# STEM Family Engagement Program for Families with Young Children

**YaeBin Kim**
University of Nevada, Las Vegas

**Abstract:** Let's Discover STEM is designed to provide enriching foundational Science, Technology, Engineering, and Mathematics experiences for Latino children who likely would not have such experiences; teach parents how to nurture children's curiosity by encouraging and supporting their children's STEM learning at home, in school and throughout the community; and build a connection between homes and schools to support children's STEM success as they enter and progress through school. Since 2017, Let's Discover STEM program in Nevada (Clark and Washoe) have been provided in-person 7-week classes (32 hands-on STEM activities, 7 mini-lessons, and 7 STEM children's books) to Spanish-speaking families with young children to support their early STEM learning. After the program, parents were significantly more confident about using STEM skills to teach their children; believed their children could learn from them; were significantly more confident about helping their children succeed in school; and felt that they were significantly better prepared to help their children learn. Parents also reported that their children's STEM readiness skills were significantly improved (e.g., recognizing shapes and numbers, building with blocks, recognizing patterns, etc.)

**Keywords:** Early STEM, family engagement, parenting, school readiness, and parent-child interaction

**Citation:** Kim, Y. (2023). STEM Family Engagement Program for Families with Young Children. In M. Shelley, V. Akerson, & M. Unal (Eds.), *Proceedings of IConSES 2023-- International Conference on Social and Education Sciences* (pp. 563-568), Las Vegas, NV, USA. ISTES Organization.

## Introduction

Young children are born scientists. They are naturally curious about the world around them—eager to explore, invent and solve problems. They are enthusiastic investigators, and as they explore their world, they are beginning to develop STEM (Science, Technology, Engineering and Math) knowledge and skills. Unfortunately, by the time they reach fourth grade, many children are lacking key STEM knowledge and skills (Hammer, Jia, & Uchikoshi, 20011). Hispanic children are particularly at risk for not developing strong STEM skills and aspirations. In 2015, only 12% of Nevada Hispanic fourth-graders rated at or above proficiency in both math and science, which may help explain why Hispanics are underrepresented in STEM professions (National Assessment of Educational Progress, 2015). Fortunately, early exposure to STEM, whether at home or in school, supports children's overall academic growth, develops early critical thinking and reasoning skills, and enhances later interest in STEM studies and careers (McClure et al., 2017). Providing opportunities for young children can help them gain basic STEM skills in: Observing what is happening, what they see, hear and feel; Predicting what will happen if they try something or what will happen next; Experimenting and investigating

their predictions to see what really happens and why; Interpreting and drawing conclusions, such as whether the results would be the same in another setting.

Equally important, involving parents encourages them to take an active role in creating a positive and safe environment at home for exploration and discovery (Dearing & Tang, 2010; Fan & Chen, 2001). By creating a stimulating STEM-rich environment at home, young children will be better prepared as they enter and progress through school.

**Let's Discover STEM**

Funded by a NIFA Children, Youth and Families at Risk grant, Let's Discover STEM/Descubramos STEM was designed to provide enriching STEM experiences for young Hispanic children (3-6 years old) who likely would not have such experience, and to teach parents how to nurture children's curiosity by encouraging and supporting their children's early STEM learning. Young children learn best when doing—touching, moving, testing, playing. Therefore, central to Let's Discover STEM/Descubramos STEM were workshops where children and parents were actively engaged in hands-on, developmentally appropriate activities designed to enhance STEM-related interest, knowledge and skills. Targeting families in at-risk neighborhoods in Las Vegas and Reno/Sparks, the seven-week workshop series focused on beginning STEM, as well as parents' skills and confidence in boosting children's early STEM learning. The majority of these children were not in formal early childhood programs. During the weekly lessons, families: discussed key foundational STEM skills; engaged in a variety of hands-on, experiential STEM activities; read a carefully selected STEM book; learned about do-at-home enrichment activities that enhance the value of STEM; and received a free book and materials to complete additional enrichment activities at home.

