not only support their math outcomes, but also other outcomes that will help them succeed in STEM.

Our findings have applied implications concerning how to design, further strengthen, and evaluate high-quality afterschool activities that may be leveraged by afterschool advocates. Our study provides concrete examples and evidence-based recommendations of how specific practices can be implemented. First, our findings highlight the importance of youth-staff relationships and how mentors can establish connections with their mentees by leveraging different cultural aspects, such as learning more about their interests (e.g., youth culture), sharing their traditions (e.g., race/ethnic culture), or working together through group-based learning. Adolescents stated that even though their racial/ethnic cultural backgrounds were different from their mentors, they were interested in learning more about their mentors' racial/ethnic backgrounds and enjoyed discussing similarities based on other interests. This provides insights for how mentors and adolescents can bridge differences by connecting based on their shared interests or by learning about each other's sociocultural backgrounds. Another way to promote positive youth-staff relationships is by allocating time for informal conversations or designing

learning environments, such as collaborative learning, that will provide mentors and mentees with opportunities to learn from one another. These interactions also provide a space for adolescents to learn more about possible careers while establishing a strong foundation for the youth-staff relationship. Second, our findings highlight the importance of program activities and describes how collaborative learning, incorporating advance math concepts and real-world applications, and organizing campus tours can benefit students. Our findings reveal the importance of making activities meaningful and connecting them to real-world examples to help students make connections and strengthen their skills. In order to continue improving the quality of afterschool activities, it is important to understand the specific practices that shape adolescents' experiences.

Limitations and Future Directions

Although the present study contributes to the literature on STEM afterschool activities and the importance of program characteristics on adolescent outcomes, limitations remain. First, underreporting of certain topics or events can occur with open-ended questions as participants are more likely to report things that are more salient to them. For example, in our interviews we asked adolescents how Math CEO changed the way they think about math. Adolescents likely mentioned the most salient ways rather than reporting a more exhaustive list. Future studies could utilize a broader research questions that include all of themes mentioned in this study and also question that focus on other STEM domains, given that math serves as a gateway into other STEM pathways (Watt et al., 2017).

We focused on common themes across adolescents. An important next step is to understand how person-environment fit matters for these processes. In other words, we need to

ask which activity experiences are most impactful for which students so that we can leverage different program characteristics to maximize adolescent learning.

This study also focused on Latinx adolescents' experiences in a math afterschool program. Because Latinx individuals remain under-represented in STEM domains (NSF, 2019), it is important to understand how afterschool activities can serve as a structural resource to support Latinx adolescents' STEM pursuits (Mahoney et al., 2010; Yu et al., 2020; Yu et al., 2021). However, it is important to note that there are other student populations who are under-represented in STEM fields (NSF, 2019). Therefore, future studies might include students from other racial and ethnic backgrounds attending other STEM afterschool activities. It is important that future work continues to examine how these processes shape URM adolescents' experiences and outcomes in STEM afterschool activities and how we can build upon these practices or adapt them to create high-quality afterschool settings.

Conclusion

The findings from this study provide scholars and educators with a better understanding on how program characteristics can shape Latinx adolescents' experiences in afterschool activities. In order to create high-quality afterschool settings, it is important to understand *why* specific practices matter and *how* staff are engaging in responsive, effective best practices. While the findings are situated within a math afterschool activity, our findings revealed that adolescents felt that they are gaining math outcomes as well as broader outcomes (e.g., relationship skills). This is of great importance as educators and scholars focus on designing programs that could benefit student in various ways and not just in helping them build STEM skills. Moreover, these skills may serve as critical elements for succeeding in STEM careers.

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Appendix 3.1

Interview Protocol for Study 2

I'd like to start by asking you to tell me a little bit about yourself.
1. How would you describe yourself as a student?
2. What are your favorite subjects in school and why?
3. How do you feel about math and science?
   a. Do you think math and science are important? Why or why not?

General Questions About Math CEO

1. What made you want to join Math CEO?
2. What has been the best part of MATH CEO for you?
   a. What do you like about the program? Favorite activities?

Not all the kids at Math CEO like everything about Math CEO and that's ok.
3. What about you? Are there things about Math CEO that you do not like?
   a. Which parts of Math CEO are just OK or aren't very exciting or interesting to you?
4. How is Math CEO similar from the classes that you take in school? How are they different?

Youth-Staff Relationships

1. Who is/are your mentor(s) at Math CEO?
2. Describe your mentor(s) to me.
3. What is the best part about your relationship with your mentor(s)?
4. Tell me about some of the ways you are alike. How do you feel about the similarities between you?
5. Tell me about some of the ways you are different. How do you feel about the differences between you?
   a. [If it hasn't already come up, ask about mentor gender] – How do you feel about your mentor being the same/different gender as you?
6. Does your mentor do things so that you know he or she respects you?
7. Tell me something you think you have learned from your mentor(s).
8. Tell me about something you think mentor(s) learned from you.
9. We know that no one is perfect. Imagine you had super powers and could change something about your mentor or your relationship with your mentor to make them the best mentor ever. What would you change? Why?

Cultural Responsiveness

1. In the survey that you completed for us in beginning of the school year you noted that your race and/or ethnicity is (_____). Does that sound like you?
2. The next few questions ask you about the idea of Culture as it relates to your race and ethnicity. Have you heard of the word "culture" before?
3. [Regardless of their answer, provide handout of the definition of Culture and read it aloud]: *People use the word Culture to basically describe the ways people of different racial or ethnic groups do things based on things like their beliefs, languages, family values, customs and activities.*
4. Does this definition make sense to you?
   [Pause to make youth reflect on the definition; provide examples or help as needed]
5. Based on this definition, how would you describe your culture? (for example, your Mexican or Family culture?). [Provide key examples/questions if students struggle answering]:

1. *Let's start by thinking about how your family does things.*
2. What language do you speak at home?
3. What types of activities or customs do you do with your family?
4. What personal or educational values are important to you and your family?

[Interviewer notes about how youth describe their culture]

6. Can you describe a place, any place, where you feel like you fit-in culturally versus places you feel like you don't fit-in? (so for example where do you feel like your Mexican and/or Family culture is valued and/or respected?)
   a. What makes you feel that way?
7. How do you feel at Math CEO? Do you feel like you fit-in culturally at Math CEO?
8. [Before moving on to the sub-questions below, remind youth about what they said about their culture]
   a. How is your culture represented or reflected, if at all, at Math CEO?
   i. What about in terms of the people (so both your peers and mentors) in Math CEO and how you interact with them?
      1. *Sometimes students have said they like to have a mentor who is the from the same ethnic and cultural background and sometimes students have said that wasn't a big deal to them or prefer to work with someone who is different.*
         1. How do you feel about your mentor(s) being from a (*similar/different*) culture as you?
         2. How is it helpful to have a mentor that is from a (*similar/different*) cultural and ethnic background as you?
         3. How do you feel about the other students at Math CEO being from a similar cultural or ethnic background as you?
   b. In what ways are the things done at Math CEO similar from your Mexican and/or family culture? How are they different?
      1. What about in terms of the activities or what you learn in Math CEO?
   c. In what ways, if at all, does Math CEO support your culture?
      1. Is it important to you that Math CEO support your culture? Why?
   d. In what ways can Math CEO can change or improve to better support your culture?

<u>Outcomes and Skills</u>

1. Has being in Math CEO changed the way you think about things or the way you act in school?
   a. In what ways?
   b. What things has it changed?
2. Has being in Math CEO changed the way you think or feel about math and science?
   a. In what ways?
   b. What things has it changed?
3. How has Math CEO changed how you think about your future?

<u>Closing</u>

1. Is there anything else you would like to tell me about your life or your experience at Math CEO that we haven't covered?
2. Thank you so much for taking the time to do this interview. If I need to have some things clarified later, can I contact you again?

Table 3.1

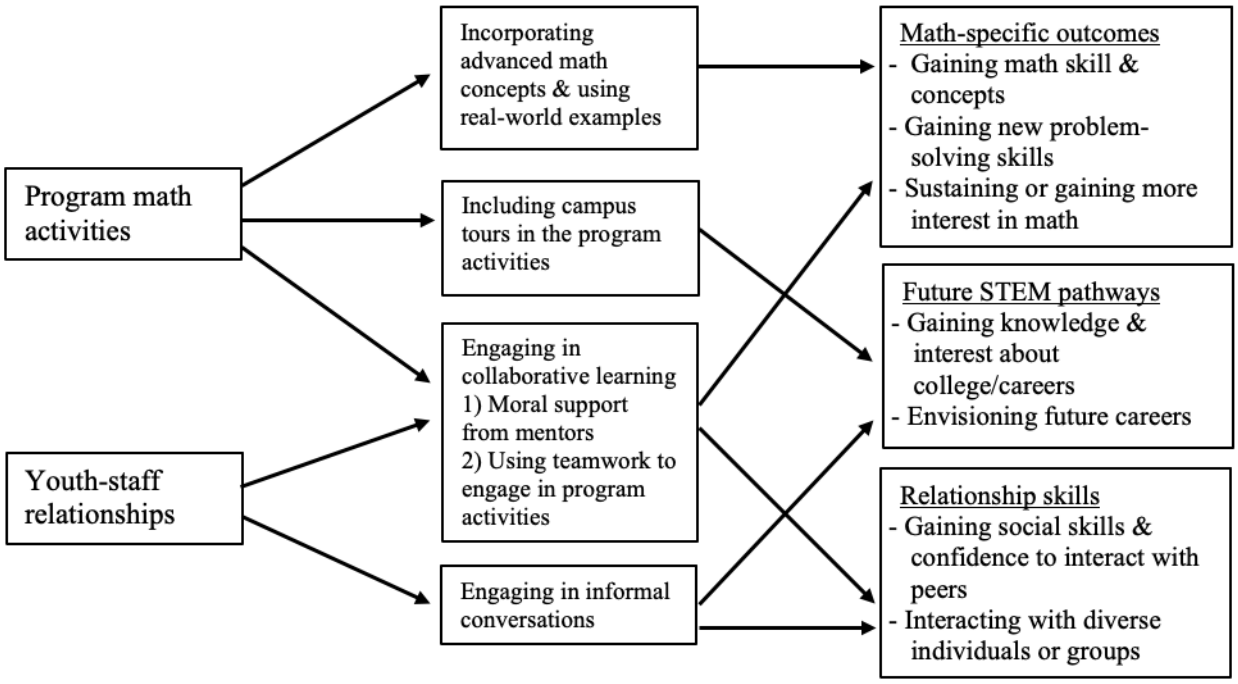
Outline of the Coding Framework

Outcomes	Themes	Selected examples
Math Outcomes	Gaining new math skills and concepts	"The way I think about things, because before, I used to always need a piece of paper. Now, I can just do mental math. That actually helps me because every time I'm in the test and they forget to give me paper, I can just do it in my mind."
	Gaining new problem-solving skills	"Now I pay more attention to my math class because some things that we're learning here, we learned in math…If I already learned it here, I could teach them and go over them."
	Sustaining or gaining interest in math	"I like math and science…one of my favorite subjects and now I want to learn more and the different ways we can be using the math and science and how we could help the world."
Relationship Skills	Gaining social skills and confidence to interact with peers	"Yeah. I act a bit--I can be more confident with myself. I can talk a little bit more with more new people. That's getting better over time."
	Interacting with diverse individuals or groups	"I have learned how to interact with people more… and get to learn about new things and learn about new personalities and adapt to things, to different situations."
Future STEM pathways	Envisioning future careers	"Before I thought I would only finish high school and enlist in the army and that's it but now… I can do more things like engineering."
	Gaining knowledge & interest about college/careers	"Cause I didn't want to go to college but then [now] I – I have an idea."
Characteristics	Specific practices	Selected examples
Youth-staff relationships	Mentors engaging in informal conversations with adolescents *Undergraduate mentors have conversations about STEM pathways or about their sociocultural backgrounds.*	"And they talk about college sometimes...Well I [will] know what to do like if I asked them about this college…they tell me what courses they are so like if I want to apply here in the future something like that."
Youth-staff relationships and program activities	Engaging in collaborative learning *Collaborative learning involves moral support from mentors and incorporating*	"Amy, she was also one of my mentors. And like, she [would say] 'Oh, you got this, you know how to do this,' and stuff and I guess that's the way they help me."

	teamwork in program activities.	"Sometimes they force us to work together. I'm like okay and I'll do it and I get my teamworking skills like more better."
Program activities	Incorporating advanced math concepts and real-world problems *The math afterschool program designs math activities based on real world problems that encourage students to use various problem-solving skills*	"When they use examples like real life, it makes me think that you don't have to do the way they teach you, that you can also use other examples that you think might help you understand it more clearly."
	Including campus tours in the program activities *Mentors organize and provide campus tours.*	"For example, when they said in the [campus] tour—like there's this [study] where you can sleep and then you earn money, that's something I never knew that they did here [at the university]."

