

Parent Support of Mexican-Descent High School Adolescents' Science Education: A Culturally Grounded Framework

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Abstract

The aim of this study was to use sociocultural perspectives to elaborate on Eccles' parent socialization model and create a culturally grounded, multidimensional model of parent support among Mexican-descent families. Given Latinx underrepresentation in science, technology, engineering, and mathematics careers, we focus on science as an important domain in which to study parent support. Using a qualitative approach, this study examines (a) what forms of parent science support do Mexican-descent parents and adolescents perceive as best practices and (b) what are the social, cultural, and contextual barriers parents face and in what ways do parents continue to support their adolescents in science in spite of those barriers? Seventy-four parent (mean age: 40 years; 23% U.S.-born and 77% Mexico-born) and 73 adolescent (mean age: 15 years; 41% female) interviews were analyzed using inductive and deductive approaches. Findings suggest that parents use traditional and nontraditional culturally grounded forms of support: involvement at home, providing words of encouragement (e.g., *échale ganas*), and leveraging resources (e.g., kin support). Participants felt work-related

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barriers, linguistic barriers, and limited science knowledge shaped parents' support. Results highlight the unique ways parents support their adolescents' science education as well as the need for educators to consider how parents' sociocultural experiences shape their support.

Keywords

parent support, Mexican, Latino, adolescent, culture, science, family involvement

Let's say he wants science, just be there for him, even if you don't understand it, try and get involved. You know, whatever they want, experiments, whatever they need, just get them what they need, just be there for them.

—Sofia¹

Sofia's reflection on the importance of supporting her children's education in various ways aligns with the literature on parent support of children's science education (e.g., Hill & Tyson, 2009). With a growing national interest in strengthening the science, technology, engineering, and mathematics (STEM) pipeline, more attention recently has been placed on how parents support their children in specific STEM domains (e.g., Aschbacher et al., 2010). Although the STEM pipeline has been a national concern for all youth, taking a deeper look into parental support for Latinx adolescents' science outcomes is critical. Statistically, Latinx are the second largest ethnic group in the United States representing 17.8% of the population, but only account for 7% of the STEM workforce (U.S. Census Bureau, 2017). This study specifically focused on science as an important domain in which to study parent support due to Latinx individuals' underrepresentation in science occupations and degrees as well as the potential loss of social mobility due to institutional inequalities.

The Latinx STEM leaky pipeline can be partly explained by institutional inequalities and the structural barriers that Latinx students face during their K-12 education, such as academic tracking, less exposure to high-quality teachers, and attending underresourced schools (e.g., Adelman, 2006; Conchas, 2001; Flores, 2007; Tyson et al., 2007). Empirical evidence suggests that parent support predicts the academic achievement for Mexican-descent adolescents (e.g., Altschul, 2011) and is considered a central reason for why Latinx students persist in the STEM pipeline (Aschbacher et al., 2010; Peralta et al., 2013; Taningco, 2008). However, little is known about Latinx parent support for adolescent outcomes in science (e.g., Aschbacher

et al., 2010). In addition, definitions of parent support of children's education that have traditionally been used in research are typically grounded in mainstream models based on White, middle-class families (e.g., Jeynes, 2003). Such narrow definitions do not fully capture the unique ways Latinx parents support their children and often portray parents as not involved (e.g., Auerbach, 2007; Hill & Torres, 2010).

The aim of the current study is to enrich existing models of parental support by utilizing sociocultural perspectives. This study uses qualitative findings to highlight the culturally grounded, multidimensional nature of parent support among Mexican-descent families, which is the largest Latinx ethnic group within the United States. Because the literature on Mexican-descent parental support in science is quite limited, we draw on the literature of parental support in science for other ethnic/racial groups and the literature of Mexican-descent parental support of academics in general (which is not subject-specific).

Ecological Model of Parent Support in Adolescents' Education

According to the Eccles' (1993) parent socialization model, which is an extension of the expectancy-value theory, parents play a crucial role in their children's education through a variety of behaviors. Although we focus on science, parents can support their children with similar strategies in other academic domains. Parents hold beliefs and values about their children that shape their supportive behavior, including role modeling, helping on schoolwork, giving encouragement, and providing resources and opportunities for their youth among other behaviors (Eccles, 1993). Scholars have used this model to examine how parental support at school and home influence youth's motivational beliefs and achievement in a variety of academic domains, including English and math (e.g., Simpkins, Fredericks, & Eccles, 2015). Although much of the literature focuses on White, middle-class families, these same models have been used to describe parental support among Mexican-descent families (e.g., Altschul, 2011; Ceballo et al., 2014; Jeynes, 2003). Altschul (2011), for example, found that Mexican American parents supported their children's academic achievement by participating in school events, providing resources, engaging in school-related conversations, and participating in enriching activities.

The literature on science recognizes the key role that parents play in influencing youth's identification with, achievement in, and motivation in science (Archer et al., 2012; Harackiewicz et al., 2012; Jodl et al., 2001; Rice et al.,

2013). For example, findings based on the nationally representative Longitudinal Study of American Youth data set suggest that parents' values and beliefs predict adolescents' math and science outcomes (e.g., motivation) (Wang & Staver, 2001; Wilkins & Ma, 2003). Among Latina middle school youth, science-related experiences at home (e.g., parent support of science careers) was one aspect that is associated with Latinas' science identity (Kang et al., 2019). Another study found that Latinx and White parents' support through coactivity, positivity, and school-focused behaviors was related to adolescents' ability of self-concept and value in biology, chemistry, and physics (Simpkins, Price, & Garcia, 2015). In addition, parents play a crucial role in youth's science persistence, where Latinx youth who persisted in science were more likely to have parents who encouraged them and had high expectations for them to do well (Aschbacher et al., 2010). The emerging literature on Latinx adolescents' science outcomes suggests parents matter; however, many of these studies are grounded in mainstream American models of parenting and give less attention to Mexican-descent culture.

