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# The Relevance of Childhood Science Talk as a Proxy for College Students' STEM Identity at a Hispanic Serving Institution

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**Abstract**
Youths of marginalized demographic groups frequently find themselves excluded from participatory discourses in school science. As a result, these students often decide early in their school careers that science is not "for them" and consequently infrequently pursue STEM careers. Efforts to increase diversity of STEM participation have included targeted informal learning experiences for young people from marginalized populations. However, these efforts are not always designed to explicitly support STEM identity formation—a construct closely associated with STEM career pursuit. In this study, we explore the connection between childhood informal STEM learning experiences of Hispanic/Latino students at a Hispanic Serving Institution, their identification with STEM, and the factors that contribute to their STEM identity (recognition as a STEM person and interest in STEM). Results show that talking about science with friends and family was the only informal learning experience associated with students' STEM identity or the factors contributing to STEM identity development. Moreover, talking with close family about science was more relevant to their identity formation than talking with extended family or friends. Implications discussed include the need for bridging science learning experiences with home culture.

**Keywords** Informal learning · Identity · Childhood · Family · Conversations · Hispanic

## Introduction

The value of exploring contributors to young people's perception of themselves as STEM people (i.e., STEM "identity") lies in part in its strong association with career choice attitudes

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and behavior (Dou et al. 2019; Hazari et al. 2010). The construct of identity provides an encompassing and robust framework for researchers to explain the career-related pursuits of individuals in general, and students, in particular (Archer et al. 2010; Barton and Tan 2010; Tytler 2014). However, researchers have noted obstacles hindering students' ability to see themselves as STEM people or actors within the STEM enterprise, particularly those from groups historically marginalized in these fields (e.g., Archer et al. 2010; Tan et al. 2013; VanLeuvan 2004).

Much research has been done to support the notion that traditional institutional STEM discourses fail to include or invite certain groups of students. Aschbacher et al. (2014) noted that youths from lower socioeconomic groups perceive an early disconnect between themselves and their formal science education, espousing statements like "science is not me," "I value science but I don't do it well," or "I can do science but I don't value it" (pp. 738–39). Young people from marginalized gender (Cadaret et al. 2017; Perez-Felkner et al. 2012) and racial/ethnic groups (Chang et al. 2014; Slaughter et al. 2015) experience little exposure to messaging that supports their self-identification as persons capable of achieving careers in STEM fields. Compounding this effect, youths from these groups, such as Hispanic[1] youth, frequently receive substandard science education due to lack of resources, lower teacher expectations, and misplacement into special education programs (see reviews in Guiberson 2009; Guerra and Rezende 2017). STEM education presents little in the form of representation of these students' ethnic identities in scientific discovery, and additional sociocultural forces, such as membership in an economically underprivileged group, preclude students' abilities to envision themselves as scientists (Guerra and Rezende 2017).

Encouragement from others and opportunities to engage authentically with science are factors that contribute to youth seeing themselves as scientists (Chapman and Feldman 2016; Tan et al. 2013). However, these critical elements are often lacking for young people, particularly in formal K-12 contexts (Walls 2012). In these settings, students are generally expected to use technical language over their own colloquial language, taught that science is a set of facts divorced from their social origins, and limited by teachers' control of what counts as valid science (Archer et al. 2010; Barton and Yang 2000; Elmesky 2005). Collectively, these findings suggest a need for interactive opportunities that provide children contexts for speaking about science in authentic and welcoming settings that are inclusive of their cultural identity. One possible area for constructing these experiences is in the students' homes, settings which are ideally positioned to frame STEM as culturally relevant and accessible.

The aforementioned challenges facing all K-12 students' STEM identity development suggest a necessity to explore supports that promote and facilitate their ability to see themselves as current or future participants in STEM. We undertook this challenge in a survey of entry-level English course students at 27 universities across the country ($N = 15{,}847$; Dou et al. 2019). This work determined that participants who "talked with friends and family about science" during their formative years (ages five to nine) identified much more as a "STEM person" than those who did not, regardless of their gender, ethnicity, school-related experiences, performance, or level of parental support. Encouraged by the results of this work and research noted above that further establishes the value of discursive events (promotive or obstructive) in identity construction for marginalized groups, we undertake an exploration of the connections between childhood talk experiences and STEM identity for Hispanic students.