Figure 3.1

Presentation of Findings in a Conceptual Model.



CHAPTER 4

Adult Mentors' Challenges and Strategies in a Math Afterschool Program Serving Latinx Adolescents

(Under review at *Applied Developmental Science*)

Abstract

Mentors who work with youth in afterschool programs are critical to youth' experiences, yet there is little research on how to better train mentors. Mentors (n=15; 11 female; 8 Latinx, 7 non-Latinx) serving Latinx adolescents in an afterschool program were interviewed to understand (a) the challenges mentors encountered when working with adolescents, (b) the strategies they leveraged to respond to these challenges, and (c) the extent to which mentors' responses varied by their racial/ethnic cultural backgrounds. Mentors mentioned challenges with promoting motivation, teaching math content, navigating group instruction, building connection with adolescents, and establishing authority or respect. To respond to these challenges mentors mentioned seeking help from experienced mentors, attending trainings, facilitating collaborative learning, integrating real-world examples, engaging in structured non-math related conversations, and leveraging students' sociocultural assets. Results provide key stakeholders with insights on how to design trainings to better support frontline staff who work with diverse youth.

Keywords. Afterschool program, frontline staff, adolescence, Latinx, quality

Adult Mentors' Challenges and Strategies in a Math Afterschool Program Serving Latinx Adolescents

Though research has demonstrated that having high-quality frontline staff in afterschool programs matters in promoting positive youth development, less research has focused on how to better train and prepare adults to work with and mentor youth (Mahoney et al., 2010; Akiva et al., 2017, 2020; Vandell & Lao, 2016; Walker & Larson, 2006). According to the National Afterschool Association (2017), frontline staff vary in education level, experience level, and the age groups they have mentored – all of which could lead to variability in their ability to work effectively with youth. Moreover, afterschool programs are becoming increasingly diverse where frontline staff and youth may experience sociocultural differences or similarities that require staff to be better prepared to develop co- and cross-ethnic relationships with youth (e.g., Hirsch, 2005). Perhaps not surprisingly, scholars argue that it is essential to provide frontline staff with the tools and resources necessary to thrive and to help prepare them for the challenges they might encounter while working with youth from diverse backgrounds (Larson & Walker, 2010; Larson et al., 2015; Walker & Larson, 2006, 2012). Knowing what challenges frontline staff face and the strategies they currently leverage to address those challenges can help the field design effective trainings to support staff. Staff's preparedness to handle challenges should enrich youth's experiences and promote positive youth development (Gutierrez et al., 2017; Hirsch, Deutsch, & Dubois, 2011).

With the rise of university-community partnerships, researchers are beginning to focus on how these networks provide an avenue for frontline staff to receive evidence-based education, hands-on training, professional development, and credentials to work in afterschool settings (Mahoney et al., 2010; Underwood et al., 2021; Vandell & Lao, 2016). Through university-

community partnerships, afterschool educators and researchers are able to learn more about how to strengthen the afterschool workforce by understanding what challenges frontline staff encounter in hope of designing trainings that address those concerns (e.g., Vandell & Lao, 2016). This study focuses on the perspectives of adult mentors who work with adolescents in a high-quality math enrichment afterschool program created through a university-community partnership, as an exemplar to learn more about how to strengthen professional development and support for frontline staff. The goal of this study is not to generalize nor to convey a one-size-fits-all approach, but to offer key insights that may contribute to better preparing frontline staff in afterschool settings.

Afterschool Program Quality and The Role of Frontline Staff

Frontline staff are key to improving program quality and shaping youth's experiences in afterschool programs (Eccles & Gootman, 2002; Jones & Deutsch, 2011; Kataoka & Vandell, 2013; Larson et al., 2005; Smith et al., 2010). Hirsch and colleagues' (2011) Program-Activities-Relationships-Culture (PARC) model suggests that frontline staff play an important role in three aspects of program quality: youth-staff relationships, program activities, and center culture. In fact, youth often report that the main reason for participating and remaining in an afterschool program is because of their relationships with frontline staff (Akiva & Horner, 2016). In afterschool programs, youth have opportunities to build connections with adults that they would not normally interact with in other settings. These adults may come from diverse sociocultural backgrounds where co-and cross-ethnic youth-staff relationships may form (Hirsch, 2005; Spencer, 2007). Scholars also suggest staff are key in how program activities are facilitated and executed (Hirsch, 2005; Smith et al., 2010; Vandell & Lao, 2016), which may influence youth's decision to participate in an afterschool activity (Akiva & Horner, 2016). One thing that scholars

are beginning to focus on is implementing culturally responsive practices when engaging in various program activities with youth (McGovern et al., 2019; Ngo, 2017; Yu et al., 2021).Therefore, it is important to examine how frontline staff work with youth and the ways that they can be better supported when interacting with youth from diverse sociocultural backgrounds in afterschool programs.

Using a dynamic view of culture, scholars have begun to address how taking into account youth's sociocultural backgrounds, beyond that of race and ethnicity, promotes positive experiences for youth in afterschool activities (Eglash et al., 2013; Soto-Lara et al., 2021; Williams & Deutsch, 2016; Yu et al., 2021). Simpkins and colleagues' (2017) framework of culturally responsive practices describes ways in which culture can impact frontline staff's interactions with youth. Though Simpkins and colleagues (2017) provide a general outline of culturally responsive practices, there is more work needed because it is hard work to implement culturally responsive practices that center youth's sociocultural backgrounds and perspectives (Ettekal et al., 2020; Gutierrez et al., 2017). While these frameworks highlight the benefits of culturally responsive practices, there might be challenges that frontline staff encounter when considering youth's sociocultural backgrounds. This is especially important in contexts where youth interact with cross- and co-ethnic frontline, where it is not guaranteed that youth will bond with their co-ethnic mentors or that cross-ethnic mentors will be responsive to youth's diverse backgrounds (e.g., Hirsch, 2005). Understanding these challenges, will help design effective trainings that can better equip frontline staff.

Frontline Staff Challenges and their Responses

According to the PARC model (Hirsch et al., 2011), frontline staff may experience challenges in three ways: facilitating program activities, establishing youth-staff relationships,

and being responsive to youth's sociocultural backgrounds. Recent research on the challenges frontline staff experience when interacting with youth align with the three broad categories from the PARC model and provide more details on what are some of the challenges frontline staff may have when working with and mentoring youth (Larson & Walker, 2010; Larson et al., 2015). This literature, reviewed below, highlights the various challenges that frontline staff may face based on the broad categories from the PARC model and underscores why it is critical for frontline staff to develop skills in specific challenging and target areas such as learning how to teach content material, establish relationships with youth, and work with diverse youth.

Many afterschool activities use hands-on and inquiry-based activities that require frontline staff to use a wide range of teaching skills (e.g., scaffolding, facilitating, role modeling) (Hirsch, 2005; Larson et al., 2015; Morales et al., 2011; Yu et al., 2020). For example, Hirsch (2005) documented how frontline staff at an afterschool program, SMART Girls, had difficulty facilitating lessons on life skills involving role-playing. Moreover, many staff at this program felt they went into the program activities unprepared or lacked confidence in facilitating the sessions (Hirsch, 2005). Similarly, in a math afterschool program, adult mentors reported having difficulties with keeping youth engaged and teaching the math activities when they did not know the content (Yu et al., 2020). Facilitating and instructing youth in program activities requires various teaching skills, therefore frontline staff may experience various challenges pertaining to teaching youth in afterschool settings.

In addition to facing teaching challenges, frontline staff also report challenges with establishing relationships with youth, building trust, and managing classroom behavior (Hirsch, 2005; Hirsch et al., 2011; Larson & Walker, 2010; Rhodes, 2004). For example, scholars have noted that staff find it difficult to form connections with youth who are more timid or reserved

(Hirsch, 2005; Hirsch et al., 2011). Scholars also suggest that the critical ingredient in establishing youth-staff relationships is building trust, rapport, and respect (Deutsch & Jones, 2008; Jones & Deutsch, 2011; Ettekal et al., 2015; Rhodes, 2004). However, some frontline staff find it challenging to make such connections, particularly over a small time frame (Hirsch et al., 2011). Related to building trust, frontline staff also face challenges when trying to establish respect and authority with youth (Deutsch & Jones, 2008; Hirsch et al., 2011). In an evaluation of an afterschool program, researchers found that some frontline staff were unable to manage classroom behavior or enforce rules while also struggling to make their voices heard when they perceive that youth do not respect them (Hirsch et al., 2011). Most of the studies on staff challenges are based on youth's or researchers' perspective, more work is needed to understand frontline staff's perspectives and their specific challenges (Larson et al., 2015).

Lastly, effective frontline staff are able to be culturally sensitive and responsive to youth's sociocultural backgrounds; however, staff may encounter challenges in understanding and utilizing culturally responsive practices (Gast et al., 2017; Gutierrez et al., 2017; Hirsch et al., 2011). When using culturally responsive practices, it is important that frontline staff are aware of youth's diverse sociocultural backgrounds. Even though some frontline staff may be well-intentioned in supporting youth's sociocultural backgrounds, some have narrow views of culture and have facilitated learning activities based on inaccurate representations of youth's culture (Ettekal et al., 2020; Herrera, 2016; Spencer, 2007). Staff also have reported feeling unprepared in connecting with youth from different sociocultural backgrounds or responding to cultural incidents (e.g., discrimination) (Gutierrez et al., 2017; Hirsch et al., 2011; Spencer, 2007). This is particularly important as cross-ethnic youth-staff relationships might experience different challenges than co-ethnic youth-staff relationships (Hirsch et al., 2011). For example,

White frontline staff working with Latinx youth reported feeling unqualified to engage in a dialogue with youth about negative stereotypes of Middle Eastern individuals when showing a video on the September 11th attacks (Gutierrez et al., 2017). Not responding to cultural incidents or not being responsive to youth's sociocultural backgrounds may lead to cultural divides and make cultural differences between the frontline staff and youth apparent, where youth feel misunderstood or unmotivated (Ettekal et al., 2020; Gutierrez et al., 2017; Spencer, 2007).

The literature on program quality argues that frontline staff need to engage in best practices when working with students (Rhodes, 2020; Soto-Lara et al., 2021; Yu et al., 2021). Though the literature focuses on developing frontline staff's skills and competencies in teaching and working with youth, it often does not include the specific challenges staff may face (e.g., Vandell & Lao, 2016). As a result, staff are often unprepared to address common challenges that occur when working with youth. For instance, studies suggest the importance of bridging cultural divides or engaging in culturally responsive practices (Gutierrez et al., 2017; McGovern et al., 2019; Ngo, 2017; Simpkins et al., 2017); however, there is little guidance on what this looks like and the complexities that can arise when engaging in this demanding, but valuable work. How, for example, can frontline staff learn about youth's sociocultural backgrounds to be culturally responsive if they feel unsure about their ability relationship-building skills. Therefore, it is critical that in professional development and trainings staff can learn about various ways or strategies they can utilize to respond to specific challenges.

Having the literature on best practices separate from the literature on the challenges frontline staff face creates gaps in the field's understanding and, ultimately, the field's ability to support frontline staff in doing their best work (Larson & Walker, 2010). More work is needed to use a strength-based perspective to examine how frontline staff already handle challenges they

experience when working with youth that does not place blame on frontline staff and instead considers the strengths and skills that staff can draw upon to overcome these challenges (e.g., Larson & Walker, 2010; Larson et al., 2015). To address this goal, research needs to connect staff challenges to best practices or the strategies they leverage. Moreover, the literature on best practices is very broad and covers many topics (e.g., Ngo, 2017; Rhode, 2020; Yu et al., 2021). Though all are very helpful, some staff may need specific strategies on how to enact these broad best practices, such as what can a frontline staff member specifically do to build a warm, trusting relationship with youth.