Culturally Grounded Parent Support

Although there is much empirical support for Eccles' (1993) parent socialization model, there are limitations when it comes to addressing parent support among Mexican-descent families. The model argues that the cultural milieu of families affects parent support; however, the model offers less guidance on how culture plays a role. According to the parent socialization model (Eccles, 1993) and bioecological theory more broadly (Bronfenbrenner & Morris, 1998), culture is theorized as an external force that influences parenting. Rogoff (1993) and other sociocultural theorists argue that culture is not an external influence, but rather it is inseparable from one's behavior and settings. Although this distinction may seem subtle at the first glance, Vélez-Agosto and colleagues (2017) discuss the implications of this shift in a recent theoretical piece. Grounded in sociocultural frameworks, Vélez-Agosto and colleagues' cultural microsystem model argues that culture is inseparable from the processes that transpire within all bioecological systems (e.g., microsystems). In this paper, we apply their broad model to the family microsystem, and parent support specifically where culture should shape parent science support in two ways: (a) elaborates on culturally grounded nontraditional forms of parent support and (b) addresses the social, cultural, and contextual barriers that shape parent support and the extent to which parents continue to support their adolescents in spite of these barriers.

First, to better understand how culture is embedded within parent support among Mexican-descent families (Vélez-Agosto et al., 2017), we need to

understand how families conceptualize being involved that may be different from traditional forms of parent support. Because the literature on parent support in science among Mexican-descent or Latinx parents is lacking, we draw on the broader literature on Latinx parent support of their children's education. Mexican-descent parents define their roles in terms of *apoyo* (support) which includes various forms of engagement from instilling moral values to providing resources (e.g., Auerbach, 2007; Nava, 2012). For example, Azmitia and Brown (2002) found that in addition to engaging in parenting behaviors outlined in Eccles' (1993) parent socialization model (e.g., role modeling), Latinx parents also provide *consejos* (advice) and teach their youth values (e.g., respect) to help them succeed academically. Similarly, other scholars have documented how parental cultural beliefs and values (e.g., *respeto and el buen camino*), adages, and life lessons are ways in which Mexican-descent parents support their children's education (e.g., Azmitia & Brown, 2002; Delgado-Gaitan, 1994; Rios Vega, 2014). For example, Lopez and colleagues (2001) found that Mexican-descent parents encourage their youth to succeed academically by providing them with life lessons that teach them to value education, such as highlighting struggles with working in low-paying jobs. In relation to *familism values*, a strong sense of family unity, Mexican-descent families engage in nontraditional forms of support by leveraging their kin support to provide resources and guidance for their children (Sánchez et al., 2006; Stanton-Salazar, 2001). Notably, these nontraditional forms of support (e.g., *consejos*) are discussed in separate studies for general academic outcomes and, to our knowledge, scholars have not looked at all of these nontraditional forms of support together or in science. The goal of our first research question is to unpack the various ways in which Mexican-descent parents support adolescents' science outcomes, including those beyond traditional forms of support.

Second, sociocultural perspectives offer insights into how social, cultural, and contextual barriers shape the ways in which Mexican-descent parents support their adolescents (e.g., Eccles, 1993; O'Sullivan et al., 2014; Peralta et al., 2013; Vélez-Agosto et al., 2017). Much of the current literature focuses on education in general and not science specifically. Often parent support models highlight parent behaviors (e.g., speaking with teachers) within contexts (e.g., school involvement) that may come with specific challenges for Mexican-descent parents (e.g., N. E. Hill & Torres, 2010; Nava, 2012; Suárez-Orozco & Suárez-Orozco, 2009). For example, the literature on parent socialization among Mexican-descent families suggests that parents often feel misunderstood by schools that lack bilingual staff, which might be a stronger concern for Mexico-born parents (Hill & Torres, 2010; Suárez-Orozco & Suárez-Orozco, 2009). Even when parents attend events designed

to increase parental involvement, there is often a cultural mismatch between what schools and parents expect (e.g., Delgado-Gaitan, 1991; Hill & Torres, 2010). Given these cultural gaps, Mexican-descent parents may support their adolescents in science in other ways (e.g., providing resources or encouragement) that do not necessarily put them in direct contact with the school. Many Mexican-descent families also work multiple low-paying jobs, limiting the amount of time parents have to work with their adolescents on schoolwork (e.g., Hill & Torres, 2010; Nava, 2012), which includes working on science-related projects. Finally, parents with more limited education may struggle to support their high school children in advanced science courses (e.g., O'Sullivan et al., 2014). Even though Latinx remain underrepresented in science fields, much of the literature focuses on Mexican-descent parents support of their adolescents' education in general, and less on the specific ways in which parents support them in the science domain, such as enlisting help from relatives. Our goal for our second research question is to document the barriers that may shape parent support within the science domain.

Another goal of our second research question is to address how parents continue to support their adolescents in science in spite of the social, cultural, and contextual barriers they face. Peralta and colleagues (2013) found that Latinx college students pursuing STEM careers did not see parents' absence at school-related events as not caring because they were very much involved in other ways, such as supporting their educational decisions, providing words of encouragement, and motivating them by sharing their own stories of sacrifice and the limited educational opportunities they had growing up (Peralta et al., 2013). Although there is some indication that parents support their adolescents in various ways, less is known about what supports they leverage despite the barriers that they face, which is something we plan to further document by addressing our second research question.

Current Study

In an effort to better understand parent support among Mexican-descent families, we draw on theoretical frameworks that allow us to focus on the unique ways parents support their youth by using science as a domain. The present exploratory qualitative study will fill the scholarly gap by utilizing parent and adolescent interviews to address two research questions:

Research Question 1: What forms of parent science support do Mexican-descent parents and adolescents perceive as best practices?

Research Question 2: What are the social, cultural, and contextual barriers parents face and in what ways do parents continue to support their adolescents in science in spite of those barriers?

The goal of this study was to develop a culturally grounded, multidimensional model of parent support for Mexican-descent families and we expect to find that our findings shed light on the heterogeneity of Mexican-descent families.

Method

Research Design and Participants

The present study utilized a consensual qualitative method rooted in constructivist and some elements of postpositivist paradigms to explore parent support among Mexican-descent families (Hill et al., 2005). Interview data were drawn from a larger, mixed-methods longitudinal study that examines the association between Latinx family support and adolescents' science motivation and academic outcomes. Participants were selected from three ethnically diverse public high schools in a large southwestern metropolitan city. At each site, approximately 23% to 48% of the student population identified as Latinx, with the majority of Mexican-descent.

