

Exploring Latinx Parent Involvement in Informal Science Activities

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ABSTRACT

Diversity has been shown to improve the ability of groups to problem solve and make predictions, as well as guarding against groupthink and overconfidence. Marginalized groups within the Science, Technology, Engineering, and Mathematics (STEM) fields are still largely underrepresented despite various efforts to increase diversity in STEM. This study focused on the gap in representation of Hispanics/Latinxs in the STEM fields. While most science programs focus on directly encouraging students to pursue STEM careers as a way to increase Latinx representation, our study focused on Latinx parents. This study explored the types of informal science activities Latinx parents engage in with their children. In order to connect with Latinx parents, we organized 15 family science night events in a small city in central Texas that has a large Hispanic population. At the events, parents completed a parental involvement survey to find out what types of informal science activities they are involved in with their children. We utilized common household items or materials that were inexpensive in designing the activities for the family science events to ensure they were accessible to all families. Eighteen Latinx parents participated in the study. On the parental involvement survey, Latinx parents identified 27 science activities that they have performed with their children, with 63% of those being structured and indoor activities and 59% being free activities. In terms of parent participation, the majority of Latinx parents (73%) preferred free activities. This study outlines the design of family science events and can help inform school districts, principals, teachers, and informal science education organizations on strategies for increasing Latinx parents' involvement in their childrens' science education.

Keywords: family science, Latinx, parents, parental involvement, STEM

Introduction

In order for the United States to remain competitive economically with other countries, science, technology, engineering, and mathematics (STEM) careers are necessary (Christensen, Knezek, & Tyler-Wood, 2015). A better economy, better jobs, and new industries were seen as the number of graduates with STEM degrees increased after World War II (Holdren & Lander, 2012). A major factor for the U.S. having one of the best economies globally can be attributed to those working in the STEM fields (Christensen, Knezek, & Tyler-Wood, 2014; 2015). These STEM professionals have created important and useful products that have become increasingly intertwined in the lives of U.S. citizens (Holdren & Lander, 2012). Today, there are increasing career opportunities being created that need to be filled as the United States continues to push the boundaries of science.

College Graduates with STEM Degrees

Between 2008 and 2018, STEM jobs were projected to grow by 17% according to the Center on Education and the Workforce at Georgetown University (Carnavale, Smith, & Melton, 2011). Furthermore, it has been estimated that the amount of STEM jobs requiring at least some college is 91% (Carnevale, Smith, & Melton, 2011). Currently, the number of students graduating with a STEM degree is not keeping pace with the increasing numbers of STEM jobs (Chen & Simpson, 2015; Christensen, Knezek, & Tyler-Wood, 2014; Knezek, Christensen, Tyler-Wood, & Periathiruvadi, 2013). In addition, those who entered college planning to major in STEM and then graduating with a STEM degree is less than 40% (Holdren & Lander, 2012). The percent of those STEM graduates is even less for those that are historically underrepresented in STEM which include Hispanic/Latinx, Black/African-American, and Native-American/ Native Alaskan. Also, only about 18.7% of STEM working professionals are of an underrepresented population (National Center for Science and Engineering Statistics (NCSES), 2019), which is disproportionate compared to their representation of 33.2% in the U.S. population (United States Census Bureau, 2019). This disparity illustrates the need for the United States to better utilize a large group of its population for our country to reach its full potential in the STEM fields.

Workplace Diversity

Innovation stemming from diversity within teams has been acknowledged by various companies and organizations (Tachibana, 2012). Google has acknowledged their lack of diversity and addressed it by expanding access to careers in technology, strengthening their community outreach, broadening their supplier network, and creating inclusive products (“Diversity | Google,” 2018). Universities are also making efforts to increase diversity within their institutions, including Texas State University. One of the five goals for Texas State University is to enrich their learning and working environment by attracting and supporting a more diverse faculty, staff, and student body (“Diversity Plan,” 2012).

Groupthink and overconfidence are characteristics found in less diverse groups, which can be guarded against through diversity within groups (Brodock & Massam, 2016). When deciding where to apply and when accepting employment, Glassdoor found the majority (67%) of job seekers consider a company’s diversity (“What job seekers really think of your diversity stats,” 2014). Furthermore, diversity within groups improves the ability to make predictions (Page, 2007) and to solve problems (Tachibana, 2012). Studies have reported increased net profit margins (Tachibana, 2012), increased employee ratings, and decreased project costs (Brodock & Massam, 2016) as benefits of gender diversity.

Diversity within STEM Fields

In 2008, there was a large effort to increase diversity within the STEM fields throughout the Obama presidency (Handelsman & Smith, 2016). Handelsman and Smith (2016) reported these efforts included billions of dollars worth of investments towards 14 federal agencies dedicated to STEM education in 2016, as well as the *Educate to Innovate* campaign, and goals to prepare 100,000 math and science teachers by 2021. To show its priority to STEM education, the Department of Education during Obama’s presidency hosted the *White House Science Fair*, along with its support of the *Race to the Top* competition, and encouraged post-secondary education leaders to provide historically underrepresented students with pathways to attain STEM degrees. To further prioritize STEM education, Obama’s 2017 budget provided millions of dollars towards Next-Generation High Schools, Student Support and Academic Enrichment grants, Teacher and Principal Pathway programs,

expansion of computer science programs, and increasing diversity in STEM (Handelsman & Smith, 2016).

Latinx Representation in STEM Fields

There has not been much change in the representation of Latinxs in STEM fields, despite efforts to increase diversity within STEM fields. Over the years, the Latinx population in the U.S. has steadily grown, while the White population has decreased in percentage (Table 1) (USCB, 2010; 2015; 2019). Within the STEM field, Latinx representation has grown, but not by much. The Latinx population remains underrepresented in the STEM fields compared to Whites in STEM (Table 2) (NCSES, 2013; 2019, USCB, 2015). See Table 1 and Table 2 for data comparisons. This illustrates that despite growing in number in the overall population, Latinxs are still underrepresented in the STEM fields. In addition, Latinxs face many challenges on their path to becoming STEM professionals, despite the many efforts to increase diversity with the STEM fields.

