

Developing a STEM Identity as an Educator:

A Design-Based Research Study
of Kid Spark Education's STEM
Professional Learning Program

SEPTEMBER 2023



Kid Spark Education is an educational nonprofit with a mission to help children learn and love STEM, especially students from communities underrepresented in science, technology, engineering, and math (STEM) fields. Kid Spark has been working to accomplish its mission through the targeted use of an engineering curriculum and building materials developed specifically for underrepresented children and their teachers.

In the spring of 2022, Kid Spark commissioned The Nonprofit Institute at the University of San Diego (NPI) to conduct a design-based research study focused on the development and implementation of a professional learning course for early childhood educators that would complement the existing curriculum. The research study was collaborative, whereby the NPI team partnered with Kid Spark leadership to design and carry out the research study, develop and refine the professional learning course, and interpret the implications of the findings for practice. This research project was conducted between April 2022 and June 2023 and the objectives for the research project are below.

OBJECTIVES

1. *Develop a professional learning plan for early childhood educators that complements the existing early childhood curriculum and can be implemented widely in schools.*
2. *Gather insights from site administrators on how to sustain STEM learning in schools and informal learning settings over time.*
3. *Pilot the professional learning course and Kid Spark curriculum in a variety of early childhood educational settings in order to assess if and how participation increases educators' self-efficacy in teaching STEM.*

Educator Participant Demographic Profile

The findings are the result of data gathered from 24 educators who participated in the Kid Spark online professional learning course and implemented the Kid Spark curriculum with young children, ages 3-6.

The NPI team conducted focus group interviews and administered pre/post surveys with the educators across 11 preschool, after-school, and K-12 settings. Most educators were Pre-K - 1st grade teachers with under a decade of experience, self-identifying as African American, Hispanic, or individuals of color, and possessing minimal to no previous exposure to STEM.

Years Teaching



21%
White

Race / Ethnicity

4%
I prefer to self-describe



25%
African American / Black

8%
Asian

42%
Hispanic / Latino/a/x

Educational Setting

54%
PreK - 12



33%
Preschool

13%
Informal

Prior STEM Experience



38%



62%

Age Range

38%

29%

33%

20-35 Y/O

36-50 Y/O

51-65 Y/O

ADDITIONAL RESEARCH AND IN-DEPTH INTERVIEWS ON KID SPARK IMPLEMENTATION

The NPI team also conducted a total of 11 interviews with site administrators from educational settings that had implemented Kid Spark in the past 1-4 years to better understand the conditions necessary for effectively sustaining STEM programs in educational settings. **These conditions can be found on page 5.**

Findings

Kid Spark Professional Learning Impact on the Development of an Educator's STEM Identity

The completion of the Kid Spark professional learning course coupled with subsequently implementing the curriculum with a group of young children showed early evidence of positively impacting educators' confidence and **self-efficacy in teaching engineering***.

Analysis of data gathered from a pre/post Teaching Engineering Self-Efficacy Scale (TES) survey, depicted in **Figure 1**, demonstrates a significant increase in educators' self-efficacy in teaching engineering following participation in the professional learning course and implementation of the curriculum.

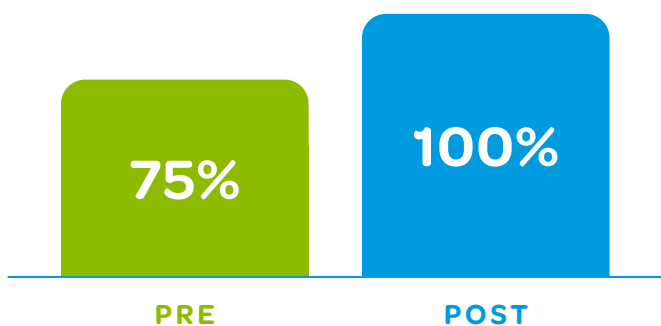


DEFINITION:

Self-Efficacy in Teaching Engineering

A teacher's personal belief in their ability to positively influence student learning of engineering

Figure 1: Pre/Post Percent who "Agree" or "Strongly Agree" in Overall Self-Efficacy in Teaching Engineering (6-point scale where 1=Strongly Disagree and 6=Strongly Agree)



*The difference from Pre to Post was statistically significant ($p < .05$)

71%

of Educators Increased their Self-Efficacy in Teaching Engineering from Pre to Post



Before this course I would teach a concept and have students try it after. Now [I present] a problem and allow students time to create, share with peers, and make it better. Using real world problems are key along with content and practices that are relevant. I see myself teaching this way in all subject areas.