Purposive sampling was used to select parents ($n = 74$) and adolescents ($n = 73$) who self-identified as Mexican-descent from a larger longitudinal study that included 104 Latinx families. The families included in this study were selected because they were of Mexican-descent ($n = 74$) and had interview data collected when the adolescents were in the 10th grade. Families were dropped from this study if they were of non-Mexican-descent ($n = 19$; for example, Puerto Rican, Salvadorans, Guatemalan) or if they did not participate in the study during the 10th grade ($n = 11$). We compared the 74 Mexican-descent families in the current study to the 30 families who were dropped and found differences in some demographic variables. Independent t -tests showed that these two groups did not significantly differ in terms of parent age ($d = 0.17$), but that families included in the current study had lower family incomes ($d = 0.69$) and had lower education levels ($d = 0.68$) compared with families who were dropped.

The majority of Mexican-descent mothers (age range: 30–56) who participated were Mexico-born (77%) with 23% U.S.-born. The median household income was US\$30,000 to US\$39,000. The majority of adolescents were U.S.-born (81%) and living in two-parent households (80%). For participating in the larger study, which included the interviews used for this study as well as surveys and observational tasks, participants received US\$50 each.

Researchers

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, in an area with a large Mexican-descent population. She used her experiences and cultural knowledge to examine interviews in Spanish and English, and to interpret participants' responses to gain as much insights from the interviews. The second author is a White, female raised in California whose family has been in the United States for more than three generations. The context in which she was raised and her research expertise made her aware of the importance of cultural processes in family systems. The data collection team consisted of bilingual research assistants from different ethnic backgrounds and at different education levels (e.g., undergraduate and graduate students). Research assistants who spoke Spanish conducted the interviews when participants preferred to speak in Spanish. The rest of the research team involved with coding and analysis consisted of the authors of this study as well as one Latinx and three Asian-descent doctoral students.

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. Everyone was encouraged to openly share their feelings and thoughts. Having a diverse team allowed us to check our biases by having dialogues, question assumptions, and use external auditors (Hill et al., 2005). When there were disagreements, such as having different notions of parent support, the research team discussed the issue until consensus was reached.

Interview Procedures

Following the Institutional Review Board protocol, adolescents and their families were recruited during the 2012–2013 (i.e., 9th grade) academic year and interviewed in their homes during the 2013–2014 academic year. The semi-structured interview scripts contained multiple open-ended questions that were developed based on the existing literature (e.g., Eccles, 1993; Hill & Tyson, 2009; Simpkins, Fredericks, & Eccles, 2015; Simpkins, Price, & Garcia, 2015). The interview protocol contained sections on adolescent science motivational beliefs, parent support, and general Latinx interest in science. The three questions analyzed in this study came from the section on parent support in high school that were designed to elicit conversation around parents' and adolescents' perceptions on best ways parents supported their

adolescents in science and the degree to which barriers got in the way of supporting them (Supplemental Appendix A). Parents were asked (a) “What are the two most important things you can do to help [her/him] with science?”; (b) “What other things do you wish you could do?”; and (c) “What gets in the way of doing those things?” Adolescents were asked the same questions but tailored to their perspective. Data for our first research question came from interview question a and data for our second research question came from interview questions b and c. Research assistants used both standard probes that were developed with the interview script (e.g., “why is that?” or “why do you think these are important?,” see Supplemental Appendix A for the standard probes) and personalized probes tailored to elaborate on participants’ specific experiences and obtain detailed responses from participants.

Interviews were conducted according to participants’ preferred language. More than half the parents ($n = 45$) and one adolescent were interviewed in Spanish. 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. Translation of Spanish interviews followed a six-step process to ensure accuracy and cultural meaning (Simpkins et al., 2011).

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 mandatory training sessions where they could become familiar with the interview script, practice interview skills, have questions answered, and learn how to probe. Second, weekly meetings were held to provide the data collection team with the opportunity to debrief and talk about any issues or concerns with the interviews. Third, multiple data sources, namely the adolescent and parent interviews, were collected to ensure consistency across data sources, reliability of themes across interviews, and strength of evidence, which is referred to as triangulation (Morrow, 2005). Fourth, 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). Finally, in addition to discussion between the first and second authors, the research team was consulted during coding and analysis.

Coding and Analyses

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. The interviews were broken down into segments by each of the three interview questions. Codes and categories were developed by considering each line, as well as the words or phrases of the segments in the interview transcripts. Interviews were coded if parents described ways in which they supported their adolescents and the barriers they faced. There were six parents that responded that they did not help their adolescents and 12 adolescents that responded that their parents did not help them, and therefore, their interviews were not coded. One adolescent interview was not analyzed because they described parent support in math rather than in science. Sixty-eight parent interviews and 60 adolescent interviews had relevant data and were included in the analysis. Coding and analyzing the interviews occurred in three stages described below.

In the first stage of coding, an inductive and deductive approach was used where keywords and phrases from participants' own words were used to summarize topics (in vivo codes) or keywords and phrases were created to summarize topics (descriptive codes) (Saldaña, 2016). For this first step, the first author used a subset of parent interviews conducted in both Spanish and English. The codes were reviewed by the second author, where we refined existing codes and discussed other possible codes. We then integrated a deductive approach, using prior literature, to refining the codes. For example, we used Eccles' (1993) parent socialization model to refine codes on provision of resources (e.g., school supplies) and the work of N. E. Hill and Torres (2010) to develop codes on linguistic barriers. We then took the codes to the research team where the members coded a subset of interviews using the codes. During the meetings, consensus was used when disagreements occurred. The preliminary coding framework was developed by returning to the data, reviewing memos, and using codes that reoccurred in the data (Saldaña, 2016).

In the second stage of coding, the preliminary coding framework was applied to all interviews. Given that more interviews were analyzed at this stage, codes continued to be redefined by discussing them with the second author and returning to the data. This process yielded a stronger coding framework that captured parents' support and the barriers that shaped their support. Categories were developed and refined through meetings with the second author and research team, using the coding framework, reviewing memos, and using existing literature. For example, we used Simpkins Price and Garcia (2015) work to develop the coactivity category and the work of Azmitia and Brown (2002) to develop the *consejos* (advice) category. With our research team, we discussed and reached consensus on issues such as whether the categories captured the codes and whether codes fell under

multiple categories. After all parent interviews were analyzed, the iterative stages to coding were applied to the adolescent interviews.