Another important element missing in the literature is that of culture and addressing how culture shapes frontline staff's daily experiences and interactions in afterschool programs (Simpkins et al., 2017; Williams & Deutsch, 2016). It is important to note that youth in afterschool setting will most likely work with adults from diverse sociocultural backgrounds and form co- and cross-ethnic relationships with adults. Some studies suggest that although youth and mentors might share the same race or ethnicity, they might differ in other aspects of their sociocultural backgrounds such as family income, gender, identities, and their cultural values (Hirsh et al., 2011; Rhodes et al., 2002; Simpkins & Riggs, 2014; Spencer, 2007). Not being responsive to youth's sociocultural backgrounds may lead to cultural divides or negative youth experiences in afterschool programs (e.g., microaggressions) (Ettekal et al., 2020; Spencer, 2007). Afterschool programs that are not responsive to youth's sociocultural backgrounds are ineffective in providing positive youth experiences, are at risk of falling apart, and may have challenges in recruiting and retaining youth in the program (e.g., Cole & Distributive Literacy Consortium, 2006).

Current study

Aligned with research suggesting that frontline staff matter in designing high-quality afterschool programs that are responsive to youth's needs and sociocultural assets (Eccles & Gootman, 2002; Simpkins et al., 2017), this study focuses on qualitatively exploring and identifying best practices frontline staff utilize when addressing every day challenges. We utilized qualitative interviews from mentors, serving as frontline staff, to provide more insights into a) some of the challenges they encounter when working with adolescents, b) the strategies they leveraged to respond to these specific challenges, and (c) the extent to which mentors' racial/ethnic cultural backgrounds shape the challenges they encounter and strategies they use when working with adolescents. Exploring these topics qualitatively allows frontline staff to describe their perspectives and experiences that can shed light on how to better support frontline afterschool staff.

Study Context

This study focuses on a math afterschool activity created by mathematics faculty in a Hispanic-serving university institution through a university-community partnership. The mission of the math afterschool program was to serve under-represented students in STEM from under-resourced schools and provide hands-on math enrichment activities that promote various math outcomes and knowledge about STEM pathways. Through the university-community partnership, mentors who attended the university as undergraduate students had the opportunity to work with middle school students from two nearby under-resourced schools in southern California. Adolescents were recruited from the local middle schools, referred by their math teachers, and selected through an application process. A large proportion of participants who attended the afterschool activity were adolescents who typically needed more support with math.

Once a week, middle school adolescents took a school bus to the university campus after school and attended a 2-hour math enrichment session afterschool. During the sessions, 2-3 mentors worked in groups with 6-10 adolescents. Mentors engaged with adolescents in various fun and hands-on math enrichment activities to introduce different math concepts (e.g., numerical sense, proportionality, geometry, and statistics). The math enrichment sessions were designed to introduce adolescents to new mathematical concepts as well as to promote learning skills, critical thinking skills, and collaboration.

Mentors interviewed for this study participated in a larger mixed-methods study examining high-quality culturally responsive practices in a math afterschool activity. During the 2018-2019 school year, approximately 80 college students (69% female) served as mentors working with middle schoolers who self-identified as Latinx (90%). Mentors participated in the afterschool activity either as volunteers or for course credit. Some mentors stayed in the program for as little as one academic term that lasted approximately 8 weeks (e.g., fall quarter) and others stayed from more than one academic term. On average, there were 40 mentors each academic term. Mentors came from various majors: math (40%), science (33%), education (30%), engineering (15%), and others (20%). Additionally, approximately 37% were first generation college students. Each quarter, mentors attended optional weekly training sessions that lasted approximately 60-90 minutes. In the training sessions, mentors received instruction on the math content materials that would be used during the afterschool sessions, learning about the math activities they would introduce to adolescents, learning more about teaching skills, and receiving support on how to work with adolescents. Mentors also had the opportunity to collaborate with the leadership team on organizing STEM-focused field trips and workshops for parents.

Method

Research Design and Participants

The present study used a consensual qualitative method rooted in constructivist and some elements of postpositivist paradigms to explore a) the challenges mentors faced when working with Latinx adolescents in a math afterschool activity and b) their responses to various challenges (Hill et al., 2005). Following IRB protocols, 12 mentors and the three session leaders who had previously been mentors (11 Female; 4 STEM majors; 11 education majors; 8 Latinx; 6 Asian; 1 White mentors) were purposively selected to participate in the in-depth interviews during the spring quarter based on how long they had been mentors in the program (at least two quarters). Moreover, the 12 mentors were selected because they covered the range of high (n = 4), moderate (n = 5), and low (n = 3) scores on the *youth work relational self-efficacy scale* (Akiva et al., 2017) that measures staff's perceptions on how well they think they work with youth (12 items, e.g., “In general, I form positive relationships with kids;" 1 = *Not well at all*, 5 = *Extremely well*). For participating in the interviews, each participant received a $10 honorarium.

Interview Procedures

The semi-structured interview script contained multiple open-ended questions that were developed based on existing literature (e.g., Larson et al., 2015) and conversations with the research team. The interviews lasted an average of 50 minutes and were conducted in English, according to participants’ preferred language. Interviews were audiotaped and transcribed verbatim. A research assistant checked the transcribed interviews with the original audiotapes and the first author inspected the work of the research assistant. The interview protocol contained sections on mentors’ general background information, mindsets on students’ math abilities, experiences in the math afterschool activity, prior experiences with youth-staff relationships, and

perspectives on their and their mentees' social identities and culture.

All interviews were read and coded in their entirety. However, particular attention was placed on the section about mentors' prior experiences with youth-staff relationships as it elicited more information about their challenges and the strategies they used to respond to those challenges. For the first research question, particular attention was placed on the following two interview questions: "What was the most challenging part in showing your mentee(s) that you cared about them?" and "What was the most challenging part in providing your mentee(s) with math-related support?" For the second research question, particular attention was placed on two interview questions that followed after each interview question mentioned above: "How did you respond to the challenges?" and "How did other mentors respond to these challenges?" A complete list of the interview questions can be found in Appendix 4.1.

To ensure trustworthiness, which is a standard of quality for qualitative research also referred to as validity, credibility, and rigor, four main steps were taken (Morrow, 2005). First, all interviewers attended training sessions to help them become familiar with the interview script, practice interview skills, have questions answered, and receive feedback. All interviewers observed an interview before they did one on their own and received feedback on their first interview. This process ensured that the interview protocols were consistently followed. Second, the data collection team attended meetings to provide opportunities to debrief and talk about any issues or concerns with the interviews. Third, analytical memos (i.e., a collection of the first author's notes, queries, interpretations, perspectives) were written and reviewed frequently during coding and analysis (Morrow, 2005; Saldaña, 2016). Lastly, the research team was consulted during coding and analysis in addition to the discussion that occurred between the first author and co-authors.

Researchers Positionality and Reflexivity

To control for potential biases influencing data analysis, it is important to discuss our experiences, perspectives, and biases and how they may operate in the research process (Hill et al., 2005; Morrow, 2005). The lead author is a bilingual, second-generation Latina who has worked in afterschool settings. She used her experiences and cultural knowledge to examine interviews and to interpret participants' responses to gain as much insights from the interviews. The second author is an Asian and Pacific Islander male who has had several years of professional experience working with youth and community members, and who has research interests related to STEM afterschool programs. The third co-author is a White, female raised in Italy with expertise in pure mathematics and in the teaching of mathematics and who also helped establish a math afterschool activity. Finally, the last co-author is a White, female whose research expertise is on organized afterschool activities. The data collection team consisted of bilingual, doctoral students from different racial and ethnic backgrounds. The rest of the research team involved with coding and analysis consisted of the authors of this study.

Coding and Analyses

Coding the interviews occurred in multiple iterative stages where both inductive and deductive approaches were utilized to identify patterns in the data (Saldaña, 2016). To assist in data analysis, Microsoft excel spreadsheets were utilized (Meyer & Avery, 2008; Ose, 2016). Interviews were broken down into segments by each section of the interview protocol. Codes and categories were developed by considering each line of text, as well as the words or phrases. Coding and analyzing the interviews occurred in four stages described below.

In the first stage of coding, the first and second research questions were addressed by the first author by reading the interviews in their entirety and placing particular attention on the

youth-staff relationship section. Inductive and deductive approaches were used where the codes were based on the data using in-vivo (i.e., verbatim words or phrases from participants) and descriptive (i.e., words or phrases that summarize a topic based on prior literature) coding techniques (Saldaña, 2016). Codes, categories, and themes were developed for each research question, such that there were specific codes for the different challenges that were mentioned in the interviews and specific codes for how mentors responded to the challenges. This yielded two different preliminary coding frameworks, one focusing on the challenges and the other focusing on the strategies mentors employed to address the challenges. The preliminary coding frameworks were developed and refined by returning to the data, reviewing memos, receiving feedback from the research team, and using codes that reoccurred in the data (Saldaña, 2016). With the research team, we discussed and reached consensus on issues such as whether the categories captured the codes and whether codes fell under multiple categories.

In the second stage of coding, we were interested in finding patterns or connections between the specific challenges mentors encountered and the specific strategies they employed. To capture the linkages or connections, these patterns were recorded for each participant. These connections were then examined across all the interviews to document if mentors were utilizing similar strategies to address similar challenges. By examining the linkages within and between participants helped to identify which linkages reoccurred in the data. These linkages were further refined by returning to the data, reviewing memos, and receiving feedback from the research team. A diagram of the linkages was created to show the ones that reoccurred in the data (Saldaña, 2016). The diagram demonstrates the strategies that have been used by mentors in addressing specific challenges.

The third stage in analyzing the data was to create themes for the challenges encountered

by mentors (research question 1) and the strategies they used to address the challenges (research question 2). Themes were developed using the coded interviews, the coding framework, and existing literature. The final themes discussed in this paper are common themes across the interviews (Ryan & Bernard, 2003).

In the final stage, we were interested in understanding the similarities and differences between Latinx and non-Latinx mentors' interview responses. To capture whether Latinx and non-Latinx mentors mentioned similar or different challenges and strategies, their interviews were examined separately. Their similarities and differences are further highlighted in Figure 4.2, which was created after examining their interviews separately.

Results

The Challenges Mentors Encountered

To address our first research question, we identified two overarching themes for challenges: (a) Promoting adolescent participation and learning during math activities, and (b) developing relationships with adolescents. Within these overarching themes, there were five sub-themes or challenges that are described below using interview excerpts (Table 4.1). Similarities and differences between Latinx and non-Latinx mentors' responses are described as well.

Theme 1: Promoting Adolescent Participation and Learning During Math Activities

Promoting Motivation. Both Latinx and non-Latinx mentors mentioned that sometimes adolescents did not feel motivated to work on math activities. Many of the mentors attributed their low motivation to having a long day at school or to other factors, such as family obligations:

> "I know when somebody's frustrated with doing certain activities or sometimes they're just too tired to do anything…I understand that they have other things that could be weighing them down from school or from home." – Julie, Latinx, Education major

Mentors understood that students were embedded in other social contexts and seemed aware of adolescents' sociocultural backgrounds and reasons for their low motivation and disengagement. Latinx and non-Latinx mentors also mentioned that adolescents were disengaged and unmotivated when math activities were not seen as particularly fun or were too challenging. For example, Angel (Latinx and education major) described how it was difficult to motivate adolescents especially, "if they felt like the lessons were too long, too boring for them." When mentors expressed that it was challenging to promote motivation, they often described that students came into the afterschool activity unmotivated because of external factors or because the activities themselves did not spark adolescents' interests.

Teaching Math Content. Latinx and non-Latinx mentors described challenges with teaching new math content, especially if they did not feel like they had a 'math background' – or the math skills or knowledge. As described by the mentor below,

> "Not having that background to be as detailed as my co-mentor in math because she was a math major. I felt that was challenging for me because I felt I wasn't as helpful as I could have been if I had a math background." – Aubrey, non-Latinx, education major

Trish, a Latinx session leader, described that many of the mentors she worked with often felt unprepared or not knowledgeable in math to help students learn. Interviews with session leaders also revealed that some mentors did not attend training sessions that were designed to provide them with more resources and coaching on how to teach the content material. While this was something often mentioned more by mentors with education majors than STEM majors, we

found that STEM majors experienced challenges in teaching math in a different way. For example,

> "Sometimes when it comes to trying to explain a concept to them, I find it really hard to explain it or ask questions in a way that would help them understand it. I don't want to make it seem like I don't care about teaching, but I do. I just can't do it well." – Christina, non-Latinx, STEM major

Even though mentors in STEM majors understood the math content and knew how to do it themselves, it was difficult for them to explain it in terms that a middle school student could understand. Moreover, they often struggled to fine more than one strategy to explain math content. Although both education and STEM majors described difficulties with teaching math, there were nuances to what challenges they experienced.