[1] Here, we apply the terminology used by the 2008 Higher Education Opportunity Act in the designation of Hispanic Serving Institutions.

Our aim is to present research that positions informal talk experiences with individuals outside the K-12 establishment as a component of STEM identity development that holds great potential in lowering hurdles limiting STEM career participation for these students.

## Theoretical Framework

Gee (2000, p. 99) notes that "[w]hen any human being acts and interacts in a given context, others recognize that person as acting and interacting as a certain 'kind of person.'" In this framework, an individual's identity is intimately and inextricably linked with the ways in which the individual is seen by and interacts with others in particular settings. According to Gee, individuals operationalize a multitude of identities, which are fluid in that they may evolve over time and are made manifest depending on one's immediate social context. As such, identity can be viewed through the lenses of how others communicate with the individual (*Discourse* identity), participation in groups of individuals who define membership through shared activity (*Affinity* identity), biological factors (*Nature* identity), and institutional structures and authority figures (*Institution* identity) (Gee 2000).

Following the guidance of the identity framework of Hazari et al. (2010), which builds directly off the work of Gee (2000) and Carlone and Johnson (2007), we approach identity as a construct with three primary factors: interest, recognition, and performance–competence. Because Hazari et al.'s (2010) work is further contextualized within STEM worlds, we refer to their framework as disciplinary-based identity (e.g., physics identity). We adopt their definitions of interest as "desire/curiosity to think about and understand physics," recognition as "recognition by others as being a good physics student," performance as "belief in the ability to perform required physics tasks," and competence as "belief in the ability to understand the physics content" (Hazari et al. 2010, p. 982). Their framework, developed with physics students, has been consistent in conceptualizing disciplinary identity in a wide variety of STEM fields including mathematics (Cribbs et al. 2015) and engineering (Godwin et al. 2016). As such, throughout this paper, we use the phrase "STEM identity" to express individuals' self-perception as science, technology, engineering, and/or mathematics people, and use the broad conception of "science" espoused by Aschbacher et al. (2014) and others cited here which encompasses fields like computer science that overlap with the "TEM" of STEM.

Hazari et al. (2010) found that, of all the factors, physics "recognition" was most correlated with physics identity. Their work echoes the conclusions of Carlone and Johnson (2007) whose framework defines three similar constructs of competency, performance, and recognition as contributing to science identity, but ultimately concluding that recognition is the most significant contributor to an individual's construction of a science identity. Thus, they suggest that being seen by others as a "science person" is the most important factor in seeing the self as a "science person," even more so than carrying out the tasks of a scientist (i.e., performance–competence) or being curious about science (i.e., interest).

## Literature Review

Hazari et al.'s (2010) identity framework implies that social structures have tremendous influence on the types of disciplinary-based identities individuals adopt, and, in turn, the careers they feel comfortable pursuing. Due to the institutionalized nature of traditional schooling contexts, informal learning settings (e.g., museums, camps, home environments, and media) have been shown to provide new social structures where young people may explore their aspirations (Archer et al. 2010; Barton and Yang 2000; Elmesky 2005).

### Informal Learning Experiences and STEM Identity

Informal STEM learning settings can provide individuals with opportunities to operationalize STEM identities in ways that are less constrictive than formal learning settings (NRC 2009; Tan et al. 2013), and thus more accessible for traditionally marginalized groups. These settings can motivate knowledge attainment (McClain and Zimmerman 2014; Szechter and Carey 2009) and foster talking events between visitors that nurture STEM interest development (Jackson et al. 2018; Mohr-Schroeder et al. 2014), and recognition as science-oriented individuals (Riedinger and McGinnis 2016; Pattison et al. 2018).