The final step in analyzing the data was to create themes that best captured the ways in which parents supported their adolescents and the social, cultural, and contextual barriers that shaped their support. Themes were developed using the coded interviews, the coding framework, and existing literature. They were further refined through conversations with the second author. 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 and parent interviews (Ryan & Bernard, 2003). To capture whether parent support in science differed by parental nativity status, we examined interviews from Mexico-born and U.S.-born parents separately. Table 1 outlines the themes and categories for parent support. We then linked parent support to parents' responses on the barriers they faced for each of the parents and then aggregated parent support across the parent responses into the barriers. This is further addressed in the "Results" section with selected excerpts.

Results

Perceived Parent Support

To address our first research question, this section highlights the unique and meaningful ways that Mexican-descent parents, both U.S.-born and Mexico-born, support their adolescents in science. We highlight some examples that demonstrate the complex ways in which culture plays a role in parental support by focusing on both traditional and nontraditional culturally grounded forms of support described by the families. Parent and adolescent interviews revealed three main themes of how parents supported their adolescents: involvement at home, providing words of encouragement, and leveraging resources. Under each theme, we highlight the differences and similarities between Mexico-born and U.S.-born parent responses. Table 1 presents definitions and more selected quotes from the interviews. Figure 1 further highlights the culturally grounded parent behaviors added to the Eccles' (1993) parent socialization model. In the next sections, interview excerpts are used to illustrate each theme with the corresponding categories.

Involvement at home. For the first theme, both U.S.-born and Mexico-born parents mentioned being involved at home in similar ways organized into two main categories: coactivity and schoolwork. Prior literature has defined coactivity as informal interactions between the parent and adolescent, such as

Table 1. Outline of Coding Framework for Parental Support (Themes and Categories).

Theme	Category/definition	Selected examples
Involvement at home Parents: $n = 55$ Adolescents: $n = 48$	Coactivity <i>Parent and child spending time together doing an activity</i>	Parent: "I think it's the interaction and how things work . . . hands on and being that you know we have a bike shop. There's a lot of hands on that you have to get your hands dirty and how things work and feeling it and touching it" Adolescent: ". . . we watched all these criminal shows and the scientific ways that they find the criminal . . . and talking to me about science jobs and what I want to do in college and that's pretty much set the path for me"
	Schoolwork <i>Parents' support related to school activities</i>	Parent: "Make sure they are doing [homework], check their grades on the website, see where they're at, what they're doing." Adolescent: "They ask me like if my homework is—my homework is done."
Providing words of encouragement Parents: $n = 21$ Adolescents: $n = 11$	Consejos <i>Parents giving advice</i>	Parent: ". . . it's important for her to learn as much as she can . . . I tell her that science is really important cause it's a it's something that may have . . . far in the future." Adolescent: "Yeah, they always tell me advice and stuff."
	Échale Ganas & Dar Animo <i>Giving encouragement and empowerment</i>	Parent: "I can encourage him by talking to him and telling him that he can do it" Adolescent: ". . . like after I get my test, like showing them and you know them giving me feedback. Like on my test like saying 'oh, you did good' or 'you could try harder'"
Leverage resources Parents: $n = 33$ Adolescents: $n = 15$	Economic resources <i>Monetary support</i>	Parent: "If he needs to put anything together, we will go to the store and get his stuff." Adolescent: "They um buy me the materials I need . . ."
	Social resources <i>Using kin and community members as support</i>	Parent: "I'll have resources where I can talk to my sisters or my brother . . . find somebody that I know . . . and make it easier for him . . ." Adolescent: ". . . they ask-they tell me to ask my sisters for help."

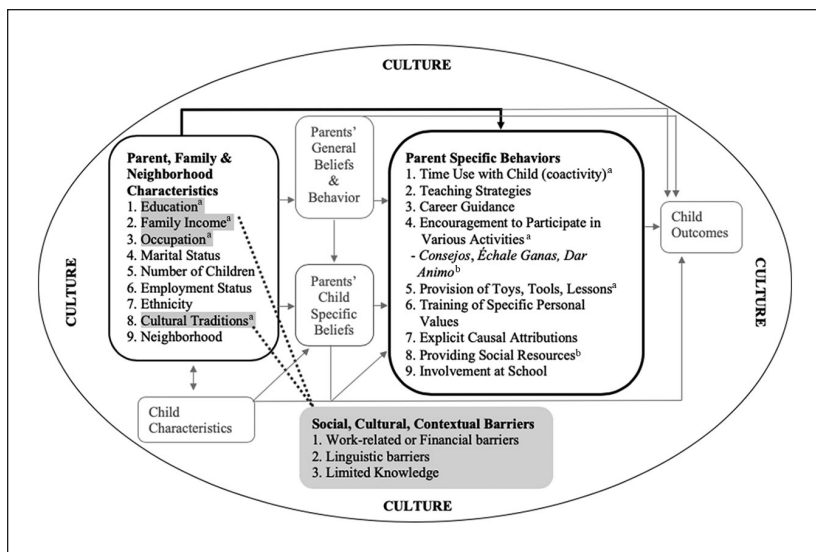


Figure 1. Extending the Eccles' (1993) parent socialization model using sociocultural perspectives (e.g., Vélez-Agosto et al., 2017).

Note. Using culture to address culturally grounded, nontraditional forms of support and the how social, cultural, and contextual barriers are embedded in parent practices and are not just distal factors.