## Methods

The Let's Discover STEM program was first developed for in-person delivery modes and was delivered in-person between Fall 2017 and Spring 2022. During the pandemic, between Fall 2020 and Spring 2022, virtual classes and in-person classes were interchangeably provided. More specifically, only virtual classes were provided during Fall 2020, then some sites started requesting in-person classes starting in 2021. We continued providing virtual options to partner sites in 2022, although more requested in-person workshops. Overall, our team provided 18 virtual classes to 236 families and 72 in-person classes to 779 families during this period. Out of the 1,015 program participants, evaluation data was collected from 826 families. The reduced sample size for participants with evaluation data is mostly due to participants who did not attend all of the sessions when in-person and due to difficulties collecting evaluation forms from families during virtual programming. Sample sizes are smaller for some variables reported due to missing data and attrition of participants during the program. Additionally, some scales (i.e., the STEM School Readiness scale) were not implemented until later in the program life cycle.

**Participants**

Participants were families from 43 community sites in Clark and Washoe County in Nevada. The study sample reported in this paper consisted of 826 parents/caregivers who returned evaluation forms for data collection. Most of the participating parents/caregivers were females and more of them took the class in Spanish and were Hispanic. More than half of them were stay-at-home (see Table 1).

Table 1. Parents/Caregivers Demographics (N = 826)

| | |
|---|---|
| Parent Gender | |
| Male | 61 (9%) |
| Female | 654 (91%) |
| Language | |
| English | 339 (45%) |
| Spanish | 419 (55%) |
| Parent Ethnicity/Race | |
| Hispanic or Latino | 508 (71%) |
| White/Caucasian | 83 (12%) |
| Asian | 62 (9%) |
| Black | 43 (6%) |
| Other | 13 (2%) |
| Parent Employment | |
| Employed full-time | 127 (18%) |
| Employed part-time | 95 (14%) |
| Unemployed/Not Working | 470 (68%) |
| Parent Education | |
| Less than high school | 134 (19%) |
| High school | 215 (31%) |
| Some college | 210 (30%) |
| College and over | 133 (29%) |
| Parent Age | |
| 20-30 | 152 (22%) |
| 30-40 | 365 (54%) |
| 40-50 | 131 (19%) |
| Over 50 | 33 (5%) |

*Measures*

The following measures were used to collect data from program participants from 2017 through 2022.

*Number of Sessions Attended*

The number of sessions attended by each parent-child pairing was recorded using an attendance sheet filled out each week by the program instructor and could range from one to seven sessions. They were categorized into two groups: families attend 1-4 sessions and families attended 5-7 sessions.

*Parent Perceived Impact of Program*

The parent perceived impact of the program was the mean of five items collected at the end of the program, each answered on a 5-point Likert-type scale from "very little" to "very much." Example items include, "how much has the program increased your knowledge about STEM?" and "how much has the program increased your child's interest in doing STEM-related activities?" The scale had good reliability ($\alpha = 0.88$).

*Parent Support of STEM*

The parent support of STEM scale was the mean of four items answered on a 5-point Likert-type scale from "very little" to "very much." This scale was collected at the end of the program as a post-reflective measure, meaning there were four items asking how the parent felt before the program as well as four items asking how the parents felt after completing the program.

Example items include, "how confident were you that you could use STEM skills to teach your child?" and "how much did you believe your child could learn from you?" The scale had good reliability (pre-support of STEM $\alpha$=0.88; post-support of STEM $\alpha = 0.86$).

*STEM School Readiness (SRS)*

The STEM School Readiness (SRS) scale was the mean of 16 items answered in a 3-point Likert-type scale including "not yet," "somewhat," and "yes." This scale was collected at the end of the program as a post-reflective measure, meaning there were 16 items asking what "My child could do BEFORE the program" and 16 items asking what "My child can do AFTER the program." Example items include, "count 1-20," "build with blocks," and "compare objects to determine more or less." The scale had excellent reliability (pre-SRS $\alpha$=0.94; post-SRS $\alpha$=0.90).

*Total Number of Weekly Take Home Activities Completed*

For each weekly take-home activity sheet, parents indicate which of the four activities they completed with their child. This variable is a sum score of the total activities, out of 24, that a parent indicated they completed with their child during the program.