Table 1

Latinx and White in U.S. Population

Year	Latinx (%)	White (%)
2010	16.4	63.6
2015	17.6	61.45
2018	18.3	60.4

Note. Data from 2010 taken from USCB (2010)

Note. Data from 2015 taken from USCB (2015)

Note. Data from 2019 taken from USCB (2019)

Table 2

Latinx and White Representation in STEM

Year	Latinx (%)	White (%)
2013	6	51
2015	6.6	70.75
2017	8.6	67.8

Note. Data from 2013 taken from NCSES (2013)

Note. Data from 2015 taken from USCB (2015)

Note. Data from 2017 taken from NCSES (2019)

STEM Education for Latinxs

In pursuing a career in the STEM field, Latinxs face numerous obstacles in their education. Flores (2011) listed the various obstacles Latinxs face: not being exposed to culturally relevant science curriculum, not being prepared for college course work, not being encouraged to pursue STEM careers, and not being exposed to Latinx mentors in STEM. In addition to these obstacles, families of Latinx students may not have the knowledge to assist their children in pursuing STEM careers and may not even be aware of career opportunities within STEM (Flores, 2011). Hernandez, Rana, Alemdar, Rao, and Usselman (2016), reported that Latinx parents recognize their lack of knowledge of STEM careers and STEM opportunities for college students, but are aware of the many challenges faced by their children. Out of school or informal science programs has been shown to influence youth to choose science as a career, increase achievement in science, and provide conversations with

family members about science topics (Bruyere & Salazar, 2010). Bruyere and Salazar (2010) reported that Latinxs are highly interested in informal science education and prefer programs that involve the entire family. The purpose of this study is to examine what types of informal science activities that Latinx parents prefer to engage in with their children.

Conceptual Framework

To form our conceptual framework that Latinx student interest in science is influenced by Latinx parents, we focused on three studies that concerned Latinx student interest in science and the connection to Latinx families. As described earlier, Flores (2011) discussed the various obstacles Latinx school children face in their science education and that many Latinx parents lack knowledge in science making it difficult to assist their children in science. (Flores, 2011). Authors Hernandez, Rana, Alemdar, Rao, and Usselman (2016), stated that Latinx parents understand they lack knowledge in STEM careers and STEM opportunities for college students. However, they are very aware of the many challenges faced by their children. Authors Bruyere and Salazar (2010) highlighted the importance of informal science programs for Latinx families as a means of encouraging Latinx youth to explore science as a career.

Theoretical Framework

The theoretical framework we propose to support our conceptual framework is that families that learn together, that is emphasized in our family science nights, promotes both student and parental interest in science. Latinx families, in particular, have a strong sense of “familismo” or sense of loyalty toward the family” (Hernandez et al. 2016 p. 357). This means that conversations about educational topics, including science, tend to include all members of the family. Araque et al. (2017) noted that, “Given Latino culture’s emphasis on collectivism and family bonds, it follows that most Latinx parents report providing informal educational support for their children at home ...providing emotional support” (p.233). Hernandez et al. (2016) also described the parental motivation of Latinx children as, “Latino parents ...encourage and motivate their children by providing verbal and emotional support.” Family science events provide an opportunity for parents to provide that support and thereby motivate children to develop an interest in STEM. Hernandez et al. (2016) described, in their GoSTEM programs, how a mother motivated her daughters at home. “One mother wrote, [I learned] how to do the experiments at home as this will be very fun for my daughters. I wish there were more workshops in the summer to motivate children” (Hernandez et al. p.360).

Programs that are similar to building interest in science through Latinx family activities are those that build interest in literacy or reading through family activities. A Latinx child's interest in reading appears to increase as the parental interest in reading increases (Larrotta & Ramirez, 2009). It is important that parents develop a skill for literacy just as we see in science skills such as in observation. Development of skills in parents whether in literacy or in science helps them to be better *motivators* for their children's interests in reading or in science concepts. As Larrotta & Ramirez, (2009) noted, “If we want to become more efficient literacy instructors, it is important that we understand that in order for the parents to help in the development of their children’s literacy skills, the parents themselves must first develop their own (p.629).

The family science nights that we designed through the use of science journals were for students and parents to be actively involved *together* and to develop skills together. We encouraged the collaboration between parents and their children rather than collaboration with a “teacher”. Correct answers were not the objectives of our family science night activities. Instead, we were interested in whether students and their parents became more motivated to learn science by working together in the family science program and at home. By using a collaborative approach in the activities where

student/parent teams are engaged first followed by exploration, the students and their parents had a “greater feeling of autonomy”. Autonomy was emphasized by Ryan and Deci (2000) as being important in the development of motivation to learn content. Thus, our theoretical framework to promote interest in science is based upon families that learn science together through simply being together, skill building and feelings of autonomy.

Literature Review

George (2000) found that children’s attitudes towards science become less positive during their middle and high school years. Furthermore, children are more likely to pursue science in college if they develop an interest in science before they reach middle school (George, 2000). When Latinx children receive only minimal support in their school studies at home, their achievement in education decreases (Rochin & Mello, 2007). Culturally, Latinx parents believe that education is the responsibility of the school and the child’s well-being is the responsibility of the parents (Ramirez, McCollough, & Diaz, 2016). Castaneda (2006) found that Latinx parents are highly concerned about their children’s education but lack the knowledge to support their children. And, when Latinx parents are given the opportunity to participate in family science activities, they are interested in bringing these activities back to their home (Hernandez, Rana, Alemdar, Rao, & Usselman, 2016).

Family Science Nights

Family Science Nights have reported benefits for students and parents, and are becoming more popular in K-12 educational settings. These student benefits include, increased confidence and increased interest in science when their parents are involved in their learning (Kaya & Lundeen, 2010), and greater academic success (Lozar, 2012; Ramirez, McCollough, & Diaz, 2016). Although, long-term parental involvement is difficult to maintain once a program is over, research has shown that parents become more supportive of their children’s science learning when hands-on activities are provided (Kaya & Lundeen, 2010; Perera, 2014).