Despite the broad diversity of informal learning settings, research supports the notion that visiting brick-and-mortar locations, such as zoos and aquariums (Bell et al. 2009), consuming non-fiction science and science fiction media (Dou et al. 2019; Spiegel et al. 2013), and attending science camps or after-school programs (Chittum et al. 2017; Riedinger and Taylor 2016) support science interest and/or science identity development. However, when explored more granularly, these relationships are more complicated than they first appear. For instance, Martin and Toon (2005) noted that educational messages provided in zoos may actually serve to alienate visitors belonging to marginalized groups, making them feel less connected to science through lack of sense of commonalities between their identity and institution's narrative. Dawson (2014) makes similar arguments about science museums and centers, later extending this work to science television and science clubs, proposing that a spectrum exists across these settings that ranges from weak to strong models of social justice.

### Talking About STEM and STEM Identity

The complicated and sometimes contradictory nature of research examining the effects of informal learning experiences suggests the need to consider the details of individuals' behaviors and actions in these settings and how those behaviors and actions associate with STEM identity. Research directed toward understanding these components has suggested that conversations that occur during and around the learning situation, rather than the context of learning itself, may be key in determining their effect on students, particularly as it relates to interest and identity development (Dou et al. 2019; Jackson et al. 2018; Simpkins et al. 2015). For instance, Palmquist and Crowley (2007) concluded through their review of literature on the topic that the crucial factor in students' taking advantage of learning opportunities in brick-and-mortar locations appeared to be the conversations family members used to engage their children. Similarly, Alon and Tal (2017) determined that teacher efforts to participate actively in field trips, as opposed to taking on passive management roles, were associated with larger perceived gains in student learning.

In addition to conversations during an informal experience, sense of invitation and inclusion afforded by talk opportunities associated with STEM activity appears to have an influence on STEM identity, particularly for students who are often marginalized from STEM. Thoman et al. (2007) found that talking about an activity with peers after its occurrence was associated with greater interest, and this association was especially strong for Latino students' interest in school activities. Jackson et al. (2018) found that perception of how others react to an individual's interest in science predicted the sustainability of that interest, noting that positive reactions were most predictive of sustained interest for women (as opposed to men) with lower levels of science identities. Riedinger (2015) examined conversations of young people during science camps and observed that the types of identities participants developed through social interactions in the camp created avenues for those who were typically reserved in school science to reposition themselves as science people. Examination of the influence of communications with friends suggests that individuals who receive messaging from their friends that science is valued are more likely to consider a science career (Raabe et al. 2019; Rodrigues et al. 2011).

Collectively, this body of research supports the notion that discursive contexts may be a critical factor in determining young people's perception of their access to STEM identities and careers. Nevertheless, little is known about the nature of science talk experiences that may be associated with identity development. For example, the relative effect of science talk experiences with family members versus talk experiences with friends/peers is underexplored, but can have meaningful implications on curriculum development for informal learning programs. Moreover, research is needed that examines informal learning opportunities alongside variables of talk with significant others (i.e., family, teachers, and friends) to discern the relationships between these factors and STEM identity outcomes. These research directions are especially relevant when considering the growing ethnic diversity of the US student body in light of the literature around equity and access to opportunities (or lack thereof) that allow young people to embody STEM identities.

## Purpose

Dou et al. (2019) studied the predictive power for STEM identity outcomes for five categories of childhood experiences: engaging in disciplinary-based performances (e.g., stargazing), participating in science programs (e.g., camps), participating in STEM competitions, consuming STEM media, and talking about science with friends or family. After controlling for relevant demographic factors, only consuming STEM media and talking about science during these formative years were predictive of STEM identity in college, with the latter having a much higher statistical effect. Here, we extend this work and that of some of the studies cited above by further exploring the science talk experiences that support construction of STEM identity for youths as they are recalled by students pursuing STEM majors enrolled in a Hispanic-serving institution (HSI). This shifted inquiry allows us to highlight the experiences of historically marginalized groups of individuals in STEM and gives us an opportunity to home in on the types of events that may be closely associated with students' sense of recognition as STEM people. Further, we take a more fine-grained approach at understanding the social development of identity formation by exploring the relative effect of talk events across three people groups: close family, extended family, and friends. We focus on participants' memories of the informal learning experiences they recall from their childhood (ages five to nine) to narrow our inquiry to experiences that persist over time.