Navigating Group Instruction. Most of the concerns about working with multiple adolescents in a group setting was related to whether Latinx and non-Latinx mentors were able to tailor the activities individually or whether they could assess if adolescents needed more support. Mentors mentioned that it was difficult to make sure that everyone was understanding the concept the same way or to determine if someone needed additional support. This concern was more evident among mentors who worked with adolescents from different grade levels. For example,

> "The most difficult part was when the groups had a variety of students, like students in different grade levels. In one of my groups there are two sixth-graders and then I have two eighth-graders and then a seventh-grader, so it's mixed. It can be difficult if the math activity has concepts or procedures that eighth-graders know well and that sixth-graders know nothing of." – Julie, Latinx, education major

For this category, both non-Latinx and Latinx mentors alluded to the challenges that were present when working with multiple adolescents. Some suggested that it was difficult to manage group dynamics or peer dynamics, especially if adolescents were seated next to their friends. This was also coded as mentors encountering challenges with establishing authority when trying to manage classroom behaviors, which will be discussed under the following categories.

Theme 2: Developing Relationships with Adolescents

Building Connections with Adolescents from Diverse Sociocultural Backgrounds.

When Latinx and non-Latinx mentors were asked to describe their relationships with their mentees, many mentioned how it was difficult to form connections with them or gain their trust. Mentors felt that their mentees were hesitant to share things about themselves or to see them as friends. Others thought that some were more shy and reserved than others. For example,

> "I think there was a line of, 'Oh, she's a mentor.' I felt like it was more of like, 'Okay, she teaches us,' not like a friendship kind of thing. I don't think they were very comfortable enough to open up in the beginning especially." – Sally, non-Latinx, education major

Sally described that in addition to her mentees not feeling comfortable with her it also seemed like they expected a teacher-student type of relationship. She felt that her mentees had a different perception of what her role was or that it would be similar to the ones they often encountered in school with teachers. In some ways, she alluded to the power dynamics that may exist in teacher-student relationships and how that might be different in an afterschool program.

More non-Latinx mentors than Latinx mentors mentioned having challenges with connecting with adolescents from diverse backgrounds. Some non-Latinx mentors found it difficult to connect with those adolescents who were English Language Learners and Latinx

adolescents whose racial and ethnic cultural backgrounds were different from theirs. As described by a mentor,

> "I couldn't get close to one student because we didn't speak the same language." – Aubrey, non-Latinx, education major

Some Latinx mentors mentioned that although they had different ethnic cultural backgrounds or grew up in different communities than the adolescents, they still had some similarities in terms of the language they spoke and other traditions. For this category, more non-Latinx mentors shared their experiences with working with students from diverse sociocultural backgrounds.

Establishing Authority or Gaining Respect. Having difficulties with establishing authority was something that non-Latinx mentors mentioned more compared with Latinx mentors. Their challenges were centered around managing classroom behavior, getting the adolescents to follow rules, or getting them to focus or engage with the math activities instead of talking with their friends. As one mentor clearly stated,

> "When you start to lose that patience and that control, that's when it starts to slip. You're older, but you're still not acting like an adult. You're acting like a middle school kid and it's not working very well. It's not helping anyone." – Katie, non-Latinx, STEM major

Oftentimes the difference between a friendship relationship and a youth-staff relationship was blurred to the extent that mentors felt like their mentees did not respect them or listened to them when they wanted to control a situation.

Mentors also mentioned difficulties with gaining respect from adolescents or finding ways to show them that they could be respected. Mentors described how some mentees would challenge them to see if they could gain their respect. As one mentor stated below,

> "I remember clearly getting to that table that first time I got there and I remember one of them telling me like, 'Oh, You're like the new mentor, right?' And they're like, 'We'll see how long you'll last.'"– Juan, Latinx, education major

Session leaders suggested in their interviews that some mentors found it difficult to gain students' respect because mentees questioned if the mentors' intentions were good. For example, adolescents wanted mentors who were there because they were interested in working with adolescents and not because it was for a grade or fieldwork hours for a college course. In addition, adolescents were hesitant to respect mentors if eventually they would leave the program.

Mentors also reported challenges with establishing boundaries. Boundaries were often spoken about in terms of making sure that mentors did not invade adolescents' privacy unless they were willing to share. Another way that mentors talked about boundaries was making sure that they did not cross the line when showing their mentees that they cared about them, such as giving them hugs or buying them gifts. For example,

> "I think the hardest part was not crossing the line. Because at the end of the day, they are students and so you want to be respectful." – Kim, Latinx, education major

Kim, describes how she was careful with how she interacted with her mentees. In the interview, she described that she would give her students high fives and was cautious when she hugged them to make sure they were comfortable with that type of affection. Other mentors talked about making sure that the students felt comfortable and did not feel forced or pushed to share things. Mentors wanted to make sure they did not cross any boundaries, but also found ways to gain adolescents' respect and trust.

Strategies Mentors Leveraged to Respond to Challenges

To address our second research question, we identified three overarching themes for strategies mentors used: Leveraging various program resources, utilizing teaching and learning techniques, and leveraging relationship skills. Within the overarching themes, six sub-themes or strategies were identified. Table 4.1 and Figure 4.1 highlight the different strategies mentors used to respond to specific challenges. Figure 4.2 highlights the unique ways that Latinx and non-Latinx mentors utilized these strategies.

Theme 1: Leveraging Various Program Resources

Seeking Help from Experienced Mentors. Overall, mentors mentioned that seeking help from experienced mentors was very beneficial especially if they felt supported by other mentors and felt welcomed to ask for help. Something that was important was that often times mentors were seated in a table with another more experienced mentor. This nurtured a network of mentors that were willing to help each other. Mentors referred to this as co-mentoring and allowing another mentor to step in for help. One mentor described,

> "There was a student who was struggling, so if I couldn't do the one-on-one with the student, then the other mentor would do it." – Ana, Latinx, STEM major

As shown in Table 1 and Figure 1, mentors sought help from experienced mentors when they experienced challenges with teaching math content, navigating group instruction, building connections with Latinx adolescents, and establishing authority or gaining respect. Figure 2, shows the similarities and differences in how Latinx and non-Latinx mentors engaged in these strategies. Both Latinx and non-Latinx agreed on using this strategy when faced with challenges on teaching math content and building connections with Latinx adolescents. Even though both Latinx and non-Latinx mentioned this strategy when building connections with youth it was described differently.

Only Latinx mentors mentioned using this strategy when facing difficulties with navigating group instruction and only non-Latinx mentors mentioned this strategy when facing difficulties with establishing authority or gaining respect. Latinx mentors described this strategy when mentioning that their non-Latinx co-mentors would ask them for help when interacting with adolescents. So not that they themselves used it, but more like they were part of this strategy when they would help their non-Latinx co-mentors. One mentor said,

> "I think she was very good with asking questions. If I started with, 'How was your week?' She was the one that kind of went into more details. If they mentioned something, then she was asking more specific questions." – Sally, non-Latinx, education major

Non-Latinx mentors felt that mentees were willing to share more things about their backgrounds to Latinx mentors. Latinx mentors described that their non-Latinx colleagues felt that they could provide more help because they shared similarities with mentees based on their racial/ethnic cultural backgrounds.

Attending Program Trainings. Latinx and non-Latinx mentors mentioned going to program trainings as a strategy they used when facing difficulties with teaching math content. Given that the trainings mostly focused on preparing mentors to facilitate program activities and learn about the activity content, these trainings provided non-Latinx and Latinx mentors with opportunities to speak with other mentors, session leaders, or program staff to learn about how to best teach a math concept. Mentors found the manuals, videos, or other resources given at the trainings to be helpful. As mentioned by a mentor,

> "The manuals are very detailed. Being able to study on the day before the actual meeting helped a lot. Even though I wasn't able to go to the trainings personally, I can see the impact that it made for the mentors and mentees. [The session leader] has circle time. We

all collectively met after our mentor-mentee time and talked about, what was good today, what was bad, what needs to be fixed?"– Aubrey, non-Latinx, education major

Some mentors also mentioned the importance of debriefing meetings that occurred after the enrichment sessions, which they referred to as circle time. These meetings happened in addition to the trainings and helped to support staff's teaching skills as well.

Theme 2: Utilizing Teaching and Learning Techniques

Engaging in Collaborative Learning. Engaging in collaborative learning was a strategy that was mentioned by both non-Latinx and Latinx mentors when facing nearly every challenge, including promoting motivation, teaching math content, navigating group instruction, and building connections with adolescents (Figure 1 and Figure 2). Below are two examples of how this strategy was used to promote motivation and navigating group instruction,

> "Considering it's a collaborative thing where we [are] vulnerable to each other. It's a very comfortable setting. So, [mentees] feel it's a lot easier to ask for help if they don't know anything. And since they're all in it together, they help one another out. I like how they're able to ask me for help." – Julie, Latinx, education major
>
> "They would ask me, 'Does this work?' I would say, 'Let's try it and we'll see.' If it didn't work then I was like 'Okay, so instead of doing this part right here, let's try this instead." I try to get some feedback…I would try to direct them towards teaching their friend and showing them how to do it…They try to work for each other and try to help each other." Ted – non-Latinx, education major

Collaborative learning allowed mentors and mentees to have fun working with adolescents and learning together to promote motivation. With collaborative learning, mentors and mentees felt comfortable to learn from each other, where mentors were not always seen as the experts and

mentees felt like they could contribute and have their voices heard. This helped mentors who faced difficulties with teaching math content and found that they could also rely on their students. Lastly, through collaborative learning, both non-Latinx and Latinx mentors were able to use encouragement, split the group into smaller groups, and encourage teamwork skills which helped students work with each other and helped mentors respond to challenges about navigating group instruction and building connections with adolescents.

Integrating Real-World Examples. Integrating real-world examples was a strategy that was mentioned by mentors as a way to address two challenges: promoting motivation and establishing authority or gain respect. However, only Latinx mentors used it as a way to establish authority or gain respect, whereas both non-Latinx and Latinx mentors mentioned it for promoting motivation (Figure 2). As described by the mentor below,

> "I know one time he came in with a bunch of dollar bills and he kept wanting to play with that instead of doing the activity. What I did was try to incorporate math into what he was doing. I was like, 'How much money would I receive if I got 5% of your money?' He would calculate in his head and give me his response." – Ana, Latinx, STEM major

Ana changed the math activity to reflect a real-world situation to spark the adolescent's interest in math, by asking how much is 5% of his money. In addition to using a real-world application with money, Ana incorporated her students' interests into the learning activity. If she would have told him to put away his money because it was "distracting" him from doing the current math activity, the student may have gotten upset or continued to be disengaged or unmotivated. Instead, the mentor leveraged what the mentee was already interested in and used it as a way to engage the student in learning math. Something similar can also be done if mentors use students'

sociocultural backgrounds, by knowing adolescents' interests and social identities, in their learning, which will be discussed under strategy 6.

Theme 3: Leveraging Relationship Skills

Engaging in Structured Non-Math Related Conversations and Activities. Engaging in structured non-math related conversations and activities was mentioned by mentors when responding to challenges with promoting motivation and building connections with adolescents. Both non-Latinx and Latinx mentors mentioned having used this strategy to promote motivation. Only Latinx mentors mentioned using this strategy when confronted with difficulties about building connections with adolescents. First, this strategy highlights how mentors used a program element, like structured activities, to develop a relationship with their mentees to promote motivation. Such activities included ice breakers, brain breaks, and presentations about college led by mentors. These activities were designed to help mentors and mentees learn new things about each other. For example,

> "During ice breakers, I know if they like sports or something like that. I can try to tie an ice breaker to [math] questions to get them engaged." – Jayleen, Latinx, education major

Second, these non-math related activities were used by mentors to provide opportunities for adolescents and staff to take much needed breaks from the math activity to re-engage in the math activity later once they felt re-energized. They described these activities as brain breaks.

> "Some students just don't want to be sitting there and doing math for two hours. If I started seeing [the students] really need a break, I'd be like, 'Hey, you know what? Take a break, stand up, stretch, go outside.'"– Trish, Latinx, STEM major

The quotes highlight how these structured non-math related activities and conversations, such as breaks or ice breakers, helped mentors promote motivation because they were used as a teaching

technique and as a way to develop relationships with adolescents. This was helpful especially for mentors who were more reserved or shy to ask students about their sociocultural backgrounds. Utilizing ice breakers was a great way to get mentors and mentees to have conversations and learn about their interests to keep them motivated. Providing brain breaks was a simple and helpful strategy that was used to teach students and help them stay motivated.