Family Night programs can be found back to the 1980s (McDonald, 1997) and have been organized for students throughout the United States in elementary schools (Grote, 2000; Kaya & Lundeen, 2010), middle schools (Mitchell, Drobnes, Colin-Trujillo, & Noel-Storr, 2008; Yanowitz & Hahs-Vaughn, 2016), and high schools (Hansen-Thomas & Alderman, 2016). Mostly, Family Science Night programs focus on student involvement instead of parent involvement. Although parental involvement increases in science because of the event, it is difficult to maintain this involvement long-term. Typically, Family Night programs are one-night events with a large time interval between the next Family Night. Most of these programs are not monitoring parental involvement once the event is over. These Family Science Night programs have evolved to include pre-service teachers (Bottoms, Ciechanowski, Jones, de la Hoz, & Fonseca, 2017; Valadez & Moineau, 2010) and English language learners (Hansen-Thomas & Alderman, 2016). The purpose of Family Night programs is to engage parents in their children’s learning, and overall, these studies indicate family involvement is beneficial for students (Grote, 2000; Hansen-Thomas & Alderman, 2016; Kaya & Lundeen, 2010; McDonald, 1997; Mitchell, Drobnes, Colin-Trujillo, & Noel-Starr, 2008; Yanowitz & Hahs-Vaughn, 2016). There is a need to find out what types of informal science activities parents are taking part in with their children. This information can be used to explore how Family Science Nights can be used to better serve parents in becoming more involved in their children’s science learning.

Research Question

What types of informal science activities do Latinx parents engage in with their children?

Pilot Study

In June and July of 2017, we organized three family science nights at the local library in a small city in central Texas. This was part of a pilot study to determine whether our family science events were organized appropriately to address our research question. Prior to the pilot study, we were granted IRB Exemption 2017763 by the Institutional Review Board. At the public library, we organized family science events on Wednesdays from 6pm-8pm, on June 28, July 5, and July 12. Data from these three family science events were not used in the analysis of this study because changes were made to the following 15 family science events that we used for this study. These changes will be explained further, but they include changes to the family science event format and structure, and data collection.

Parent/Guardian Continued Participation and Mail-In Involvement Questionnaire.

At the beginning of each Family Science Night, during the pilot study, we provided parental consent forms that were filled out before any data collection was taken in accordance with the university Institutional Review Board (IRB) guidelines (Appendix C). Also, the parents were given the parent/guardian involvement questionnaire as a take-home questionnaire along with a pre-addressed and stamped envelope (Appendix D). We received only a few questionnaires back in the mail from parents/guardians using this strategy. Thus, the strategy was a data collection barrier for determining parental involvement in their children's informal science education. We changed our strategy by collecting all data at the family science events. We also chose to survey parents before the event with an involvement survey. By changing our strategy, we received more data concerning informal science activities conducted with their children and their comfort level with science and family science events.

Methods

Study Sites – Research Study

Over the course of two years, we organized 15 family science events throughout a small city in central Texas. This city is about 41% Hispanic/Latinx and 49% White, 34% have a bachelor's degree or higher, and the median household income is \$37,593 (USCB, 2020). These events were conducted at the local public library, a government assistance section 8 housing complex, and the Hispanic cultural center. We chose these locations because we wanted sites that Latinx families would visit. Also, all of the locations chosen already had programmed family oriented events. At the public library, the family science events were scheduled from 6pm-8pm on Wednesday, July 26, August 2, and August 9 of 2017. The following year in 2018, we organized six additional events from 6pm-8pm on Thursday, August 2, 9, and 16, and from 10:30am-12:30pm on Saturday, August 4, 11, 18. At the government assistance section 8 housing complex, the family science events were scheduled from 6pm-8pm on Monday, October 9, 16, and 23 of 2017. At the Hispanic cultural center, the family science events were scheduled from 10am-12pm on Saturday, September 16, October 21, and November 18 (See Table 3 for number of attendees at each study site).

Table 3*Number of Participants at Each Study Site*

Study Site	#
Public Library	22*
Section 8 Housing Complex	8**
Hispanic Cultural Center	5**

Note. We had a total of n=31 participants with one participant attending four events and another participant attending two events.

Note. Values with ‘*’ include participants who attended an event at another study site

Note. Values with ‘**’ include participants who attended more than one event at that study site.

Study Setting

The space at the public library was about the size of a large classroom, the Hispanic Cultural Center was about the size of a medium classroom, and the space at the section 8 housing community was about the size of a small conference room. All of the study sites had movable tables and chairs, as well as easy access to the outside for certain activities. They all had running water, electricity, electrical outlets, access to internet/wifi, computers, as well as a projector for us to use. In addition, the study sites provided various supplies such as, pens, pencils, markers, rubber bands etc., and disposable materials like paper plates, cups, and napkins.

Participants

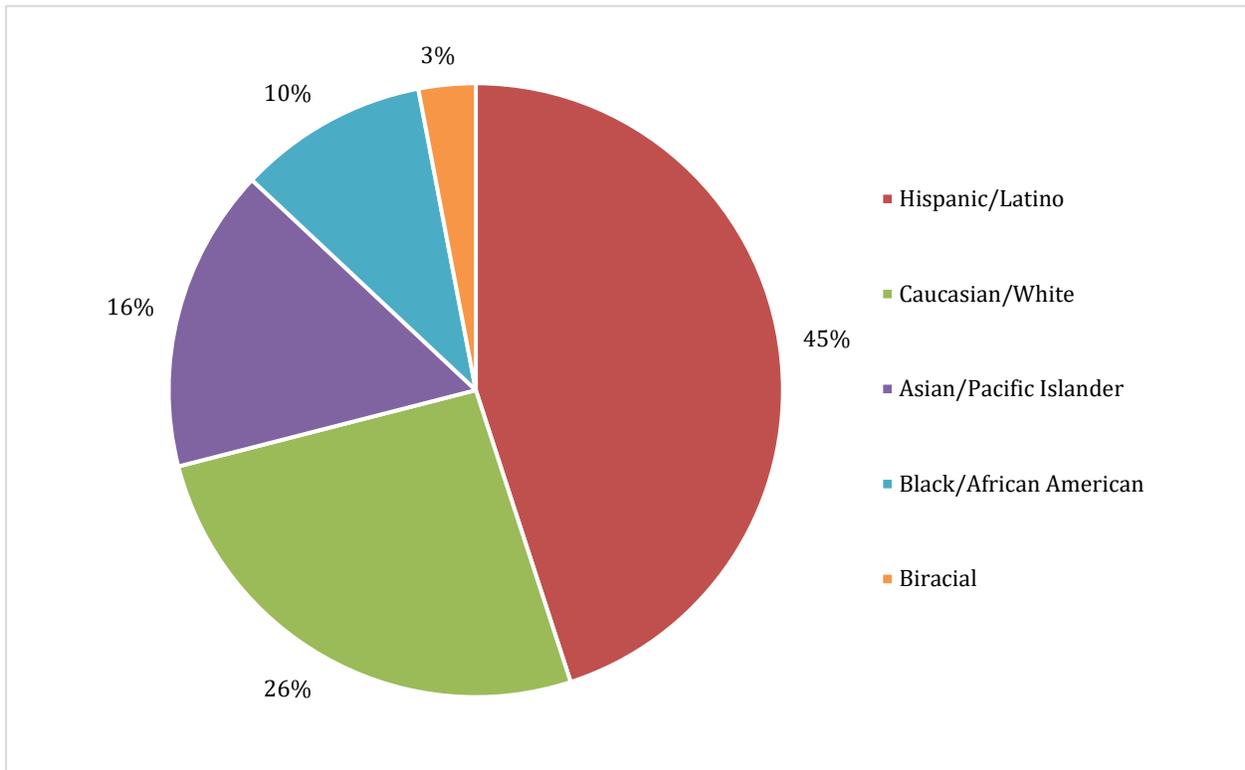
For our study, we focused on parents or guardians with children that were 9-12 years old, because this is the time period that most children begin to lose an interest in science (George, 2000). Parents and guardians with children outside of this age range were still allowed to participate. We required all children participating in the family science event to be accompanied by a parent or guardian. The parents/guardians were our research participants for this study, while their children were just event attendees who participated in the program activities. Out of the 31 parents/guardians that participated in the study, 45% identified themselves as Hispanic/Latinx (Fig. 1; Table 4). Of the Latinx participants, 71% were mothers (Fig. 2), 43% had completed graduate/professional degrees (Fig. 3), and 86% had their children in public school (Fig. 4).