*Total Time Spent in Weekly Take Home Activities*

For each weekly take-home activity sheet, parents indicate how much time they dedicated to weekly take-home activities. This was the mean of six weekly take-home activities answered on a 5-point Likert-type scale from 1 to 5 (1: No time dedicated, 2: Less than 30 minutes, 3: 30 minutes to 1 hour, 4: 1 hour to 2 hours, and 5: More than 2 hours).

## Results

### Increased Time Engaged in STEM Activities

During the workshops, children participated in as many as 28 STEM enriching activities. Also, each week we sent home ideas and activities for doing additional STEM activities. Over the course of the program, families did an average of 19 of the 24 suggested take-home activities. Nearly 87% of parents reported spending at least 30 minutes or more per week doing those activities at home, with 45% reporting spending one or more hours a week doing the activities. Through both in-class and at-home activities, children engaged in up to 52 STEM activities that otherwise would not have been done with these targeted children. In essence, through participating in the program, children and parents were engaged in enriching fundamental STEM activities that build STEM readiness and success.

*Increased Knowledge and Interest in STEM activities*

Parents reported that their children increased their knowledge about STEM and their interest in doing STEM-related activities. Parents also reported that the program increased their own knowledge of STEM and their interest in doing STEM related activities with their children. In other words, both children and parents increased their knowledge and interest in STEM because of the program.

*Increased STEM Skills*

Foundational STEM skills for young children include abilities such as counting 1-20; recognizing shapes; comparing objects to determine more or less; measuring length, size and weight; and building towers and bridges. Learning these skills early can set children up for success in STEM-related subjects in school. At the end of the series, parents rated their child's ability on 16 fundamental STEM skills. According to parents, children made significant gains on all of the emerging STEM skills focused on in the classes. In other words, parents saw an increase in their children's emerging STEM skills across the program ($t = 21.57$, $p < .001$).

*Increased Parental Confidence*

By the end of the program, parents reported being significantly more confident they could help their children

gain STEM skills that their children could learn from them that they could help their children succeed in school(, and that they were prepared to help their children learn ($t$ = 31.61, $p < .001$; $t$ = 26.25, $p < .001$; $t$ = 25.94, $p < .001$; $t$ = 29.09, $p < .001$). Parents also felt that the program helped strengthen their relationships with their children.

## Conclusion

This program implementation research proved that the family engagement program focusing on children's early STEM skills increased children's time engaged in STEM activities, parents' knowledge and interest in STEM activities, children's early STEM skills, and parental confidence in helping children develop STEM skills and be ready for school. Exposing children to STEM at a young age supports their overall academic growth and develops early thinking and reasoning skills, so it is important to start early from home. Hispanic, Spanish-speaking families were the vast majority of this program participants and the program showed that this program benefited their children and themselves. Especially, the program enhanced parents' attitudes and confidence in their ability to help their children develop fundamental STEM skills. This implies that family engagement focused program can help families improve young children's school readiness and create lasting change for families.

## References

Hammer, C. S., Jia, G., & Uchikoshi, Y. (2011). Language and literacy development of dual language learners growing up in the United States: A call for research. *Child Development Perspectives, 5,* 4-9.

National Assessment of Educational Progress. (2015). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. http://nces.ed.gov/nationsreportcard/.

McClure, E. R., Guernsey, L., Clements, D. H., Bales, S. N., Nichols, J., Kendall-Taylor, N., & Levine, M. H. (2017). STEM starts early: Grounding science, technology, engineering, and math education in early childhood. New York: The Joan Ganz Cooney Center at Sesame Workshop.

Dearing, E., & Tang, S. (2010). The home learning environment and achievement during childhood. In A. L. Reschly & S. Christenson (Eds.), Handbook on school-family partnerships for promoting student competence (pp. 131-157). New York: Routledge.

Fan, X., & Chen, M. (2001). Parental involvement and students' academic achievement: A meta-analysis. *Educational Psychology Review, 13,* 1-22.