Leveraging Students' and/or Mentors' Sociocultural Assets Through Personal and Informal Conversations. Latinx and non-Latinx mentors mentioned leveraging students' and their own sociocultural assets through personal and informal conversations when they encountered three different challenges, namely promoting motivation, building connections with adolescents, and establishing authority or gaining respect. Specifically, mentors mentioned the importance of being aware of adolescents' racial/ethnic cultural backgrounds as well as youth culture centered on their specific interests or identities. This meant knowing other aspects of adolescents' sociocultural backgrounds, like what video games they enjoyed playing, what hip-hop trends they were into, or what hobbies they enjoyed. One mentor stated,

> "If I know that they like certain things, I try to bring it up during the lesson. Getting to know them was a big factor in getting them engaged. So, trying to change up the questions if they didn't seem to be engaged and making it easier for them. That made it easier for them to ask us questions about college or what our life is like in college." – Jayleen, Latinx, education major

Jayleen described that in order to get students motivated, she incorporated students' interests in the math activity or would talk with students while doing a math activity to learn more about them or have them ask her more questions about her life. Mentors suggested having conversations about each other's interests or cultures to motivate adolescents.

Mentors also leveraged adolescents' sociocultural assets when connecting with students from different sociocultural backgrounds to bridge cultural gaps. For example, one mentor described her experience interacting with a student who only spoke Spanish and had another adolescent serve as a cultural broker.

> **"**They did have friends that did speak English and would translate back and forth. We would try to talk and communicate as best as we could with that barrier. For that specific student, I would translate to their friend because I felt that friend was close to the person. Even though it was hard I felt we did communicate. She would nod or laugh or some stuff like that." – Aubrey, non-Latinx, education major

Mentors also leveraged their own sociocultural backgrounds to connect with adolescents, such as sharing interesting things about themselves. When mentors shared something about their sociocultural backgrounds, they did it in hope that their mentees would get encouraged to ask them questions or share things about themselves as well. For example, some mentors described that they wanted their mentees to understand that they were there because they wanted to help adolescents and wished to pursue a career in teaching. When mentors shared their personal goals with their mentees, mentors realized that mentees were more willing to share with them.

Discussion

Much of the literature on program quality of afterschool programs focuses on documenting and examining the features or correlates of high quality programs (e.g., Eccles & Gootman, 2002; Hirsch et al., 2011; Yu et al., 2021). Less work examines the challenges and complexities that occur when providing high quality programming (e.g., Gutierrez et al., 2017; Larson & Walker, 2010; Larson et al., 2015). In addition to documenting the challenges of providing high quality programming, researcher and afterschool advocates can capitalize on what

mentors already do to address these challenges to help frontline staff strategize on the specific strategies that can be utilized to overcome common challenges. Therefore, this study focuses on the challenges mentors faced when working with Latinx adolescents and the strategies they leveraged to addressed those challenges.

Our findings extend the PARC model (Hirsch et al., 2011) by examining the challenges frontline staff face with implementing three key aspects of program quality, namely facilitating program activities, establishing relationships with adolescents, and addressing culture. The model gives no mention of what frontline staff can do if problems with implementing these practices would arise – a gap in the literature that the current findings address. In order to implement and design high-quality programs, we must understand what high-quality programs look like, which is described in several models as well as anticipate the problems that might arise and how to address those problems, which have largely not been discuss. Though some scholar have documented the challenges that frontline staff face (Larson & Walker, 2010), these frameworks are broad and do not clearly identify which strategies can be leveraged to respond to specific challenges, which is necessary to provide a high-quality program. Our findings revealed that some common challenges frontline staff experienced, such as difficulties with promoting motivation or establishing connections with adolescents. Additionally, frontline staff are using specific strategies to respond to challenges, such as seeking help from experienced mentors or leveraging adolescents' sociocultural backgrounds through personal conversations. Although our findings do not reveal all the challenges that frontline staff may face and all the strategies that they can use, they provide insights on potential problems to anticipate and on how frontline staff can better be supported to strategize on how to react to those situations.

While the PARC model (Hirsch et al., 2011) mainly focuses on program culture, our findings extend this notion of culture by focusing on how it is embedded within all aspects of program quality. Culturally responsive frameworks (Simpkins et al., 2017; Williams & Deutsch, 2016) suggest that culture is embedded within all aspects of program quality not just at the level of the center. Moreover, this study used a dynamic view of culture that includes youth culture centered on adolescents' interests and identities in addition to racial and ethnic cultural background. We found that mentors mentioned challenges with being culturally responsive to adolescents' sociocultural backgrounds. For example, mentors expressed feeling unprepared to engage with Latinx mentees or not knowing how to start conversations with their mentees who were different based on their racial/ethnic backgrounds, age, and interests. One way that non-Latinx mentors responded to these challenges was to leverage other mentors' and students' sociocultural backgrounds to bridge cultural divides. In order to be culturally responsive, it is important to think about how adolescents' sociocultural assets (e.g., language, identities, interests) that they bring to the program may differ from their mentors' sociocultural assets and how to bridge cultural divides by bonding over similarities between people or by creating bridges with the help of others at the program.

Second, we contribute to the literature on culturally responsive practices by focusing on how frontline staff's sociocultural backgrounds played a role in the challenges they faced and the strategies they used (Ettekal et al., 2020; Hirsch, 2005). Findings from our study revealed how Latinx and non-Latinx mentors experienced similar and different challenges as well as used similar and different strategies to respond to the challenges (Figure 2). One area that both Latinx and non-Latinx experienced challenges in distinct ways was bonding with Latinx youth who were similar or different in terms of their ethnic cultural backgrounds. For example, Latinx

mentors acknowledged that their sociocultural backgrounds did not always match with their mentees although they shared similar racial and ethnic backgrounds. This is consistent with studies that focus on the heterogeneity (e.g., gender, nativity, socioeconomic status, language) that exists among the Latinx population and their experiences in afterschool programs (Ettekal et al., 2015; Ettekal et al., 2020; Hirsch et al., 2011; William & Deutsch, 2016). For instance, one study found how a Latino male staff member at an afterschool program found it difficult to develop a personal connection with a Latino adolescent who distrusted males based on his upbringing (Hirsh et al., 2011). Another study also found that though parents and adolescents saw benefits to having same-ethnic staff, they valued other features as well such as learning about other cultures from their peers (Ettekal et al., 2020). We found that mentors themselves can provide adolescents with opportunities to learn about other cultures, where they saw differences between their backgrounds and their mentees' as learning opportunities to learn about other cultures.

While much of the literature focuses on being responsive to youth sociocultural backgrounds, little research focuses on being responsive to frontline staff's needs and skills (e.g., Simpkins et al., 2017). In our study, we took mentors' education into account by focusing on their majors. Findings revealed nuanced ways in which math majors differed from education majors. Math majors expressed more difficulty with teaching the math content in terms that middle schoolers could understand, whereas education majors were concerned about not knowing enough math to really understand the concept and then teach it. This suggests the importance of training students not only to understand the math content, but also how to teach students who are younger or might need more scaffolding. As a result, to better prepare frontline

staff it is important to understand their strengths and needs to design trainings that will strengthen their skills or better support their needs.

Lastly, our findings contribute to the literature on youth-staff relationships by not only describing the different aspects and the challenges to developing these relationships, but also by suggesting how youth-staff relationships can be leveraged to promote certain outcomes (Rhodes, 2020; Soto-Lara et al., 2021). Although our intention was not to document how youth-staff relationships or staff play a role in promoting adolescent outcomes, we did find that one of the challenges that mentors described was promoting motivation or sparking adolescents' interest in the math activity. Both Latinx and non-Latinx mentors mentioned leveraging their relationships with adolescents to get them interested and motivated in learning more about math. For example, mentors reported engaging in collaborative learning or in structured conversations to make the math activities more fun and engaging for adolescents. Some mentors also highlighted how they were able to use their adolescents' sociocultural assets and bridge what they were learning with how it could apply to their unique sociocultural backgrounds. Overall, our work highlights the importance of frontline staff and the role they play in promoting adolescent outcomes.

Applied Implications

Findings from our study provide evidence-based recommendations for designing professional development trainings that can help frontline staff navigate challenges that may arise when being responsive to youth's backgrounds and that do not perpetuate a color-blind approach to working with youth. If frontline staff are not prepared to respond to different challenges when working with youth, it may lead to negative youth experiences (Gutierrez et al., 2017). Therefore, instead of ignoring or not addressing challenges it is essential that staff are better equipped to use various strategies to help them work with youth and be responsive to

youth's sociocultural backgrounds (Gutierrez et al., 2017). The findings from this study provide some guidance on how to use different strategies when confronting issues that staff may not be comfortable or feel prepared to address. For example, mentors mentioned that when they felt unqualified or unprepared to work with adolescents from different sociocultural backgrounds, they sought help from experienced mentors and other adolescents' to bridge cultural divides. Our goal was to illustrate common strategies that can be leveraged for various challenges and that can be used for training frontline staff. Thus, our findings highlight the importance of leveraging various strategies and the importance of taking individuals' sociocultural backgrounds into account when interacting with adolescents.

Furthermore, previous models of culturally responsive frameworks in afterschool settings (Simpkins et al., 2017; Williams & Deutsch, 2016) did not provide clear examples of how frontline staff and adolescents could bridge cultural gaps by focusing on culture beyond that of adolescents' racial and ethnic cultural backgrounds. We found that mentors reported building relationships with adolescents by learning more about their hobbies, interests, or social identities. Focusing on only racial and ethnic cultural assets, may limit the various ways that frontline staff can connect with adolescents. Our findings suggest that these connections with adolescents can be cultivated either from personal and informal conversations, structured conversations and activities, or from getting help from other experienced mentors who may already have connections with adolescents.

Lastly, as researchers and afterschool advocates, we can learn from the findings that it is important to structure and provide access to different types of professional development training opportunities and supports. Mentors reported that they gained valuable insights from receiving different types of support and resources (e.g., manuals, video clips) from trainings and meetings.

It is also important to foster a sense of community between frontline staff and other staff so that they feel comfortable working together to respond to challenges and improve the quality of an afterschool program. Overall, more work is needed to address ways to better structure and provide frontline staff with high-quality professional development and training.

Limitations and Future Directions

The present research emphasizes the importance of better preparing afterschool frontline staff by taking an in-depth examination of the challenges they experienced and how they responded to them. However, we are aware of the limitations that exist in our findings. First, we need to address that the findings reported are common challenges and strategies mentioned by mentors that were more salient to them. Therefore, Latinx and non-Latinx mentors likely experienced additional challenges and strategies that were probably not reported. More work is needed that focuses on the challenges and the strategies used by mentors from other sociocultural backgrounds. Future studies can also broaden their scope to include other domains of challenges and strategies that were not addressed in this study.

Future work should focus on how different aspects of frontline staff's sociocultural backgrounds may shape how they respond to challenges. This study focused on the challenges and strategies mentioned by Latinx and non-Latinx mentors, but it is important to consider diversity beyond race and ethnicity. Future research is warranted to focus on other aspects of frontline staff's sociocultural backgrounds, such as gender, socioeconomic status, and nativity. Our findings also show that it is important to be responsive to the needs of frontline staff. However, we did not specifically ask mentors about their skills or where they might need more support because we focused more on challenges and the strategies that they reported using. While much of the research focuses on what skills and competencies staff need to develop to

work with youth (Vandell & Lao, 2016), more work is needed on how to support and strengthen the skills that staff already have so they can draw upon when working with youth.

Lastly, our study focused on adult mentors in an afterschool activity that was part of a university-community partnership which provided mentors with various resources. It would be interesting to understand the experiences of frontline staff in different afterschool settings. For example, what challenges might frontline staff face in afterschool activities (e.g., sports or clubs) that usually last for a few months or that is competitive. There are also larger afterschool programs, such as the Boys & Girls Club, where the student-staff ratios are much higher than in afterschool enrichment activities (e.g., Mahoney, Larson, & Eccles, 2005; Mahoney et al., 2009). Given the nature of these afterschool activities, frontline staff may experience different challenges. Therefore, more work is needed to understand the challenges frontline staff might encounter based on program level factors that cannot be controlled, such as duration of a program, location of the program, and the mission statement of the program, and how that may shape their interactions with youth and the strategies they might use to respond to the challenges.

Conclusion

Frontline afterschool staff play a pivotal role in program quality and in adolescents' experiences (e.g., Deutsch & Jones, 2008; Jones & Deutsch, 2011; Larson et al., 2015), therefore it is important to focus on how to better prepare them for the afterschool workforce. Through adult mentors' perspectives, we can begin to understand their unique challenges that they encounter when working with adolescents. The findings from this study also highlight the nuanced and multidimensional strategies that can be leveraged to respond to specific challenges. In conducting this research, our hope is to shed light on the importance of understanding the experiences of frontline staff and supporting their work. By providing frontline staff with the

necessary resources and training to help them engage in best practices, we are hopefully strengthening and contributing to the future of high-quality afterschool activities.