Conditions Necessary for Effective STEM Professional Learning

Based on interviews and focus groups with educators and site administrators about the professional learning course, a set of conditions emerged as being critical to the success of the course increasing educator confidence and self-efficacy in teaching STEM.

CONDITION 1 | Builds a Community of Practice

The professional learning course was designed to build a community of practice, which is a learning approach that promotes collaboration among a group of people focused on a specific topic with the goal of building knowledge and improving practice. The professional learning promoted communities of practice, by providing ongoing peer-to-peer support to educators, in two unique contexts: among educators implementing Kid Spark at the same educational setting and online among educators who implemented Kid Spark in settings across the country.

CONDITION 2 | Asynchronous Flexible, Short Format

Educators praised the asynchronous format of the professional learning modules, where they had two weeks to complete the modules online at their own pace. Educators reported that they had very limited time and being able to fit the learning into their own schedules was beneficial.

CONDITION 3 | Opportunities for Experiential Learning

Each of the modules included an interactive element where educators had to pause and use the Kid Spark building materials to complete an activity. Many of the educators reported that the experiential learning component helped them feel more confident with the materials and better understand the theory behind the program.

CONDITION 4 | Includes Accountability

Educators found value in participating in an online discussion forum and reported that receiving feedback from Kid Spark staff increased accountability for them to contribute to the online forum. However, educators still reported it challenging to keep up with the online reflections and discussions with peers, particularly once they began implementing the program with children.

CONDITION 5 | Values Educators' Time

Educators and site coordinators received financial compensation and continuing educational credits for their participation in the course and program implementation. Educators expressed great appreciation for feeling valued for their time. However, some reported they would have implemented the program without the compensation and others had already fulfilled continuing education requirements and did not need additional credits.



Conditions Necessary to Sustain Applied STEM Education Long-Term

Through interviews with site administrators who had been involved in the implementation of Kid Spark either in the past few years or as part of the current study, a set of conditions needed to sustain applied STEM long-term was identified.

CONDITION 1 | Strong Leadership-Level Support

Administrators that implemented Kid Spark successfully and long-term, did so with strong leadership that mandated STEM education be included in the curriculum. Kid Spark became a vehicle for implementing STEM education but the mandate to provide high quality STEM already existed.

CONDITION 2 | Dedicated Time for STEM

Specific to school-based settings, administrators found that for STEM programs to be successful, allotting time into the master schedule was necessary.

CONDITION 3 | Dedicated Point Person to Coordinate Applied STEM Activities

An on-site coordinator with historical knowledge of STEM learning initiatives at the site was deemed essential to ensuring a program was implemented across multiple classrooms/grade levels with hands-on materials.

CONDITION 4 | Professional Development for Educators and Administrators that Builds a Community of Practice Around STEM

Specific to K-12 schools, administrators reported that educators and principals need more hands-on training in the science standards where they get ample opportunities to practice and learn with each other.

CONDITION 5 | Curriculum that Can Be Easily Adapted to Meet Student Needs

Administrators and educators reported that in order to implement applied STEM curriculum successfully, the curriculum must be flexible enough to allow adaptations depending on the unique context of each educational setting. Educators and administrators felt that Kid Spark was highly adaptable and most educators reported that they did in fact adapt the existing curriculum to meet student needs.

CONDITION 6 | Introduction for Parents on What to Expect from STEM

Administrators stressed the importance of supporting families in understanding the value of STEM. When parents see the value of STEM, they can better advocate for strong STEM curriculum.

Summary

Kid Spark Education has developed comprehensive STEM education programs that now incorporate a scalable professional learning component. Although the professional learning course was piloted with early childhood educators delivering the Pre-K - 1 Kid Spark program, the effectiveness of the asynchronous professional learning course and online forum would likely apply to educators delivering Kid Spark to children of all ages. The addition of the professional learning component makes it possible for new and experienced educators across a variety of learning settings to be able to confidently facilitate applied STEM with preschool-aged up through middle school-aged children.