^a Behaviors found in our study. ^b New additions to the model.

taking them to museums, having conversations about school, or watching science-related TV shows (Simpkins, Price, & Garcia, 2015). James, a U.S.-born bilingual adolescent who was raised in a low-income household mentioned: “well like, they like, watch like Discovery Channel stuff . . . whenever it comes up, the they ask me if I know this or that.” While parents also mentioned these forms of support, we found that parents are spending time with their adolescents and teaching them about science by engaging in everyday activities, such as cooking or using their occupational skills. For example, two parents stated,

My job as a nail tech, I have to know about different chemical reactions . . . so I explain that. Like, sometimes, that will come up, or like, in cooking we’ll—I’ll be talking to Austin about cooking ‘cause I understand, like acidic foods and how you make things not acidic, and Austin totally gets that. Like, he’ll come in there and be like, “cause it’s a base, Mom!” (Sara, U.S.-born, English speaker, attended some college, low-income household)

Mm well, talking about all the animals, everything regarding herbs from fruits . . . I talk about what they plant, how it's all natural, all that they plant in the dirt is natural because well for her, she learns things that way. (Lucia, Mexico-born, Spanish speaker, less than high school education, low-income household)

Traditionally, coactivity has included a wide range of activities specifically focusing on how White, middle-class families spend time with their youth. For example, taking them to museums or enrolling them in programs. However, such activities might not fully capture ways in which Mexican-descent parents spend time with their adolescents that are based more on their social and cultural experiences. The parent interviews shed light on the meaningful ways that low-income parents use everyday experiences to interact with their youth to teach them valuable lessons connected to their learning at school. This is particularly important for low-income families that may have limited economic resources to enroll their adolescents into programs.

The second category, schoolwork, centered on parents' support related to school activities, such as homework help, monitoring adolescents, and providing space and structure at home for the adolescent. These behaviors aligned with traditional models of parent support outlined in Eccles' (1993) parent socialization model. As mentioned by an adolescent and parents,

. . . just reminding me if I have something to do to get it done. They give you a time and stuff. I guess it's kinda a family rule, it's like the first four hours is designated when we get home it's designated to do homework without electronics unless its school related. (Tony, U.S.-born adolescent, English speaker, high-income household)

Every single day! "Did you already do your homework, get to studying?" When I see her watching television or some show I tell her not to watch so much TV and go study or read . . . "Estrella go do your homework," or if she's watching the television, "go study, go read a book about science, go do something that will help you." (Griselda, Mexico-born, Spanish speaker, college graduate, low-income household)

. . . a place for him to work at home. Somewhere it's quiet . . . make sure he has an area to study. (Eva, U.S.-born, English speaker, attended graduate school, high-income household)

In addition to these types of support, we found that parents describe various ways in which they help their adolescents with homework although they may not necessarily know the subject. In mainstream American parent involvement models that focus on younger children, it is often assumed that parents

have the knowledge to help their children with homework (e.g., O'Sullivan et al., 2014); however, as youth progress through school into more advanced coursework, parents may not be able help with homework because their children's knowledge may surpass their own. In other words, homework help is partly contingent upon the parents' knowledge and ability to provide them with answers, and therefore, some scholars have suggested that homework help decreases during adolescence (e.g., O'Sullivan et al., 2014). Parent and adolescent responses showed otherwise, where parents continue to help with homework in ways that does not necessitate them to be knowledgeable in the subject, such as looking for examples or answers online together, quizzing them to help them prepare for a test, going to the library to do research, or taking them to tutoring or programs that offer homework assistance. Two parents stated,

I help her in taking her to whichever place where she needs to go to do her homework . . . or to look for tutoring so that it can help her . . . that she arrives on time to a place where she has to be. Those are the things that I do. (Lorena, Mexico-born, bilingual, college graduate, middle-income household)

. . . quiz him and help, ask him questions . . . if he doesn't understand something [he] just asks me. He knows I can look it up right there . . . I do the researching myself. (Briana, U.S.-born, bilingual, attended some college, low-income household)

Involvement at home can encompass a wide range of behaviors from informal behaviors (e.g., coactivity) to support with schoolwork (e.g., homework help). Although parents and adolescents mentioned traditional forms of support at home, there are other behaviors families mentioned that were equally as important to them and that have not been clearly defined in existing models.

Providing words of encouragement. The second theme describes the various ways in which Mexico-born parents encourage, motivate, and empower their youth to do well in school by using *consejos* (advice) and expressions such as *échale ganas* (give it your all). None of the U.S.-born parents mentioned providing their adolescents with this form of support. In traditional models of parent support (Eccles, 1993), encouragement is conceptualized as motivating children to engage or participate in various activities, such as sports and clubs. However, the ways in which Mexican-descent parents provide encouragement goes beyond these traditional notions where, often times, these words are connected with the notion of empowerment and resilience (e.g.,

Rios Vega, 2014). The words of encouragement are distinctly connected to Mexican-descent parent's experiences and their hope for their children to do and be better than them.

For the first category, Mexico-born parents and adolescents of Mexico-born parents mentioned providing and receiving *consejos* (advice) as a form of support. When parents gave their adolescents' advice, it was often to tell them to do well in school and to work toward a better future compared with theirs (Azmitia & Brown, 2002). A parent and adolescent stated,

... to study more. To learn more things in science so he knows how to do it, how to get to the future so they can be an important and good person. To know a lot of things others don't. We didn't grow up like the youth are growing up. I would like to make my son grow and rise to the top. Not to stay like me. (Lety, Mexico-born, Spanish speaker, less than high school education, low-income household)

... [they] always are telling me to study and work hard and understand my work and make sure I know what I am learning. Not just say "oh" pretend I am learning ... so that I can use it in my daily life and help it help it to use to help others ... people's lives. (Bryan, U.S.-born adolescent, bilingual, low-income household)

Both parents and adolescents mention how advice not only functions as a way to encourage science learning, but the *consejos* (advice) parents give is rooted in parents' life experiences and used to emphasize the importance of having an education. In other words, juxtaposing parents' limited success with their adolescents' future success if they have an education.

For the second category, Mexico-born parents used the expressions *échale ganas* (give it your all) and *dar animo* or *impulsar* (loosely translated to provide emotional support and to encourage), which are commonly used in Latin American countries. These expressions were used by Mexican-descent parents to help their adolescents develop resilience to work hard and succeed in spite of any challenges. For example, a mother said,

I help in telling him in what to do less, to give it your all and don't stay behind. (Fabiola, Mexico-born, Spanish speaker, less than high school education, low-income)

Instead of just saying "try harder" or "you can do it," *échale ganas* and *dar animo* are rooted in cultural meaning that gives them a sense of empowerment and helps adolescents develop resilience (Rios Vega, 2014). Through these words, parents emphasized the importance of working hard where their

hard work will later pay off. Parents are also saying these messages because they are aware of their adolescents' frustrations or the challenges they may be facing with learning science. Like one adolescent mentioned: "They just encourage me like to put effort in my school. And to not give up."