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Appendix 4.1

Interview Protocol for Study 3

General Questions About Self

1. Tell me a little bit about yourself in general, outside of the afterschool program(major, year in college, etc.)
2. How would you describe yourself as a student?
3. How do you feel about math?
    a. What were your experiences with math during middle school?
    b. Do you think math is important? Why or why not?

Mentor Mindset

1. What are your thoughts about middle school students' ability to learn new things in math?
2. How much do you think students' math ability is due to talent or hard work or both?
3. What are your thoughts about Latinx students' and their ability to learn new things in math?
4. The mission of the afterschool program is to help underrepresented minority youth, how do you feel about that mission?

General Experiences

1. Next, I want to know more about your experiences in the afterschool program.
2. How long have you been a mentor in the afterschool program?
    a. Why did you apply to be a mentor?
    b. What has been the best part of the afterschool program for you?

Youth-Staff Relationships

1. Tell me about your relationship with your mentee(s)
    a. Are you close with your mentee(s)? Why or why not?
    b. What is the best part about your relationship with your mentee(s)?
    c. Compare a mentee that you are close with to a mentee that you are not as close with. How are they different and/or similar?
2. What has been the most challenging part in showing your mentee(s) that you care about them?
    a. How have you responded to the challenges?
    b. How have other mentors responded to these challenges?
3. In what ways do you show your mentee(s) that you care about them? In what ways do you show your mentee(s) that you respect them?
    a. For example, do you ask about their interests, do you try to build trust, do you provide them with information about college?
4. Tell me about a meaningful conversation or interaction that you had with your mentee(s). What did your mentee(s) say or do?
5. What has been the most challenging part in providing your mentee(s) with math-related support?
    a. How is it working with one versus multiple students at the same time?
    b. How have you responded to the challenges?
    c. How have other mentors responded to these challenges?
6. Describe what you do to support your mentee(s) with their math learning or with engaging with the math activities?
    a. For example, do you encourage them or take the time to explain things to them?

7. What do you think about the training you receive from the afterschool program?
    a. What type of support do you receive from the afterschool program?
8. Do you feel like you've gained or improved any skills as a mentor?
    a. If so, what specific skills?
9. Tell me about what you hope your mentee(s) learned from you?
10. What do you think your mentee(s) has learned about college as a result of working with you?
11. What do you think your mentee(s) has learned about math as a result of working with you?

Social Identities, Culture, and Context

1. The next few questions ask you about the idea of culture as it relates to your identities and the groups that you belong to. Have you heard of the word "culture" before?
2. People use the word culture to basically describe the ways people do things based on things like their language, their hobbies, their traditions, and social identities.
3. Does this definition make sense to you? [Pause to make participants reflect on the definition; provide examples or help as needed]

Next, we will do a short activity that will help you reflect on your culture by thinking about the groups/identities that are important to you. For this activity, we would like to know which groups you belong to and which of those groups/identities are important to you. Below are some examples:

Religious groups: Catholic, Jewish, Christian, Muslim…
Racial/ethnic identity: Asian, Black, Latinx, White, Middle Eastern, Mexican …
Gender identity: female, male, other…
Activities: guitar player, writer, gamer …
Social groups: math person, fraternity/sorority, student …

Which groups/identities best describe you? List as many as you would like in the diagram below.

1. Choose the 2 most important identities from your diagram and tell me a little bit about why these are important to you.
    a. How do the two identities match or not with your mentee?
    b. Do these identities affect/influence how you interact with your mentee(s)? Please explain.
2. Tell me about other identities that are important to you and match with your mentee(s).
    a. How are you and your mentee(s) alike/different in terms of the identities you have in your diagram?
    b. Do these identities affect/influence how you interact with your mentee(s)? Please explain.

[If it hasn't already come up, ask about gender and race and ethnicity:]

1. When you are asked to describe your gender, what do you say?
2. How do you feel about your mentee(s) being the same/different gender as you?
    a. How does your gender identity affect/influence how you interact with your mentee(s) at Math CEO? Please explain.
3. When you are asked to describe your race and ethnicity, what do you say?
4. How do you feel about your mentee(s) being of the same/different racial/ethnic group as you?
    a. How does your racial/ethnic identity affect/influence how you interact with your mentee(s) at Math CEO? Please explain.
5. If your race or ethnicity does not match the one of your mentee's, share something you learned about their culture

Table 4.1

Outline of Coding Framework: Challenges and Strategies

Challenges		Strategies	
Themes/Sub-themes	**Selected Quotes**	**Themes/Sub-themes**	**Selected Quotes**
Theme 1: Promoting adolescent participation and learning during math activities		Theme 2: Utilizing teaching and learning techniques	
Promoting motivation *Mentors mentioned having difficulty with motivating adolescents to participate or learn the math activities.*	"…always hard to bring the interest from disengaged students. We kind of understand it, because it's an afterschool program and your [middle school students] are done with school, but [they are] here to do math." – Eugene	Engaging in collaborative learning	"They'll all work together, but if there's some focus issues, they'll kind of split. I'll explain things to these two students and then the other one will kind of break it down to the smaller groups." – Katie
		Integrating real-world examples	"'Give me any sort of topic that you think math isn't included and I'll tell you how math is applied.' And they just had fun throughout the whole time. I could still hear them yelling, 'Oh my gosh, that's so cool. Math is in this thing and math is also in this other thing.' And they start thinking of other different concepts and trying to see how math is applied in that" – Julie
		Theme 3: Leveraging relationship skills	
		Engaging in structured non-math related conversations and activities	"One of the things that worked was if I started seeing like they really need a break, I'd be like, 'Hey, you know what? Take a break, stand up, stretch, go outside." – Trish
		Leveraging students' and/or mentors' sociocultural assets through personal & informal conversations	"We usually start with 'Hey how's your day?' like 'What did you do?' … basically not math-related conversations, trying to build your relationship with your students. Those conversations [are] usually about school, or family, friends." – Sally

Teaching math content *Mentors described their challenges with teaching math content that they were not familiar with or found difficult to explain to the adolescents.*	"Not having like that background to be as detailed as my co-mentor in math because she was a math major. I felt like that was challenging for me [because] I felt like I wasn't as helpful as I could have been if I had so much math background." – Aubrey	<u>Theme 1: Leveraging various program resources</u> Seeking help from experienced mentors: "If they still don't understand it, then I would ask another mentor for help." – Christina Attending program trainings: "I showed up to the training sessions, which were amazing, so I knew everything. I never felt unprepared and the lessons themselves were fun." – Kim <u>Theme 2: Utilizing teaching and learning techniques</u> Engaging in collaborative learning: "If I didn't understand, I myself sat with them and [said], 'let's work on this together.' It was mainly through collaboration" – Juan
Navigating group instruction *Mentors mentioned challenges with teaching math activities to a large group of adolescents while promoting engagement.*	"When you're teaching three student you might have to go [in] multiple different directions at some point." - Ted	<u>Theme 1: Leveraging various program resources</u> Seeking help from experienced mentors: "I responded by asking for help. It was just me with a big group of students. I spoke with the director. Thankfully, she provided me with more mentors within my group." – Emily <u>Theme 2: Utilizing teaching and learning techniques</u> Engaging in collaborative learning: "I did like teaching multiple students at one time, because they're able to share ideas off each other, explain it, and interact with each other. When we were reading a passage, I would divide [it]… this student reads the first paragraph and so on." – Ted
<u>Theme 2: Developing relationships with adolescents</u> Building connections with adolescents from diverse sociocultural backgrounds *Mentors described challenges with interact with adolescents from*	"Some mentees were very reserved to themselves, very quiet and I think that was like a challenge for me and how to interact with them and them interacting with me – Emily	<u>Theme 1: Leveraging various program resources</u> Seeking help from experienced mentors: "My first quarter, I was paired with another mentor…I learned from her the way that she would value and appreciate mentees during those sessions. Whether it was just getting to know them, like things she would ask about their day…or she would make comments about how good they were doing on the work…she ended up getting the mentees gifts at the end… I got that idea from her." – Jayleen

diverse sociocultural backgrounds.		Theme 2: Utilizing teaching and learning techniques Engaging in collaborative learning: "We try to make it like a social setting, a comfortable setting, where they're doing math, but they're not forced to. That environment helped to create that closeness between us." – Julie Theme 3: Leveraging relationship skills Engaging in structured non-math related conversations and activities: "I definitely got to know them during the school year, we do different ice breakers to get to know each other…If I know they like certain things to try and bring it up during the lesson to get them more engaged" – Jayleen Leveraging students' and/or mentors' sociocultural assets through personal & informal conversations: "I felt like she was also herself because I was able to talk to her and like ask her about her hobbies and stuff. We were able to bond over that because we had common stuff, like we both play volleyball and stuff like that." – Aubrey
Establishing authority or gaining respect *Mentors described challenges with establishing authority and gaining respect from adolescents in order to enforce rules, establish boundaries, and to bond with mentees.*	"My mentees, I know they didn't like me…I had the troublemakers. They don't want to pay attention to me. It was frustrating for a while" – Trish	Theme 3: Leveraging relationship skills Leveraging students' and/or mentors' sociocultural assets through personal & informal conversations: "The challenging part is showing them that you're not just doing this because you want the credit, but you want to actually help them. That you're trying to be personalized with them...shows that there's mutual respect and that we care." - Ted