Our research questions are as follow:

1. What is the relationship between Hispanic students' STEM identity and having early informal learning experiences that include talking about science, participating in after-school clubs and camps, and consuming science fiction and non-fiction science media?

2. What are the differences in the relationships between talking about science with different groups of people (i.e., close family, extended family, and friends/classmates) and participants' sense of recognition as a STEM person, interest in STEM, and STEM identity?

## Methods

### Population, Sampling, and Instruments

We sampled students who identified as Hispanic attending an entry-level physics with calculus course at a large HSI in the southeastern US toward the end of the course spring term in 2019. All were enrolled in a STEM major, the majority in engineering or computer science. Our paper-and-pencil instrument, piloted and validated in previous research (Dou et al. 2019), gauged their participation in informal science learning activities during childhood and respondents' STEM identity. The survey also inquired about participants' level of home support around science, the primary language spoken at home, as well as their gender, ethnicity, and race—demographics we used as control variables.

### Assessing Informal Learning Experiences

Our survey included four binary response items to assess whether respondents participated in informal learning activities during the ages of five to nine (i.e., elementary school years), asking them to denote whether they had "talked with friends or family about science," "participated in science groups/clubs/camps," "read/watched non-fiction science," and/or "read/watched science fiction." For participants who selected talking about science (68%), the survey prompted them to answer an additional eight items that inquired with whom the respondents remembered speaking. We grouped responses to these items into three social groups: close family (i.e., paternal guardian, maternal guardian, and siblings), extended family (i.e., cousins, uncles and aunts, and other family members), and close non-family (i.e., classmates and best friend). The selection of individuals for the talking items was informed by prior literature (Dierking and Falk 1994; Riedinger and McGinnis 2016; Simpkins et al. 2015).

### Assessing STEM Identity

Included in our survey was a 12-item assessment of three latent factors believed to contribute to STEM identity—STEM interest, STEM recognition, and performance–competence in STEM—as well as a single item capturing students' broad sense of STEM identity (Dou et al. 2019; Godwin et al. 2016; Hazari et al. 2010). Prior to these items, the survey provided a definition of "STEM" as meaning "science, technology, engineering, or mathematics." Each of the 12 items employed a 5-point Likert scale soliciting level of agreement with statements (see Table 1). Anecdotal information suggested possible misinterpretation of the Likert scale given that we anchored the scale at the poles only but used a counterintuitively ordered version of the scale (i.e., Strongly Agree = 0 and Strongly Disagree = 4). We screened the responses ($N$ = 107) for possible misinterpretation of the scale and identified 17 respondents who indicated they "strongly disagreed" with many or all of the 12 statements but elsewhere suggested having positive affect and experiences related to STEM fields. Using this revised sample ($n$ =

90), we assessed the instruments' reliability using Cronbach's alpha assessment of internal consistency and found high reliability ($\alpha = .98$). Factor analyses reaffirmed our use of this reduced dataset. Because we were interested in the informal learning experiences of Hispanic or Latino students, we further reduced the sample to include only students who self-identified as Hispanic or Latino ($n = 79$).

## Analysis Procedures

We employed exploratory factor analysis (EFA) to assess the performance of our STEM identity items and their alignment to the theoretical framework (Hazari et al. 2010). We removed the self-referencing identity item (i.e., "I see myself as a STEM person.") from factor analysis to avoid cross-loading, as had been found in prior work (e.g., Dou et al. 2019; Godwin et al. 2016). A KMO value of 0.94 and significant Bartlett's test of sphericity [$\chi^2(55) = 1400$, $p < .001$] supported use of EFA. Three factors explained a total of 57% of the variance using promax rotation. Factor one consisted of two items assessing STEM interest; factor two consisted of three items assessing sense of recognition as a STEM person; factor three consisted of six items assessing performance-competence—factors that are consistent with our framework, as shown in Table 1 (Hazari et al. 2010). Subsequent confirmatory factor analysis supported the use of this three-factor model to measure STEM identity [$\chi^2(41) = 48.5$, $p = 0.20$, CFI = 0.98, TLI = 0.97, RMSEA = 0.05, SRMR = 0.04, BIC = 1606].