Table 4*Family Science Participants by Ethnicity (n=31)*

Ethnicity	n	%
Hispanic/Latinx	14	45%
Caucasian/White	8	26%
Asian/Pacific Islander	5	16%
Black/African American	3	10%
Biracial	1	3%

Figure 1

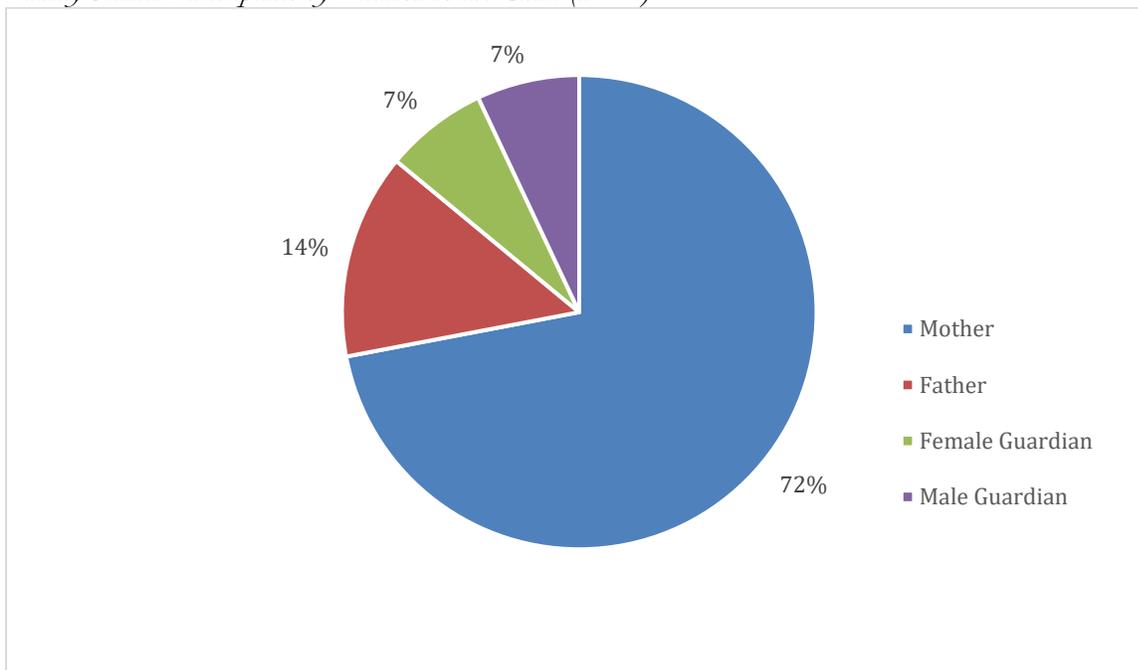
Family Science Participants by Ethnicity (n=31)



Note. Of the parents that participated in the study, 45% were Hispanic/Latinx.

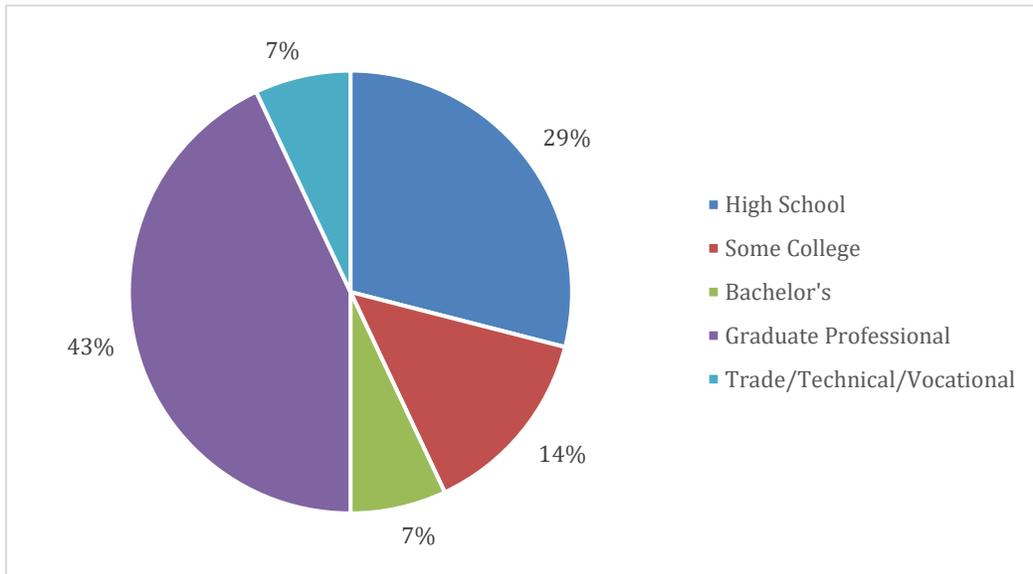
Figure 2

Family Science Participants by Relation to the Child (n=14)