Figure 4.1

Conceptual Model of Mentors' Challenges and the Strategies They Leveraged

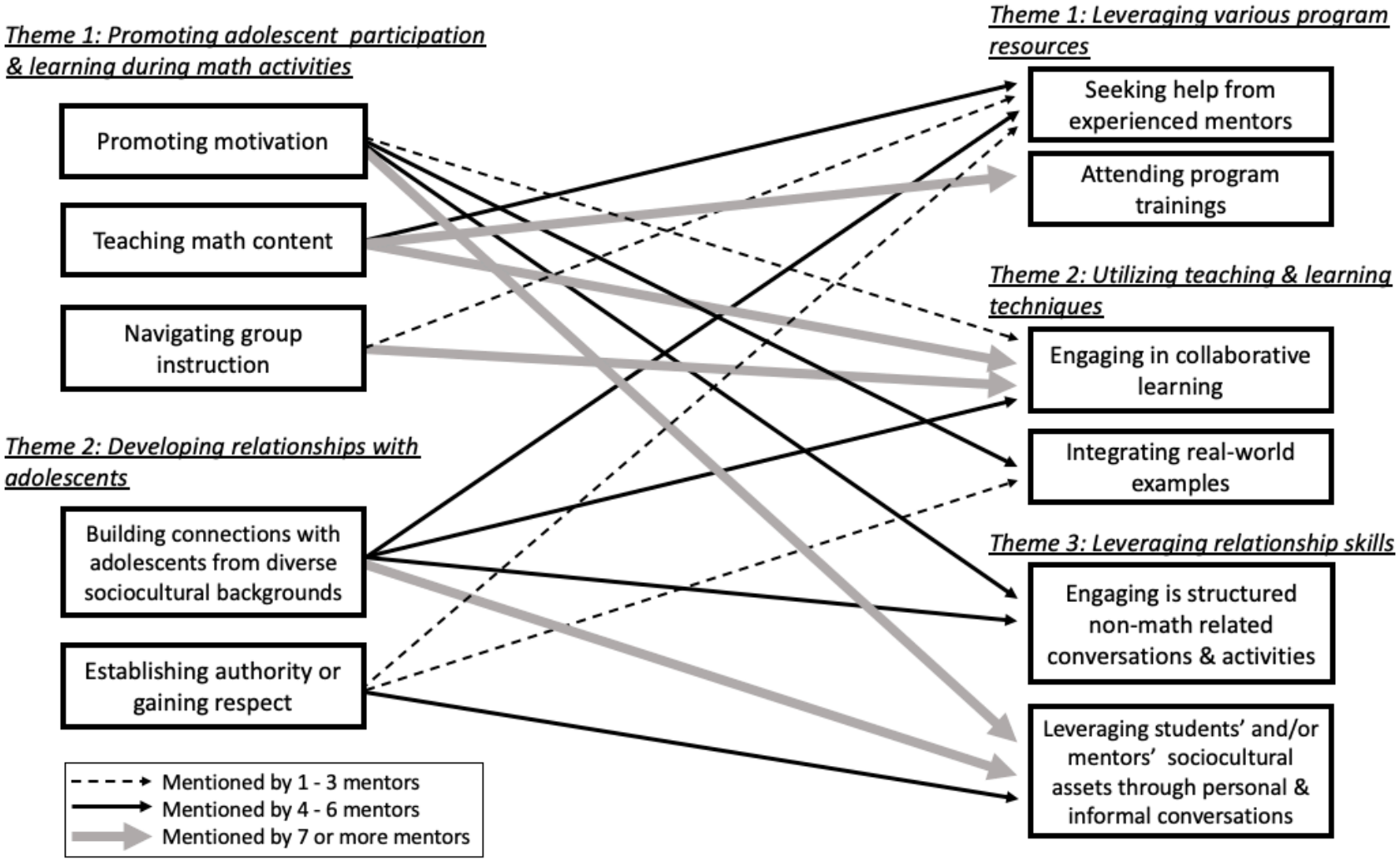
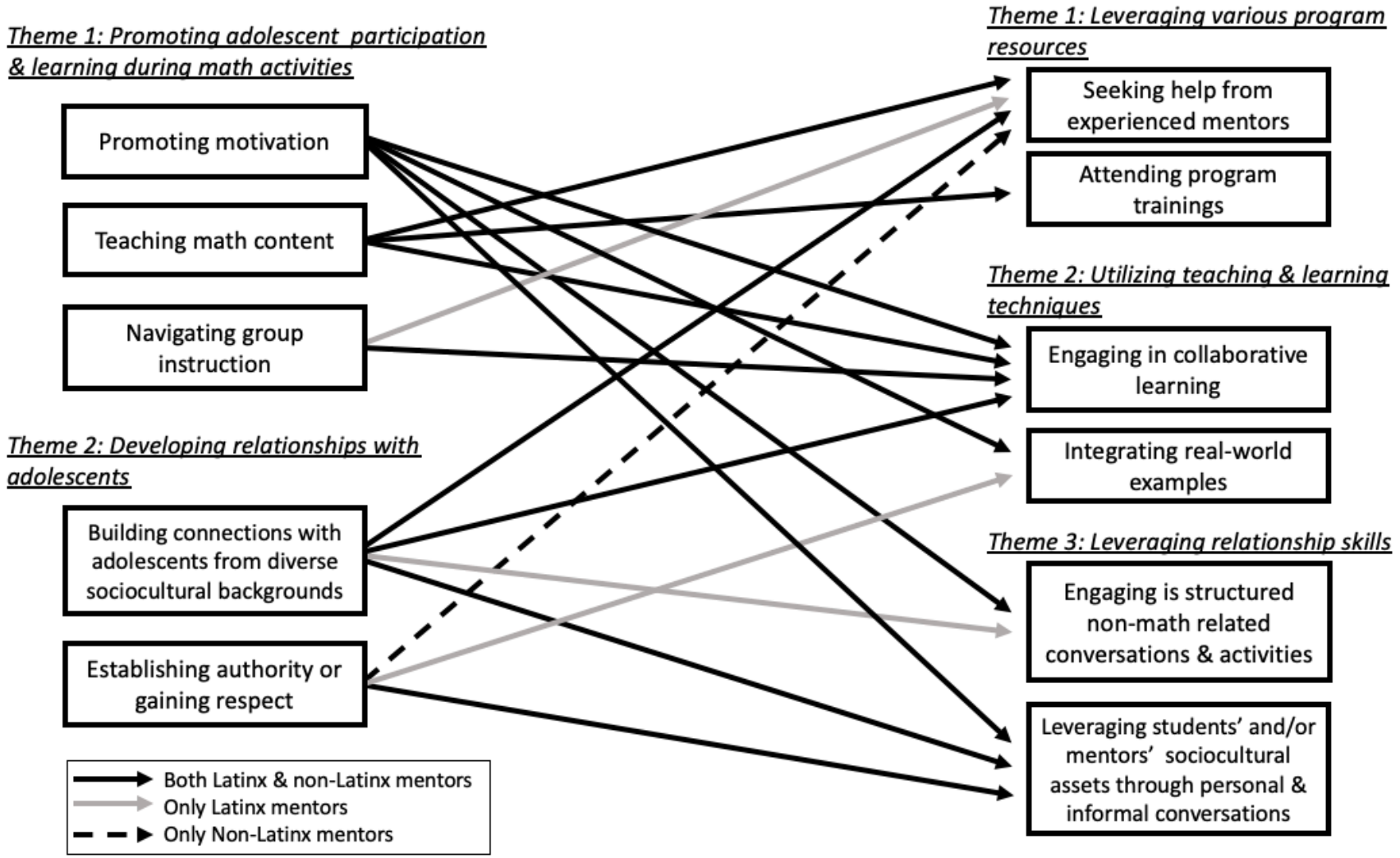


Figure 4.2

Conceptual Model of Latinx and Non-Latinx Mentors' Challenges and the Strategies They Leveraged



CHAPTER 5

GENERAL DISCUSSION

STEM organized afterschool activities have the potential to promote positive experiences and outcomes among under-represented adolescents (e.g., Allen et al., 2019; Vandell et al., 2015). However, there are gaps in the literature that need to be addressed. First, research suggests that only high-quality afterschool activities are associated with positive outcomes for adolescents (Allen et al., 2019; Durlak & Weissberg, 2007; Durlak et al., 2010; Vandell et al., 2015). Yet, most studies focus on whether participation is linked to outcomes with fewer focusing on how the quality of adolescents' experiences are linked to outcomes (Fredricks & Simpkins, 2012; Fredricks et al., 2017; Hirsch, 2005; Kataoka & Vandell, 2013; Vandell et al., 2015). Second, although the literature on high-quality afterschool programs is growing, more work is needed to document what quality looks like and what aspects of quality matter for adolescent outcomes (Eccles & Gootman, 2002). Third, much of the literature focuses on youth experiences and outcomes and less is focused on how to better support and train frontline staff who are vital for the quality of a program (Larson & Walker, 2010; Larson et al., 2015; Walker & Larson, 2006, 2012; Mahoney et al., 2010; Vandell & Lao, 2016). Lastly, little research focuses on how culture plays a role in all aspects of program quality, which is crucial to address when designing afterschool programs for under-represented adolescents that come from diverse sociocultural backgrounds (Hirsch et al., 2011; Simpkins et al., 2017; Williams & Deutsch, 2016). This dissertation addresses these gaps in the literature by drawing two main theoretical frameworks, namely the PARC model (Hirsch et al., 2011), and culturally responsive frameworks (Simpkins et al., 2017; Williams & Deutsch, 2016) to address three major aims covered by each paper: (1) to examine the extent to which program quality, measured as Latinx

adolescents' perceptions of culturally responsive practices, was associated with changes in Latinx adolescents' math motivational beliefs, (2) to document how youth-staff relationships and program activities promote math-specific outcomes, future STEM pathways, and social-emotional skills, and (3) to further understand the challenges frontline staff face and how they can be supported. In the sections below, I will focus on the overarching themes that emerged across the three studies: addressing why youth-staff relationships and program activities, as indicators of program quality, matter; addressing how culture and culturally responsive practices are embedded within youth-staff relationships and program activities; and suggesting ways to better design and improve afterschool settings by utilizing key findings to make recommendations for practice.

Youth-Staff Relationships as an Indicator of Program Quality

What do we know about youth-staff relationships as an indicator of quality? Much of the literature focuses on the general quality of youth-staff relationships (e.g., supportive and positive) (e.g., Akiva & Horner, 2016; Kataoka & Vandell, 2013; Pierce et al., 2010; Vandell et al., 2015). In other words, the quality of youth-staff relationships have been conceptualized as positive and/or supportive staff interactions with adolescents (Deutsch & Jones, 2008; Deutsch & Spencer, 2009; Ettekal et al., 2015; Halpern et al., 2000; Jones & Deutsch, 2011; Larson & Angus, 2011; Lauver & Little, 2005; Sullivan & Larson, 2010). What is missing in the literature is understanding the specific behaviors and practices that staff engage in to develop these positive, supportive youth-staff relationships (e.g., Rhodes, 2004). Two of the studies in this dissertation particularly focus on what staff do when interacting and building relationships with Latinx adolescents. For example, frontline staff can be supportive by taking the time to get to know the adolescents they are working with, such as asking them about their interests or hobbies.

Another way to help be supportive is by motivating and encouraging adolescents in what they are doing whether it is related to the activity content (e.g., finding the solution to a challenging math problem) or related to their future goals (e.g., being a scientist). This is important for key stakeholders to know in order to better support staff and improve the quality of experiences for adolescents and staff in an afterschool program. Therefore, the current dissertation contributes to the literature by documenting specific frontline staff practices and behaviors that can be leveraged to better support adolescents in afterschool activities.

Another gap in the literature pertaining to youth-staff relationships is that there is little research on how those relationships are associated to specific adolescent outcomes (Rhodes et al., 2000; Rhodes, 2020). Studies suggest that youth-staff relationships are important because they promote positive youth experiences (e.g., Kataoka & Vandell, 2013; Pierce et al., 2010); however, they are not clear in terms of which specific staff behaviors lead to which specific adolescent outcomes. To address this gap, my dissertation focused on what specific staff practices might shape adolescent outcomes. Findings from Study 2, for example, suggest that adolescents thought collaborative learning helped develop their math-specific outcomes (e.g., gaining new problem-solving skills). Adolescents thought frontline staff's engagement in informal conversations, moral support, and promoting teamwork helped bolster their future STEM pathways and relationship skills. This is important for afterschool advocates to understand when designing and improving afterschool settings because they can better leverage staff practices that may promote outcomes aligned with the program's goals or mission statements. Moreover, much of the literature focuses on adolescent outcomes centered on the activity content, such as developing math motivation by participating in a math afterschool program (e.g.,MathGirls) (Chittum et al., 2017; Kim et al., 2006; Krishnamurthi et al., 2013;

Morales et al., 2011; Peppler et al., 2006). Findings from this dissertation revealed that frontline staff play a critical role in shaping outcomes beyond the activity content. For example, frontline staff have the ability to promote relationship skills that are needed throughout one's life to be successful in various contexts and can shape adolescents' career pathways in STEM as they engage in collaborative learning and in informal conversations. Overall, this dissertation highlights how specific frontline staff practices have the potential to promote specific adolescent outcomes and that frontline staff in STEM programs shape adolescent outcomes that are beyond that of the activity content (e.g., relationship skills).

Culturally Responsive Practices in Youth-Staff Relationships

The NRC report on community programs (Eccles & Gootman, 2002) suggests that in order for any program to be effective, it is important to be sensitive to youth's cultural backgrounds. The PARC model (Hirsch et al., 2011) focuses specifically on the center culture, but does not clearly outline how culture is embedded within the other aspects of program quality, including youth-staff relationships. Therefore, this dissertation addresses a scholarly gap by drawing on culturally responsive frameworks (Simpkins et al., 2017; Williams & Deutsch, 2016) that highlight the importance of understanding race, ethnicity, and culture and the role they play in youth-staff relationships. In other words, we cannot fully understand youth-staff relationships if we do not take into account adolescents' and frontline staff's sociocultural backgrounds and what assets they bring with them to the afterschool programs. Findings from this dissertation revealed that during informal conversations adolescents shared with their mentors aspects about their sociocultural backgrounds (e.g., ethnic cultural background) as a way to connect with them. In these informal conversations, adolescents felt safe and heard by their mentors when they shared different things about their own backgrounds (e.g., speaking Spanish or growing up in

different/similar communities). It is important for mentors not to have a color-blind approach and engage in meaningful conversations that are important for adolescents. Moreover, mentors expressed how sharing their sociocultural backgrounds with adolescents provided a way for adolescents to feel more connected with them and to be more motivated to engage in the activities. Specifically, when mentors shared their interests for learning about other cultures (e.g., learning Spanish), adolescents were more willing to get to know their mentors, share things about themselves, or work with the mentor on math activities. The studies in this dissertation reveal how staff can engage in culturally responsive practices and why they are important for adolescents' experiences in an afterschool activity.

Though culturally responsive frameworks (Simpkins et al., 2017; Williams & Deutsch, 2016) primarily focus on racial and ethnic cultural backgrounds, this dissertation extends these frameworks by highlighting culture beyond that of an individual's racial and ethnic cultural background. The studies in this dissertation emphasize the need to think about the whole individual and the different sociocultural backgrounds that they bring into an afterschool activity. For example, adolescents described teaching their mentors about youth culture (e.g., hip-hop language references, dance, or music), such as 'dabbing' or saying 'fleek,' and mentors being responsive by being open to learning about adolescents' interests or hip-hop references. By engaging in informal conversations, where mentors valued adolescents' perspectives, mentors were able to establish supportive relationships with them. Mentors also reported being responsive to adolescents' interests by engaging in reciprocal relationships or conversations where they also shared their interests with adolescents and bonded over shared interests (e.g., skateboarding or playing basketball). By focusing on the sociocultural assets that individuals

bring into the afterschool program through a strength-based approach, this dissertation challenges deficit notions of working with under-represented adolescents.