We averaged the items within each factor to create STEM interest, STEM recognition, and STEM performance–competence variables and used a weighted average of the items within these three variables to create a STEM identity variable; this weighted measure exhibited high correlation with our self-referencing STEM identity item ($r = 0.94$). We then ran two separate multiple linear regression models to address our research questions. Model A (RQ1) included the items assessing participants' engagement in informal STEM activities during childhood (talk with family, consuming science media, consuming science fiction media, and attending science camps/clubs) and our control variables (i.e., gender, home support, and primary language) as predictors of STEM identity. Model $B_0$ (RQ2) homed in on the relationship between STEM identity (dependent variable) and early talk about science with the three social groups identified earlier

**Table 1** STEM identity standardized factor loadings, as well as factor mean and standard deviation

| Identity (general) | I see myself as a STEM person | Factor loadings | Mean (M) | Standard deviation (SD) |
|---|---|---|---|---|
| Interest | Topics in STEM excite my curiosity | 0.97 | 3.38 | 1.13 |
| | I am interested in learning more about STEM | 0.99 | | |
| Recognition | My teachers see me as a STEM person | 0.93 | 3.15 | 1.18 |
| | My friends/classmates see me as a STEM person | 0.94 | | |
| | My family sees me as a STEM person | 0.89 | | |
| Performance–competence | Others ask me for help in STEM | 0.85 | 3.17 | 1.03 |
| | I feel confident in my ability to learn STEM | 0.98 | | |
| | I can do well on tests and exams in STEM | 0.86 | | |
| | I understand concepts I have studied in STEM | 0.92 | | |
| | I can overcome setbacks in learning STEM | 0.88 | | |
| | I feel I belong in the STEM community | 0.84 | | |

(close family, extended family, non-family) plus our control variables. We reran model $B_0$ twice more using STEM interest (i.e., model $B_1$) and STEM recognition (i.e., model $B_2$) as outcome variables in place of STEM identity. We did not include performance–competence as an outcome variable in this study due to lack of evidence that this factor explains statistical variance in STEM identity (Carlone and Johnson 2007; Hazari et al. 2010). Additionally, our identity framework, which examines influences on identity using the overlapping frameworks of Gee (2000) and Hazari et al. (2010) is more reflective of the recognition and interest components.

## Results

Model A was statistically significant [$F_{(8,68)} = 4.46$, $p < 0.001$, adjusted $R^2 = 0.27$]. Specifically, we found that while controlling for gender, home support, and primary language, talking with friends and family about science was significant in explaining differences in STEM identity ($\beta = 0.54$, $p < .001$), but participation in out-of-school science clubs or camps ($\beta = 0.12$, $p = .28$), consuming non-fiction science media ($\beta = 0.12$, $p = .20$), and consuming science fiction media were not ($\beta = -0.14$, $p = .29$). Table 2 summarizes model A statistics.