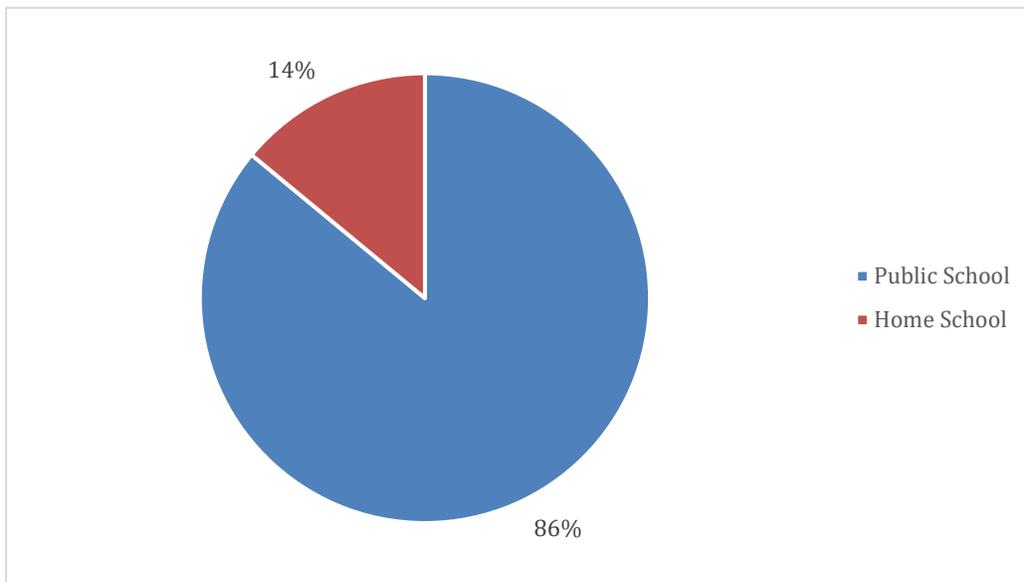
Note. The majority (72%) of the 14 Latinx parents that participated in the study were mothers of the children that were brought to the family science events.

Figure 3
Family Science Participants by Education (n=14)



Note. A large portion (43%) of the 14 Latinx parents that participated in the study had a graduate/professional degree.

Figure 4
Family Science Participants by Type of School (n=14)



Note. The majority (86%) of the 14 Latinx parents that participated in the study had children in public school.

Recruitment of Participants

Participants were recruited primarily by each of the study site directors. Although I did design a flyer for our science events, in both English and Spanish, each study site marketed our science events in their own way. They all placed fliers around their establishment, on marquees and digital screens,

as well as sending word out through their own email lists. The parents that decided to participate in this study self-selected to participate and were not compensated monetarily.

Family Science Event Structure

During the pilot study, we observed that the parents/guardians were not engaging with their children on the science activities. Types of disengaged behavior that we observed were parents/guardians watching their children work on the science activity, leaving their children alone during an activity and either sitting off to the side or doing something else other than assisting their child with the science activity. To promote more parental engagement with their children, we adjusted the set-up of my events. Initially, we set-up my family science events to resemble a *gallery walk* (Appendix A). In this set-up, there were six stations with a different science activity that participants could perform in any order. Participants were not required to complete all six activities. A volunteer was placed at each station to facilitate that activity and to answer any questions. After the pilot study, we adjusted my event set-up to resemble a *workshop*. In this set-up, we placed tables in rows and only one volunteer led the facilitation of the science activities to all of the participants at the same time. To promote more engagement among the parents/guardians, we created science journals for each event with instructions for the activities in the science journals (Appendix B). We also indicated duties that the parent would perform and duties that the child would perform. After making these adjustments, we observed more engaged behavior from the parents/guardians, as well as a decrease in the amount of volunteers and the cost for each event.

Family Science Event Activities and Materials

It was our goal for the activities performed at the family science events to be accessible to all families. We wanted the activities to be fun and engaging for both the parent and child, as well as relevant to the timeframe the events took place. For example, we built eclipse viewers before the 2017 eclipse. In addition, we chose activities that made use of materials many families would already have in their homes or could be cheaply purchased at the store. To give an example, to prepare for the solar eclipse on August 21, 2017, we had participants build eclipse viewers with their children. This activity only required a cardboard box, aluminum foil, white printer paper, tape, scissors, and a pin. In another activity, where participants made balloon rockets, it simply required a balloon, a straw, string, tape, and scissors (See Table 5 for descriptions of activities).

Data Collection

At the start of the family science event, parents signed parental consent forms, as they did in the pilot study, and initialed questionnaires so that it could be determined whether they participated in more than one family science event. We collected data from a pre-event parent/guardian involvement questionnaire that was modified in 2018 (Appendix D in 2017 & Appendix E in 2018). The modified pre-event parent/guardian involvement questionnaire made the instrument easier for the parents/guardians to complete and increased the quality of the data collected.

Table 5*Descriptions of a Sampling of Activities Used in the Family Science Events*