While traditional parenting models highlight the importance of encouragement, the current parent and adolescent interviews shed light on how words of encouragement take on a cultural meaning rooted in parents' experiences. Words of encouragement are used to empower and help adolescents develop resilience as well as to position them in a path geared toward success.

Leveraging resources. For the third theme, both Mexico-born and U.S.-born parents described providing adolescents with economic (e.g., buying materials) and social resources (i.e., enlisting the help from family members or community members) to help them with their learning. Aspects of the first category, economic resources, align with provision of materials highlighted in Eccles' (1993) parent socialization model. For example, parents and adolescents mentioned the importance of providing youth with materials and supplies to help them complete school tasks. As a parent and adolescent discussed,

she gets me the supplies I need to be able to complete the work. (Randy, U.S.-born, adolescent, bilingual, low-income household)

Get him what he needs or take him to go buy things that he'll need for a project, you know chemicals or whatever. (Gloria, U.S.-born, bilingual, less than high school education, low-income household)

We also found other ways that parents leverage their economic resources to support their adolescents' education, which are not defined in the parent socialization model. For example, only Mexico-born parents mentioned the importance of being an economic provider and discouraging their children from having part-time jobs that would distract them from their schoolwork:

He wants to work to help and I tell him no, school comes first and you can't leave school. He tells me that he can work when he's on school break . . . I say that you can work, but you just can't leave school, please don't leave school. (Raquel, Mexico-born, Spanish speaker, attended some college, low-income household)

Extending the concept of provision of materials, we found that economic support can come from parents' efforts to make sure that their adolescents are prioritizing school rather than work. As Raquel expressed in the interview,

even though they are experiencing financial difficulties and her son worries about them, she reminds him that as parents it is their job to work so that he can have an education. To some extent, this aligns with the concept of *familism* where parents prioritize the education of their adolescents and are willing to make financial sacrifices by not allowing the adolescent to work. In the long run, ensuring the adolescents' future success can be thought of as the families' success and as an obligation to the family (Stanton-Salazar, 2001).

For the second category, we found that U.S.-born and Mexico-born parents use their kin as a social network to provide their adolescents with support. However, only U.S.-born parents mentioned leveraging support from community members (e.g., tutors) in addition to kin support. As Jessica, a U.S.-born adolescent, bilingual, and raised in a low-income household describes it, "they tell me to ask my sisters for help." Similarly, mothers said,

I'll have resources where I can talk to my sisters or my brother and ask them. Find somebody that I know that would have the answer and make it easier for him. Even go to my dad which is his grandpa and cause he's retired physician. (Linda, U.S.-born, English speaker, high school graduate, low-income household)

. . . sometimes he comes to ask me "I have to do a job uh I don't know what to do mom" He comes to ask me. I tell my son, "well I know even less go ask your sister to see if she can help you." (Brenda, Mexico-born, Spanish speaker, some high school education, low-income household)

Parents providing social resources by enlisting family members to help their adolescents aligns with *familism values*, centered on family unity. This form of support is not clearly defined under traditional notions of parental support. However, we found that this form of support is particularly important for many of the families in our study because of some of the challenges that they face which are discussed in the next section.

Parent Support in the Face of Social, Cultural, and Contextual Barriers

To address our second research question, this section highlights the social, cultural, and contextual barriers that parents face and how they continue to support their adolescents in spite of these barriers. Parent and adolescent responses revealed three main barriers: work-related and financial barriers, linguistic barriers, and limited science knowledge. Figure 1 shows how these barriers listed as distal factors in the Eccles' (1993) parent socialization model should also be thought as social and cultural processes embedded within parent support.

Therefore, they are placed outside the box and are not encapsulated as distal factors in Figure 1. Although we should not discuss social and cultural processes as separate from parent support because they are embedded within parent support, for organizational purposes, we included a separate section on the barriers parents face and use interview excerpts that highlight how parents continue to support their youth in spite of various challenges.

Work-related and financial barriers. In the parent socialization model, family income and occupation are listed as factors that influence parent support. Both U.S.-born and Mexico-born parents mentioned that working long hours, having multiple jobs, and having low-paying jobs got in the way of them spending more time with their adolescents and providing them with resources. For example, one mother said,

I wish I could have afforded to put him in you know space camp or any you know organizations that they have out there. But everything costs money. (Linda, U.S.-born, English speaker, high school graduate, low-income household)

While parents mentioned the various work-related and financial barriers that they faced, we argue that these barriers are more than just distal factors that influence parenting but are also inseparable from understanding how parents support their adolescents. Therefore, we can document the various ways parents continue to support their adolescents in spite of these barriers. For example, two mothers suggest different ways that they continue to support their adolescent even though they may have limited economic resources or work-related challenges:

We try to figure out how to do it um . . . you know try to do it the easiest way. Even if it's just like finding a ball that looks like the moon or something . . . he likes the stars. So, we'll go outside . . . And we don't have [money] so we try to do what we can. (Linda, U.S.-born, English speaker, high school graduate, low-income household)

. . . as a single parent, I work, like, 10-hour days, and so, I'm never there. More often, I think he would talk to my daughter 'cause my daughter's home more than I am, in the evening. So, I think he would talk to her first or my parents. My stepdad and mom, he talks to them because they're into science. (Sara, U.S.-born, English speaker, attended some college, low-income household)

The excerpts highlight the unique ways that parents continue to support their adolescents. One mother mentioned continuing to support her adolescent by

being resourceful with the materials they had available at home to help her adolescent learn science. In the interview, the mother provided more insights as to how she did not have the economic means to enroll her adolescent into science camp, but they still learned about the stars by learning about them together and looking at them at night. The other mother discusses using her social networks, or kin network, to help her adolescent, especially at times when she might not be available. In addition, work-related and financial barriers were often mentioned by parents in low-income households. Overall, parents leveraged multiple forms of support given the barriers that they face.