Model $B_0$, assessing the association of talk from close family, extended family, and friends with STEM identity, was significant [$F_{(7,69)} = 3.25$, $p < .001$, adjusted $R^2 = .17$]. Talking about science with close family members contributed significantly to the model ($\beta = 0.45$, $p < .001$), but talk with extended family ($\beta = 0.05$, $p = .67$) and friends ($\beta = 0.02$, $p = .90$) were not statistically significant. Exploring the same contributors to STEM interest in model $B_1$, we achieved similar results [$F(7, 70) = 2.97$, $p = .009$, adjusted $R^2 = .15$]: science talk with close family was significant ($\beta = 0.47$, $p < .001$), though talk with extended family ($\beta = 0.05$, $p = .68$) or friends ($\beta = -0.04$, $p = .76$) was not. Finally, we explored recognition in STEM as an outcome in model $B_2$. Again, the regression equation was significant [$F_{(7,69)} = 2.85$, $p = .01$, adjusted $R^2 = .15$]. Talk with close family was significant ($\beta = 0.36$, $p = .01$), but talk with extended family ($\beta = 0.09$, $p = .46$) or friends ($\beta = 0.05$, $p = .69$) was not. Model B statistics are summarized in Table 3.

**Table 2** Model A model statistics. Control variables were not statistically significant. These included gender, home support of science, and primary language

| Regression coefficients | | |
|---|---|---|
| Predictor | $\beta$ | $t$ |
| Talk with friends and family | 0.54*** | 5.32 |
| Science clubs or camps | 0.12 | 1.09 |
| Non-fiction science media | −0.14 | −1.29 |
| Science fiction media | −0.11 | 1.07 |
| Control block | - | - |
| Model statistics | | |
| *F*-statistic | 4.46 | |
| Adjusted $R^2$ | 0.27 | |
| $p$ value | $<.001$ | |

***Value is significant, $p < .001$

**Table 3** Model B model statistics

| Regression Coefficients | | | | | | |
|---|---|---|---|---|---|---|
| | **Model $B_0$** | | **Model $B_1$** | | **Model $B_2$** | |
| | **(STEM identity)** | | **(STEM interest)** | | **(STEM recognition)** | |
| **Predictor** | ***β*** | ***t*** | ***β*** | ***t*** | ***β*** | ***t*** |
| Close family | 0.45*** | 3.54 | 0.47*** | 3.64 | 0.36** | 2.79 |
| Extended family | 0.05 | 0.43 | 0.05 | 0.40 | 0.09 | 0.75 |
| Friends | 0.02 | 0.13 | -0.04 | -0.31 | 0.05 | 0.41 |
| Control Block | -- | -- | -- | -- | -- | -- |
| Model Statistics | | | | | | |
| $F$-statistic | 3.25 | | 2.97 | | 2.85 | |
| Adjusted $R^2$ | 0.17 | | 0.15 | | 0.15 | |
| $p$-value | <.001 | | .009 | | .01 | |

**Value is significant, $p < 0.01$

***Value is significant, $p < 0.001$

None of the models showed significant differences across our control variables (i.e., level of home support around science, primary language spoken at home, or gender).

## Discussion

In this study, we surveyed a population of Hispanic, STEM major university students attending an entry-level STEM course at an HSI to identify factors related to their STEM identity and its development. Our results indicated that STEM identity was strongly related ($\beta = 0.54$) to having conversations about science with friends or family during the formative ages of five to nine, whereas consumption of science or science fiction media and participation in science groups, clubs, or camps were not. Further, of those who recalled talking with friends or family about science (68%), experiencing science talk with close family, such as parents and siblings, was predictive of participants STEM interest, sense of recognition as STEM people, and overall STEM identity. This relationship was not observed for talking about science with extended family or peers.

Given that institutions like zoos and museums and science camps tend to favor individuals from privileged classes (Dawson 2014; DeWitt and Archer 2017), it is encouraging that the results of this study demonstrate that talking with individuals with whom the student has close personal connections can be more powerful in supporting STEM identity construction than costlier options that may be out of reach for many families. Indeed, these home settings are uniquely rich in the cultural context and affirmation that most Hispanic students would struggle to locate elsewhere, either in formal or informal STEM learning settings, and thus may be best equipped to convey the type of recognition that contributes to STEM identity (Simpkins et al. 2015). Nevertheless, this and similar studies (see Rodriguez et al. 2019) point to differences in children's science interest as a factor of parental education, language, and gender. Interestingly, we did not find the latter to play a significant role in our findings.