Measuring Shadows	The purpose of this activity was to explore the relationship between the size and position of shadows and the position of the sun. The parent and child would go outside at various times of the day and the parent would measure their child's shadow at each of these times. Then the parent and child would take a look at the measurements to see how the measurements changed throughout the day.
Magic Tape	The purpose of this activity was to explore static electricity. Placing two strips of tape down on a table and ripping them off will demonstrate a pushing effect of the pieces away from each other. Placing one strip of tape on a table and then placing another strip directly on top of the first strip will demonstrate a pulling effect of the pieces towards each other.
Microscope Fun	The purpose of this activity was to learn how to use a microscope and preparing dry mount slides. The parent would help the child cut out different pieces of newspaper and magazines to look at under a microscope.
Microscopes and Microorganisms	The purpose of this activity was to learn how to make a wet mount slide and explore microorganisms in pond water. After looking at a drop of pond water, the child is instructed to pick something they see in their microscope and draw it.
Mutations in Fruit Flies	The purpose of this activity was to explore mutations in fruit flies. The parent would help their children look at samples of fruit flies with hand lenses and microscopes to determine which mutation each sample had.
Frankenstein's Hand	The purpose of this activity was to explore the chemical reaction that occurs between baking soda and vinegar. The role of the parent is to help their child add some vinegar to a cup and then add some baking soda into a disposable glove. Then the parent helped the child place the glove around the rim of the cup without spilling baking soda into the cup. Once the glove is firmly around the cup, the child is assisted to lift the glove to empty the baking soda into the cup. The reaction will produce a gas which will then fill up the glove giving off the impression that it is alive.
Cloud Spotting	The purpose of this activity was to explore the different types of clouds. The role of the parent was to take their child outside and take a look at the sky. With the help of a cloud identification chart, the parent helped their child identify the types of clouds in the sky.
I, Robot	The purpose of this activity was to build a model of the ISS End Effector arm and explore robots and how they are used in space. The role of the parent is to help their child build this model using common household materials. Then test their model robot to see what sorts of things it could pick up and move.
Balloon Rockets	The purpose of this activity was to observe Newton's Third Law of Motion. The role of the parent is to help their child cut a length of string and run it through a straw. Then attach the string between two sturdy objects. Next the parent would help their child blow up a balloon and pinch it shut while taping it to the straw on the string. Then let the balloon go and see what happens.
Eclipse Viewers	The purpose of this activity was to build an eclipse viewer to view the 2017 eclipse safely. The role of the parent is to help their child construct an eclipse viewer out of common household products.

Instruments

We used the pre-event parent/guardian involvement questionnaire to find out what types of informal science activities parents engage in with their children. The questionnaire included a list of various activities that parents were asked to provide a number of how often they participated in that activity with their child/children. The questionnaire also included two additional open-ended free response questions. Demographics collected on the involvement questionnaire were the parent participant's self-identified ethnicity, relationship to the child, and highest level of education. The parent/guardian involvement questionnaire was based upon the parent involvement survey developed by Dr. Hunter Gehlbach and his research team of Dr. Karen Mapp and Dr. Richard Weissbourd at the Harvard Graduate School of Education. Dr. Gehlbach and his research team made use of a multi-step process in developing surveys to ensure high validity and reliability. This multi-step process included an extensive review of the literature, interviews and focus groups, development of items, validation by experts, cognitive pretesting, and then piloting the surveys (Bahena, Schueler, McIntyre, and Gehlbach, 2016; Artino, La Rochelle, Dezee, and Gehlbach, 2014; Schueler, Capotosto, Bahena, McIntyre, and Gehlbach, 2014; Gehlbach and Brinkworth, 2011).

Translation of Materials

We provided Spanish translations of all family science events materials, including the science journals with the activities, consent form, and surveys. However, none of the materials translated in Spanish were ever requested. The Latinx parents that participated in the study preferred the English materials.

Data Analysis

We used an independent inductive approach to analyze the parent/guardian involvement questionnaires and apply descriptive codes to the data. After our initial descriptive codes were created independently, we met and discussed similarities in our codes (Patton, 1990). After the final selection of codes, we then identified patterns of Latinx parental involvement in informal science activities (Saldaña, 2016).

Results

Parental Involvement

Our research question focused on the types of informal science activities that Latinx parents engaged in with their children. Parent/guardian participants completed the parent/guardian involvement questionnaire before our family science events (Appendix E; Appendix F).

Family Science Event Participation

There were 15 family science events. Of the Hispanic/Latinx participants surveyed (n=14), only two participated in more than one family science event. One of these parents attended four events and the other attended two events.

Parent Participation in Activities

The top two of the 27 coded listed activities that parents participated in with their children at home were talking about science (14%) and visiting the library (13%) (Table 6). To understand the

nature of the science activities, the activities were clustered into *Inside/Structured*, and *Outside/Discovery*, in Table 7. *Free* and *Paid* activities were clustered separately in Table 8. *Inside/Structured* activities are activities that are typically done inside and have some sort of structure or organization by way of a guide or the infrastructure of the location. *Outside/Discovery* activities are activities that are typically done outside and have no direction with regard to content. *Free* activities are activities that do not require a fee to participate in and *Paid* activities are activities that require a fee to participate in. Talking about science was not included in these calculations because I decided that this activity could be done inside or outside and could be a structured or discovery activity. As a result, the percentages do not add up to 100% for all types of activities. Note in Table 7, there were more *Indoor/Structured* activities that parents listed than *Outdoor/Discovery*. *Indoor/Structured* activities were varied from visiting an aquarium to watching science Youtube clips. *Outdoor/Discovery* activities were also varied from collecting rocks to observing the night sky. It is interesting to note that parents did not describe any activities that were discovery oriented and inside. There were also more free activities than paid activities described by the parents. An example of a free activity is attending a science fair. An example of a paid activity is visiting a zoo. Table 9 displays how often parents participated in *Inside/Structured*, *Outside/Discovery*, *Free*, and *Paid* activities. There was 55% parent participation for activities that were *Inside/Structured* activities, whereas 32% were *Outside/Discovery*-oriented activities (Table 9). Lastly, there was 73% parent participation for *Free* activities and 27% for *Paid* activities (Table 9). Overall, Latinx parents listed participating in *Indoor/Structured*, and *Free* activities more than *Outdoor/Discovery*, and *Paid* activities.

Types of Activities

Parent participants identified 27 separate science activities (Table 6) they performed with their children outside of our family science events on the Parent/Guardian questionnaire (Appendix E). Of the 27 activities mentioned by the parents, 63% of activities were structured and could be done inside the home and 33% were discovery-oriented and could be done outside (Table 7). And, 59% of activities were free activities whereas 41% of activities required a fee (Table 8).

Table 6
Activities Performed by Hispanic/Latinx Parents/Guardians with their Children (n=18)

Activity	Participation in Activity	Activity	% Participation in Activity
Talked About Science	14% (16)	Watched Science TV Show	2.6% (3)
Visited Library	13% (15)	Attended Science Event	2.6% (3)
Worked on Home Science Projects	7% (8)	Birdwatched	2.6% (3)
Collected Rocks	5% (6)	Observed Weather	2.6% (3)
Went on A Nature Walk	5% (6)	Visited Aquarium	1.8% (2)
Watched Science Documentary	5% (6)	Worked on Science Activity Kit	1.8% (2)
Read Book on Science	4% (5)	Taught Science in Homeschool	0.9% (1)
Visited Museum	4% (5)	Watched Science Clips on YouTube	0.9% (1)
Explored River	4% (5)	Attended Science Fair	0.9% (1)
Observed Night Sky	3.5% (4)	Observed Nature	0.9% (1)
Went for a Hike	3.5% (4)	School Fieldtrips	0.9% (1)
Gardened	3.5% (4)	Visited Zoo	0.9% (1)
Researched Science Online	3.5% (4)	Worked on Science Activities Online	0.9% (1)
Helped with School Work	2.6% (3)	Total	114

Note. Values in parenthesis represent raw numbers of parental responses.