Implications for Practice

With the rise of diversity among the U.S. population, it is important to improve and to design equitable STEM afterschool programs that serve historically marginalized populations. Particularly for frontline staff, it is important that they are better prepared and supported to work with adolescents from diverse sociocultural backgrounds. Therefore, the findings in this dissertation provide evidence-based recommendations on how frontline staff and other afterschool advocates can engage in culturally responsive practices that are important for program quality. Findings from this dissertation reveal that it is crucial to understand culturally responsive practices when establishing cross- and co-ethnic youth-staff relationships. In Study 3, non-Latinx mentors reported feeling less prepared to interact with Latinx adolescents compared with Latinx mentors. Something that they did to help bridge cultural gaps was to seek help from other experienced mentors who already had connections with the adolescents. Although frontline staff in co-ethnic youth-staff relationships might be able to connect with adolescents in different ways than frontline staff in cross-ethnic relationships, sharing a similar racial/ethnic background does not guarantee that the individuals in the relationship will form a positive relationship (e.g., Hirsch, 2005; Hirsch et al., 2011). Latinx mentors who reported challenges about bonding with Latinx adolescents suggested engaging in structured activities (e.g., ice breakers) to help spark conversations and learn more about adolescents' interests. Another helpful strategy mentioned by mentors was leveraging their own sociocultural backgrounds and talking about their interests to encourage adolescents to share things about themselves. As a researcher, I learned that in order to engage in culturally responsive practices, frontline staff need to 1) be willing to learn about

adolescents' sociocultural backgrounds, 2) be willing to share their own sociocultural backgrounds with adolescents, 3) not take a color-blind approach to working with adolescents and check their biases, 4) embrace differences and similarities, and 5) leverage each other's sociocultural assets to build a relationship (see Study 2 and Study 3).

Moreover, to better support frontline staff to work with under-represented students, it is important to be responsive to staff's needs and skills. Do afterschool programs offer training or workshops for frontline staff to help them strengthen their interpersonal skills to work with adolescents? What are the things that are taught in the trainings? This dissertation revealed that frontline staff need to learn not only about the activity content and teaching, but also how to establish relationships with adolescents. In Study 3, mentors revealed that they connected with adolescents by asking them about their day or sharing with adolescents fun facts about them. However, not all mentors knew how to engage in these conversations or felt shy. Therefore, the findings highlight the importance of designing professional trainings and workshops for frontline staff where they can strengthen their interpersonal and communication skills to work with adolescents. Based on this dissertation, it is important for programs to think about 1) how to design high-quality staff trainings that help strengthen frontline staff's skills to work with adolescents and be culturally responsive, 2) how to foster staff networks where they feel comfortable leaning on and learning from each other, 3) and how to provide staff training that support their strengths and can be tailored based on their sociocultural assets. Overall, the goal is that frontline staff are able to leverage different strategies that will help them develop relationships with adolescents.

Program Activities as an Indicator of Program Quality

Though it is important to examine and design program activities related to the activity content, like teaching math in a math afterschool activity, incorporating activities that are not on the activity content can provide students and staff with opportunities to strength their relationships or promote engagement. Findings from Study 3 revealed that adolescents and mentors appreciated when some activities were not on math (e.g., ice breakers or brain breaks). These non-math related activities encouraged more communication between mentors and adolescents. Additionally, these breaks sparked adolescents' motivation to learn math. These activities helped strengthen youth-staff relationships or helped adolescents reset – both of which help adolescents' further engagement in the primary activity content. Therefore, more work is needed that examines how programs can build time for youth and frontline staff to build relationships and how they may be linked with other adolescent outcomes, such as sparking youth's motivation and engagement.

The PARC model (Hirsch et al., 2011), suggests that program activities have the potential to promote adolescent adjustment. However, studies do not focus on what aspects of program activities matter, such as how they are facilitated, structured, or implemented by frontline staff (e.g., Vandell & Lao, 2016; Yu et al., 2021). This dissertation contributes to the literature by documenting what aspects of program activities are considered important based on adolescents' perspectives and how these aspects of program activities may be linked with their adjustment. For example, findings from Study 2 highlight that incorporating advanced concepts and real-world examples, facilitating campus tours, and engaging in collaborative learning were related to a range of adolescents' math-related outcomes (e.g., problem-solving skills), future STEM pathways, and relationship skills. In conclusion, it is not only important to look at what content is

being taught, but *how* it is being taught which can affect adolescents' motivation during a developmental period when motivation tends to decline (e.g., Gottfried et al., 2001).

The findings also align with the PARC model (Hirsch et al., 2011) in that program activities were intertwined with youth-staff relationships. In order for program activities to benefit adolescents, youth-staff relationships play a role in how the program activities are structured and executed. For example, Study 2 found that collaborative learning is centered on how adolescents and frontline staff work together to engage with the program activities. Therefore, the quality of the youth-staff relationship shapes how program activities are implemented and can potentially lead to positive outcomes. We can also think about how program activities can help build youth-staff relationships. Mentors in Study 2 revealed how engaging in ice-breakers helped with building relationships with adolescent, where they learn more about adolescents sociocultural backgrounds. Therefore, it is important to understand how positive youth-staff relationships and implementing program activities are intertwined and can lead to positive youth experiences in afterschool programs.

Culturally Responsive Practices in Program Activities

This dissertation drew on culturally responsive frameworks (Simpkins et al., 2017; Williams & Deutsch, 2016) to document how adolescents' and frontline staff's sociocultural backgrounds shape the program activities. For example, consistent with other studies, adolescents in Study 2 mentioned the importance of using real-world examples in their learning and how staff were able to incorporate these to make learning fun and engaging (e.g., Krishnamurthi, 2017; Peppler & Glosson, 2013; Sahin et al., 2014). These findings underscore the importance of designing program activities that are youth-centered and are based on adolescents' sociocultural backgrounds. This is particularly important as studies have

documented how using superficial or false representations of adolescents' culture in designing program activities may result in negative experiences (Ettekal & Simpkins, 2019; Herrera, 2016). Therefore, it is important that researchers and afterschool advocates incorporate culturally responsive practices that are based on true representations of adolescents' sociocultural backgrounds.

Implications for Practice

It is critical for researchers and afterschool advocates to design program activities that are youth-centered, based on youth's and staff's sociocultural backgrounds, and that allow staff to work collaboratively with youth (e.g., Ettekal & Simpkins, 2019; Ettekal et al., 2020; Lin et al., 2015). Findings from Studies 2 and 3 revealed that adolescents and mentors perceived changes in adolescents' math-related outcomes (e.g., problem-solving skills and math motivation) when program activities were tailored to students' interests. In Study 3 a mentor mentioned that when she incorporated an adolescents' interest in the math activity the adolescent was more motivated to learn. Another mentor mentioned how one of her students was disengaged in the math activity and was more focused on playing with his money. To spark the adolescents' interest in the math learning, she made playing with the money part of the math activity and asked him how much he would have left if she took a percent of his money. This dissertation highlights how program activities that are culturally responsive have the potential to make significant impacts on adolescents' experiences in the program.

Given that frontline staff play a significant role in how program activities are facilitated in afterschool settings, it is important to provide them with resources and help them brainstorm about the various strategies they can leverage to facilitate activities and interact with adolescents when engaging in the activities. This dissertation highlights the importance of frontline staff

training and can also lean on each other to help each other respond to challenges. Study 3 shed light on how some mentors faced difficulties with providing and engaging in program activities. For example, mentors found it difficult to teach math content or to find different ways to explain a math concept, especially if students came from different sociocultural backgrounds. Other mentors mentioned difficulties with engaging in collaborative learning where they would have to work with multiple students from diverse sociocultural backgrounds. To overcome these challenges, mentors relied on attending program trainings or meetings where they could be supported in strengthening their teaching skills. They also relied on help from other experienced mentors. Because there is no one-size-fits-all approach to designing program activities, it is important that staff learn how to tailor program activities that leverage adolescents' skills, knowledge, and sociocultural backgrounds. This may include things like asking adolescents what their interests are and changing the content of the activity to align with adolescents' interests. Therefore, it is important that staff are provided with high-quality training where they can learn about these strategies and where they can strengthen their teaching and relationship skills to work with adolescents when engaging in various program activities.

Limitations and Future Directions

Though the current dissertation sheds light on best practices and how to better design and improve program quality in afterschool practices, it is also important to note that these recommendations may not be suitable for all settings and the students they serve. For example, this dissertation focused on one specific afterschool program that served Latinx adolescents from under-resourced middle schools. The intention of the studies was not to generalize or convey a one-size-fits-all approach, but to offer key insights that may contribute to supporting other afterschool settings or that may elicit conversations around similar issues that need to be further

investigated. With these key insights, afterschool advocates and researchers might be helpful in designing and improving afterschool programs, such as making sure they are youth-centered and that program activities are not based on false representations of adolescents' sociocultural backgrounds. Overall, more research is needed that focuses on different afterschool settings serving diverse student populations.

Moreover, the studies were based on adolescents' and frontline staff's perspectives and were more likely to report experiences that were more salient to them. Future research can examine similar issues while taking into account the perspectives of other key figures who shape afterschool activities, such as parents, afterschool directors, or other staff. For example, one study found that some Latinx parents in an afterschool program wanted activities centered on American culture, whereas other Latinx parents preferred activities that were focused on Latinx ethnic culture (Ettekal et al., 2019). Parents' preferences in what is taught in an afterschool program is important to consider because they play a key role on whether adolescents attend an afterschool program or not (Liu et al., 2018; Vandell et al., 2019). Additionally, the studies in this dissertation focused on an afterschool activity that served predominantly Latinx adolescents and who worked with Latinx or non-Latinx mentors. Future studies should explore perspectives from adolescents and frontline staff who come from other sociocultural backgrounds.

Though Study 1 focused on the extent to which culturally responsive practices were associated with adolescents' math motivational beliefs, which has rarely been examined quantitatively (or qualitatively) in prior research (Leonard et al., 2018; Yu et al., 2021). Our findings revealed the importance of focusing on culturally responsive practices. However, to my knowledge there are only two quantitative measures on culturally responsive practices (Dickson et al., 2016; Siwatu et al., 2017). Of these two quantitative measures, one focuses on teachers'

beliefs and abilities to be culturally responsive and the other one is on students' perceptions of culturally responsive teaching practices (Dickson et al., 2016; Siwatu, 2007; 2017). Though we adapted these measures, they also based on culturally responsive practices in classroom settings, with questions based on teaching, curriculum, and classroom management. Given that afterschool settings are distinct from classroom settings, such as having smaller staff-student ratios, using inquiry based curriculum, and providing more opportunities for stronger youth-staff relationships, these measure may not adequately capture all that staff do to be culturally responsive. More work is needed to explore the culturally responsive practices in afterschool programs to develop better quantitative measures that capture the a comprehensive set of staff practices and behaviors that may differ from what teachers do in a classroom setting. There are examples of this in the qualitative data in this dissertation. For example, in Study 3 mentors mentioned how they tailored math activities to incorporate adolescents' interests or identities or connected with adolescents based on youth culture (e.g., language, hip-hop trends, or adolescent identities). Therefore, more research is needed on developing a measure of culturally responsive practices in afterschool settings. Overall, it is important that researchers continue to look for ways to quantitatively measure culturally responsive practices.

Conclusion

As current trends in afterschool activities have focused on serving under-represented adolescents and designing equitable STEM enrichment activities, the aim of this dissertation was to further explore the importance of designing high-quality afterschool activities and the importance of taking into account culture when considering different aspects of program quality. The findings from this dissertation emphasize that culture is embedded in aspects of program quality, specifically in youth-staff relationships and program activities. Furthermore, the findings

provide an in-depth examination of what culturally responsive practices look like and why they are integral to program quality. In order to further explore these processes, this dissertation focused on both adolescents' and frontline staff's perspectives in order to get a more holistic understanding of program quality in an afterschool activity. Findings from the current dissertation also provide applied implications that can be used by afterschool advocates, researchers, and other practitioners that are concerned about the students they serve and how to best design and improve the quality of afterschool activities.

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