Linguistic barriers. Mexico-born parents, but not U.S.-born parents, mentioned linguistic barriers when it came to helping their adolescents with either homework or attending school events. In the parent socialization model, cultural traditions are listed as a factor that influences parent support. However, it is not further unpacked. We found that some Mexico-born parents mentioned not understanding their adolescents' assignments due to the differences in language use. For example, one mother mentioned,

Here the language of English is what eliminates me. I swear that if I knew more English, I would understand more and I would help her more. (Erica, Mexico-born, Spanish speaker, attended some college, low-income household)

Although not speaking English is a barrier unique to Mexico-born parents, they described how this barrier did not impede them from engaging with their adolescents using other forms of support. For example, two mothers stated,

Well the most important thing that I can do is—is all the time motivating him so that—so that he does well in science because the fact that I cannot help much to do homework, but I can help by motivating him so that he always—always when he takes some classes he tries to do better and—and would get better grades . . . Well I am studying English so that—so that I can understand better what he does. (Leticia, Spanish speaker, high school graduate, low-income household)

Like I don't speak English and they study in English. Who helps the most is my eldest daughter . . . [I help] a little her and there, because it is in English. (Irene, Mexico-born, Spanish speaker, less than high school education, low-income household)

Both mothers acknowledged that linguistic barriers made it challenging for them to help their adolescents with school. However, one mother discussed the importance of providing encouragement as a way to support her child that

does not require her to speak or read English. Throughout the interviews, parents mentioned providing various forms of support, like having her eldest daughter help, where they do not necessarily need to use English.

Limited science knowledge. Finally, both U.S.-born and Mexico-born parents described having limited science knowledge as a challenge in helping their adolescents with their schoolwork. In the parent socialization model (Eccles, 1993), parent education is mentioned as a characteristic that influences parent support. We found that education is relevant to parents discussing their limited science knowledge. Mostly Mexican-descent parents with lower levels of education mentioned limited science knowledge as a barrier. One mother mentioned,

I wish I was more educated. The older she gets and the higher grades she gets I-I don't. The harder it gets for me to help her. I just do whatever I can to help her. (Beth, U.S.-born, English speaker, high school graduate, low-income household)

In addition to education being a reason for having limited science knowledge, only Mexico-born parents mentioned the education curriculum in Mexico being different from the education curriculum in the U.S., which made it difficult for them to help their adolescents. This is a challenge that U.S.-born parents did not necessarily face. As one mother discussed,

There are times I can't, because I didn't study here school nor English, I didn't study that. I studied in Mexico, I teach him what I learned in Mexico . . . I finished high school, but everything was done in Mexico, but when you get here it's all invalid. (Raquel, Mexico-born, Spanish speaker, attended some college, low-income household)

The excerpts provide us with insights on how different experiences (i.e., education level or being educated in different countries) are connected with limited science knowledge. However, there are other ways in which Mexican-descent parents continue to support their youth that are beyond traditional forms of involvement (e.g., homework help), such as using technology and doing research with them, using help from others, or taking them to tutoring. Two mothers state,

It depends what she's learning and if it's something—I'll be the first to admit I have no idea. I'm very forward with them like, "I have no clue . . . call so and so or ask your dad" (Liz, U.S.-born, English speaker, attended some college, middle-income household)

I don't help much because I don't know much but, I could help, being there with him, reading or listening the most I can. (Fabiola, Mexico-born, Spanish speaker, less than a high school education, low-income household)

Even though it might be difficult for parents with limited knowledge to support their adolescents with their schoolwork, parents are engaging in other forms of support that can replace behaviors such as homework help, but that still benefit the adolescent. This highlights the extent to which parent support is multidimensional, where parents are using various forms of support to help their adolescents in spite of barriers that may impede them from providing one form of support.

Discussion

The aim of the study was to offer a multidimensional, culturally grounded model of parent support in science extending Eccles' (1993) parent socialization model using Vélez-Agosto and colleagues' (2017) cultural microsystem model. We addressed the following research questions: (1) What forms of parent science support do Mexican-descent parents and adolescents perceive as best practices and (2) What are the social, cultural, and contextual barriers parents face and in what ways do parents continue to support their adolescents in science in spite of those barriers? We found that parents supported their adolescents' science learning using traditional and nontraditional forms of support: involvement at home, providing words of encouragement, and leveraging resources. We also found that parents face work-related and financial barriers, linguistic barriers, and challenges due to their limited science knowledge. Despite these barriers, parents continue to leverage multiple forms of support to help their adolescents.

Our findings highlight parent behaviors that extend current forms of parent support under the parent socialization model. Based on families' responses, we reconceptualized our understanding of coactivity and provision of materials, outlined in Figure 1, to include more relevant examples for Mexican-descent families. For example, we found that both Mexico-born and U.S.-born parents creatively spent time with their adolescents at home by engaging in learning activities using real-world examples to teach them more about science (e.g., cooking or planting) that do not require significant financial resources. Engaging in these activities can spark youth's interest in science. Finally, we found that in addition to both Mexico-born and U.S.-born parents providing youth with materials, Mexico-born parents placed great emphasis on their roles as economic providers so that adolescents can prioritize their education. This adheres to *familism values*, because prioritizing

adolescents' educational success in the present can translate to the betterment of families' social and economic status in the future (Stanton-Salazar, 2001). These nuanced forms of support contribute to parenting models that may not highlight the uniqueness that exists in how parents support adolescents in science for Mexican-descent families.

Moreover, we extended the parent socialization model by adding culturally grounded forms of support used by Mexican-descent parents, particularly those born in Mexico. For the theme providing words of encouragement, we found that Mexico-born parents use *consejos* (i.e., advice) and expressions rooted in cultural meaning (i.e., *échale ganas* and *dar animo*) to empower their youth and to emphasize the importance of having an education (e.g., Azmitia & Brown, 2002; Rios Vega, 2014). Most importantly, parents use these words of encouragement to instill values such as hard work and to help their adolescents develop resilience (e.g., Delgado-Gaitan, 1994; Lopez et al., 2001). Another parent behavior we added in Figure 1 was providing social resources where parents in our study used their kin to support their adolescents. This form of support is rooted in *familism values* highlighting the importance of family as a unit of support (e.g., Stanton-Salazar, 2001). Adding culturally grounded forms of parent support extend mainstream notions of parent support traditionally used in research.