Table 7*Activities Clustered by Inside, Outside, Structured, and Discovery*

Inside/Structured Activities	Outside/Discovery Activities
Visited Library	Collected Rocks
Worked on Home Science Projects	Went on a Nature Walk
Watched Science Documentary	Explored River
Read Book on Science	Observed Night Sky
Visited Museum	Went for a Hike
Researched Science Online	Gardened
Helped with School Work	Birdwatched
Watched Science TV Show	Observed Weather
Attended Science Event	Observed Nature
Visited Aquarium	
Worked on Science Activity Kit	
Taught Science in Homeschool	
Watched Science Clips on YouTube	
Attended Science Fair	
School Fieldtrips	
Visited Zoo	
Worked on Science Activities Online	

Table 8*Activities Clustered by Free and Paid*

Free Activities	Paid Activities
Talked About Science	Watched Science Documentary
Visited Library	Read book on science
Worked on Home Science Projects	Visited museum
Helped with School Work	Research science online
Attended Science Event	Watched science tv show
Taught Science in Homeschool	Visited aquarium
Attended Science Fair	Worked on science activity kit
Collected Rocks	Watched science clips on youtube
Went on a Nature Walk	School field trips
Explored River	Visited zoo
Observed Night Sky	Worked on science activities online
Went for a Hike	
Gardened	
Birdwatched	
Observed Weather	

Table 9*Types of Activities Performed by Hispanic/Latinx Parents with their Children (n=18)*

	% Types of Activities	% Parent Participation in Activity
Inside/Structured*	63% (17)	55% (63)
Outside/Discovery*	33% (9)	32% (35)
Total	(27)	(114)
Free	59% (16)	73% (83)
Paid	41% (11)	27% (31)
Total	(27)	(114)

Note. Items with an asterisk do not include the activity talking about science.

Note. Values in parentheses represent raw numbers of responses.

Discussion

Latinx Parent Involvement

For our research question, we wanted to know what types of informal science activities Latinx parents are engaging in with their children. Fifty-five percent of Latinx parents mentioned participating in structured activities that could be done inside, and 73% of Latinx parents' mentioned free activities. The data indicate that Latinx parents in our study seem to be more engaged with their children in free and structured activities that can be done inside. Since most Latinx families have low socioeconomic status (SES), free activities would be highly appealing (USCB 2017a). The American Psychology Association (2018) defines socioeconomic status (SES) as quality of life attributes as well as the opportunities and privileges afforded to people within society, which include income, education, and social status. According to the United States Census Bureau (2017a), 25% of all Hispanic families make less than \$30,000 whereas 12% of white families make less than \$30,000. Also, on average, Hispanic families make \$37,000 less than White families. In addition, the median household income for the city our study was completed in is \$37,593 (USCB, 2020). Free science activities may be all that Hispanic families can afford for science education enrichment.

The preference of Latinx parents for *structured* activities that can be done inside may be connected to their level of education. Castaneda (2006) and Kaya and Lundeen (2010) found that Latinx parents do not have the necessary knowledge and skills to assist their children with science activities. According to the United States Census Bureau (2017b), 28% of Hispanics have less than a high school diploma and 18% have a bachelor's degree or more. Whereas, 6% of Whites have less than a high school diploma and 39% have a bachelor's degree or more. This may explain why 55% of the Latinx parents that participated in our study preferred structured activities that included a guided component over discovery-based activities. Examples of structured types of activities include family science events at local public establishments, watching science documentaries or YouTube videos, or reading books on science. Doing more structured and guided science activities with their children may be their solution for their lack of knowledge in science. Interestingly, a large percentage, 44%, of Latinx parents that participated in our study had a bachelor's degree or higher, which is more than double the national value. This is also higher than the education level of the city our study took place in which contains 34% with a bachelor's degree or higher (USCB, 2020). If it can be assumed that Latinx parents in my study know more about science due to their high education levels, then one would have expected they could assist their children in both structured and discovery activities inside and outside. Despite the fairly high educational levels of Hispanic parents in our sample, the results indicated a preference for structured activities. An alternative explanation for the preference for inside

activities in our study may be a seasonality factor. Ten out of the 15 family science events that we organized took place during the summer months of July, August, and September. In Texas, it gets very hot during these months and may cause parents to consider only inside activities with their children. Still, it is not clear why the highly educated Latinx parents in our study preferred structured activities that could be done inside.

While none of the Latinx parents in our study listed that they volunteered at their children's school with science, 86% of them were interested in assisting their children's school with science. This suggests that Latinx parents care about their children's science education and are willing to be involved. This is supported by Castaneda (2006) who found that Latinx parents do care about their children's education and Hernandez, Rana, Alemdar, Rao, and Usselman (2016) who found that Latinx parents who participated in family science activities wanted to keep doing the science activities at home.

Summary

Latinx parents, in our study, are more engaged with their children in free and structured science activities that can be done inside. This information may help school districts, administrators, and teachers to determine the best ways to implement family science programming in their schools or classrooms to better support their students' science education and to promote an interest in science. Latinx children who have their science learning supported and have an interest in science instilled in them may be more likely to pursue science in college and move forward to careers in STEM. This may help to decrease the gap in representation of Latinxs and Hispanics in the STEM workforce.

Limitations

It is important to note that only 18 Latinx parents participated in the study, which was a small sample size. In addition, Latinx parents that participated in our study volunteered to participate, which incorporates a self-selection factor into the study. Furthermore, because the Latinx parents in our study generally had higher levels of education than Latinxs in the general U.S. population, results from our study may not be generalizable to all Latinx parents. In the United States, the percent of Latinxs that have a bachelor's degree or higher is 18%, while 44% of the Latinx parents in my study have a bachelor's degree or higher (USCB, 2017b).