Jackson et al. (2018) remind us of the critical role that science talk plays in the affirmation and development of youths' interest in science and science fields. Our work builds on their findings, ascribing importance to science talk not only in the case of science interest but also for individuals' sense of recognition from others as STEM people. Prior recommendations for motivating engagement in STEM have focused on early exposure and hands-on participation, but few have addressed the role of science talk. Our findings suggest that soliciting science talk should play a major role in formal and informal interventions that seek to increase participants' STEM interest and identity. They also suggest that those efforts should be coupled with parental interaction (e.g., conversing with children while watching a science program through questioning that encourages curiosity and positions children as capable of engaging with science).

We should note that in our previous study (Dou et al. 2019) of students enrolled in a variety of programs (i.e., not just STEM majors) nationwide, we observed that consuming science and science fiction media was associated with STEM identity. In this present research, consuming science and science fiction media were not found to be influential. Thus, it is possible that media consumption may differentiate individuals who identify as a STEM person when looking at university students more broadly, but talk with close family distinguishes a higher degree of STEM identity for those who enroll in STEM majors. Additionally, since the research presented in this paper isolated students who identify as Hispanic, it may suggest that talk experiences are particularly important for students who identify as members of these marginalized groups (Cadaret et al. 2017; Chang et al. 2014; Slaughter et al. 2015; Perez-Felkner et al. 2012).

## Conclusions

Hazari et al. (2010) and Carlone and Johnson (2007) detailed that recognition by others is an important contributor to disciplinary-based identity, yet many schools fail to provide that recognition to marginalized groups. For instance, institutional recognition by schools tends to limit access for Hispanic students to advanced classes, disproportionately placing them in remedial programs (see Guiberson (2009) for a review). These types of negative recognition events in schools can permeate into the ways that teachers communicate with Hispanic students (Gee's *Discourse* and *Institutiona*l views of identity) and the types of activities to which these students feel invited (the *Affinity* view). Due to the obstacles for Hispanic youth that tend to exist in formalized school structures, informal home experiences have the potential for significantly influencing their STEM identity. Home experiences allow students to develop their identities as both Hispanic and a "STEM person".

Indeed, our research found no connection between any other informal learning experiences and STEM identity, specifically with regard to experiences that take place during individuals' childhood years. Thus, simply providing exposure to science and science activities may not have the desired effects on science learning and STEM identity if not coupled with meaningful interactions from families, a notion supported by other research suggesting the value of family support on science interest and career intentions (e.g., Maltese and Cooper 2017; Sha et al. 2016). In other words, attending science camps or visiting informal learning sites may support STEM identity if that activity is coupled with family conversations, but in the absence of these interactions the relationship may diminish.

## Limitations and Future Research

Because our research was conducted with students enrolled in STEM programs at a particular HSI, our results may not extend to college students as a whole, though prior findings suggest some generalizations can be made (Dou et al. 2019). Additionally, had we chosen to include Hispanic college students *not* enrolled in STEM programs could have answered related questions about the informal experiences that lead to pursuing STEM degrees, but that work is beyond the scope of this study. We also remind readers of the cross-sectional nature of this study, which precludes us from assigning causal value to talking about science with family between the ages of five and nine. Here, we see a reciprocal relationship between recollection of those experiences and seeing oneself as a STEM person. With that said, we also understand the term "STEM person" is in itself subject to scrutiny. In addition to defining the STEM acronym in our survey and finding consistency between its use in this study and prior studies, we see alignment between the way we use the term and the way similar studies use the term "science," as stated earlier.

The connection between childhood influences and college identity are complicated products of many underlying relationships. Our future work includes collecting additional quantitative data to create models detailing the interactions of these relationships and qualitative data to explain the relationships observed. We believe that family discourse is particularly salient for children in formulating their science interests and their perception of family values around science, a notion we intend to explore further in future analyses. We also acknowledge the role of agency in identity formation. The value of childhood science talk in STEM identity development may result as a combination of these factors: interest formation, recognition opportunities, cultural/family support, and greater agentic empowerment than other activities.

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