Finally, we found that there were behaviors (e.g., teaching strategies, career guidance, role modeling) for supporting adolescents in science outlined in the parent socialization model that were either not present in our study or were only mentioned by few of the parents. One reason for why this might be is that these behaviors might be more relevant for younger children rather than for adolescents, for subjects other than science, or for other demographic groups. Involvement at school, for example, is a cornerstone to many models on parent involvement in children's education and is rooted in mainstream American culture. However, this type of involvement was only mentioned by three Mexican-descent parents and was never mentioned by adolescents as one of the most helpful strategies to support adolescents in science. In fact, some research suggests that the barriers that Mexican-descent parents face inhibit their involvement in school, such as experiencing linguistic barriers when communicating with school personnel (e.g., Hill & Torres, 2010; Nava, 2012; Suárez-Orozco & Suárez-Orozco, 2009). Moreover, parents' teaching strategies and role modeling in science may also be used less among Mexico-born parents, given their education experiences in a different country where what they learned may not necessarily align with what their adolescents are learning in the United States. Although these behaviors were not present in our study, some research does suggest that teaching strategies

and role modeling may occur in other domains, such as reading and sport participation (Simpkins et al., 2011; Simpkins, Fredricks, & Eccles, 2015).

Another reason why such behaviors may not be present within the science domain might be that these forms of behaviors can still be operating in other ways or within parent behaviors that are already outlined, for example, when parents might discuss career options while spending time with their adolescent through coactivity. Moreover, it is important to acknowledge Mexican-descent parents' sociocultural background, where some parents mentioned not having a degree or a career related to science, posing another challenge communicating with their adolescents about science. Given that parents may need more expertise or knowledge in science to support their adolescents within this domain, they may support their adolescents through less direct behaviors than teaching strategies, role modeling, and career guidance calls for and that may be more likely to be used in other domains, such as English. Because there are behaviors that do not work for Mexican-descent families given their sociocultural experiences, it was important for this study to highlight and address some of those barriers and the ways in which parents responded to them.

Aligned with Vélez-Agosto and colleagues' (2017) cultural microsystem model, we found that social, cultural, and contextual barriers shape parent support. Parents and adolescents mentioned work-related and financial factors, linguistic factors, and limited science knowledge as barriers. In the parent socialization model, education, family income, occupation, and cultural traditions are constructs closest to the barriers mentioned by Mexican-descent families but are seen as distal factors. Using sociocultural perspectives, we conclude that these barriers are embedded within parent support where parents describe how they continue to support their adolescents in science in spite of the barriers. While some of the challenges that parents reported facing are not novel and have been documented in other studies (e.g., Hill & Torres, 2010; Nava, 2012; Suárez-Orozco & Suárez-Orozco, 2009), the findings go beyond what has been documented in the literature to describe how parents continue to support their adolescents despite these barriers. An interesting finding was that when it comes to limited science knowledge, parents supported their adolescents using various forms of support, except for involvement at school. This again brings into question whether there continues to remain a disconnection between parents and schools. Our findings are important for key stakeholders (e.g., teachers and counselors) who need to be aware of the challenges that families face and find ways to better support them, such as developing low-cost learning programs for families or establishing parent support groups designed to address their needs.

This study also highlights the heterogeneity that exists among Mexican-descent families. Valenzuela's (1999) ethnographic analysis on the schooling experience of Mexican-descent youth reveals that nativity plays a role in the different challenges that students experience. Similarly, we found that U.S.-born and Mexico-born parents experienced work-related barriers and constraints due to their limited science knowledge, but only Mexico-born parents experienced linguistic barriers (e.g., Hill & Torres, 2010). Furthermore, low-income families were more likely to mention work-related and financial barriers compared with high-income families. While documenting these barriers, this study sheds light on the heterogeneity within Mexican-descent families.

Limitations and Future Work

Although the current study contributes to the growing literature on Mexican-descent parental support of adolescents in science, limitations exist. Although parent and adolescent interviews were used for triangulation, underreporting of what parents do could still be an issue given our open-ended interview questions. Parents and adolescents are more likely to report what is most salient rather than everything parents do. In addition, though parents may support their adolescents in similar ways in other academic domains, our findings focus on science. We explicitly focused on science due to Latinx underrepresentation in science and that existing research on science is much more limited compared with other STEM domains (Simpkins, Price, & Garcia, 2015; Wigfield et al., 2015). The parental supports identified in this study likely apply to other specific subjects, but that expectation needs to be tested. Prior research suggests that certain aspects of White, middle-class parents' support of children's academic and leisure pursuits varied by domain (Simpkins, Fredricks, & Eccles, 2015); for example, coactivity and modeling were most prevalent in reading and sports, less prevalent in math, and rare in music. Finally, the current study focused on Mexican-descent families. The findings reported may not be prevalent among other racial or ethnic groups. Though Mexican-descent families represent the largest Latinx ethnic group in the United States, we recommend future work that continues to develop culturally grounded models of parental support that captures the unique experiences of parents from other ethnic backgrounds.

Conclusion

The findings from this study provide a more holistic view of how Mexican-descent parents support their adolescents in science by documenting the

sociocultural factors embedded in parental support. As noted in our findings, parents engage in various behaviors to support their adolescents in a science domain. These behaviors include parent-adolescent coactivity, supporting schoolwork, providing words of encouragement that emphasize resilience (e.g., *échale ganas*), and leveraging their economic and social resources (e.g., having kin help). Understanding family support in specific subjects like science, the barriers families' experience, and how they overcome those challenges from their perspectives can help scholars and educators to better support families and increase parental support instead of reverting to parenting models to that may not apply to their everyday lives. It also takes a strength-based perspective to understand how parents from various racial/ethnic groups support their adolescents in science, which may vary in some ways from traditional models of how parents can or should be involved in their adolescents' education. Understanding this can further contribute to our understanding of how some students continue to succeed and where are the areas where parents and adolescents can be supported by educators.

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Supplemental Material

Supplemental material for this article is available online.

Note

1. Participants were given pseudonyms to protect their identities.

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