Even with these limitations in the study, the research findings are valuable. There are scarce studies in the literature regarding the types of science activities Latinx parents engage in with their children. Since parents are the most influential in the early development of children, it is necessary to better understand what Latinx parents are doing with their children in science. Through understanding Latinx parents, we are better able to indirectly support Latinx children's academic achievement in science and interest in STEM careers.

Future Directions

Future studies that explore the types of informal science activities that Latinx parents engage in with their children should have a larger sample and more representative of the Latinx population in the United States. To overcome this limitation, study sites should be selected that are visited more by Latinx parents. Also, partnering with a local school district in organizing family science events for parents and their children may decrease the effects of self-selection. It would be beneficial to have a larger sample size and reduced self-selection effects to gain a clearer picture of the types of informal science activities Latinx parents are doing with their children.

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Appendix A

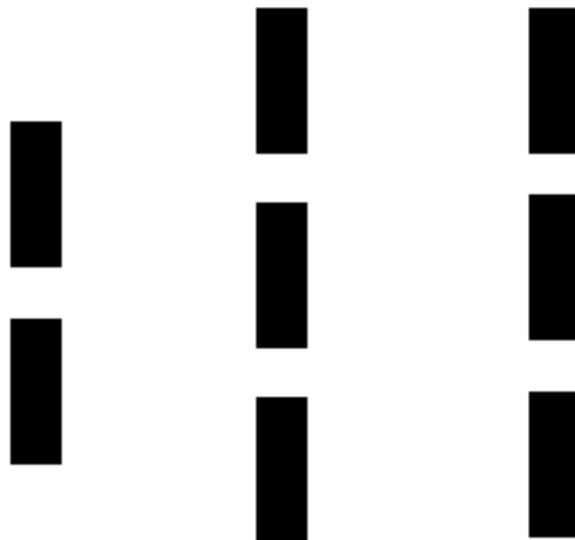
Family Science Event Set-Up

*Black rectangles represent tables

Pilot Study Family Science Event Set-Up



Revised Family Science Event Set-Up



Appendix B**Science Journals**

My Science Journal!

Name

Magic Tape

1. Parent: Pull off two strips of tape about 4 inches long and fold the ends back on themselves to make a handle. Stick the two strips of tape down on top of the table.

Parent and Child: Quickly rip off the strips of tape and hold them so that they hang down vertically. Slowly bringing the two strips near each other and observe what happens.

2. Parent: Pull off one strip of tape about 4 inches long and fold the end back on itself to make a handle. Stick the strip of tape down on top of the table. Pull another strip of tape of the same length and fold the end back to make a handle and stick this strip on top fo the strip on the table.

Parent and Child: Pull the two strips of tape off the table and hold them so that they hand down vertically. Quickly pull apart the two strips of tape and slowly bring the two strips near each other and observe what happens.

Appendix C

Informed Consent

Study Title: Increasing Parent Interest in Science and Parental Involvement for Latino Parents with Family Science Nights

Principal Investigator: Author

Co-Investigator/Faculty Advisor: Author

This consent form will tell you why this study is being done. It will tell you why you are invited to participate. It will also tell you what you need to do to participate. You will be told about risks and difficulties that you may have while participating. We encourage you to ask questions at any time. If you decide to participate, you will be asked to sign this form. You will be given a copy of this form to keep.

PURPOSE AND BACKGROUND

This study will explore parent interest in science. Also, parent involvement in their children's science learning. You are asked to participate because you are the parent or guardian of a child in the 9-12-year age group.

PROCEDURES

If you agree to be in this study, you will participate in the following:

- A Family Science Night event
- A science attitude survey & event exit survey (10 min.)
- A take-home parent/guardian involvement questionnaire (10 min.)

Family Science Nights will be at the Public Library. They will be on Wednesdays from 6pm-8pm, June 28, July 5, July 12, July 26, August 2, and August 9. You will first complete the science attitude survey. After the Family Science Night, you will complete the exit survey. At the end of the event, you will be given a take-home questionnaire. This will be mailed back to us or returned during the Family Science Night event.

RISKS/DISCOMFORTS

The survey will have questions about your background. If you are not comfortable answering these questions you may leave them blank. If the survey or questionnaire makes you uncomfortable, you may leave them blank.

BENEFITS/ALTERNATIVES

The benefits to you are more awareness of science. Also, how to be more involved in your children's science learning.

EXTENT OF CONFIDENTIALITY

Your name will not be used in any written reports or publications. Information from paper documents will be converted to an electronic file. Then all paper documents will be shredded. The electronic file will be password protected and kept for three years. Then the electronic file will be deleted.

PAYMENT/COMPENSATION

You will not be paid for your participation in this study.

PARTICIPATION IS VOLUNTARY

You do not have to be in this study if you do not want to. You may refuse to answer any questions you do not want to answer. You may withdraw from this study at any time.

QUESTIONS

If you have questions about this study, you may contact Author.

This project 2017763 was approved by the University IRB on June 26, 2017. Questions about the study should be directed to the IRB Chair or to the IRB Regulatory Manager.

DOCUMENTATION OF CONSENT

I have read this form and will participate in the project described above. Its purposes, involvement and risks have been explained to my satisfaction. I understand I can withdraw at any time.

Printed Name of Study Participant	Signature of Study Participant	Date
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Signature of Person Obtaining Consent	Date
---------------------------------------	------

Appendix E

**Modified for Summer 2018
Family Science – Parent/Guardian Questionnaire**

Instructions: We would appreciate your completion of this questionnaire. You may choose not to answer questions that you are not comfortable with.

1. In the box next to each activity, mark the number of times you have done that activity with your child in the past week. If an activity you and your child have done is not listed please describe in the section called “other”.

	Collected Rocks		Visited Aquarium		Visited Zoo		Worked on Science Activities Online		Observed Weather
	Observed Night Sky		Went on a Nature Walk		Used Physical Models		Worked on Home Science Projects		Visited library
	Went Camping		Went Fishing		Went for a Hike		Explored River		Birdwatched
	Attended Science Event		Attended Science Fair		Visited Museum		Watched Science Clips on YouTube		Taught Science in Homeschool
	Gardened		Talked About Science		Watched Science Documentary		Watched Science TV Show		Read Book on Science
	Researched Science Online		Worked on Science Activity Kit	Other:					

2. What obstacles, if any, prevent you from being more involved in your child’s science education?

3. What might help you overcome any obstacles you listed above? Please explain.