



**KIDSPARK**  
E D U C A T I O N

## Learning How to Think Like an Engineer: A Design-Based Research Study of Kid Spark Education's Curriculum in Kindergarten

Presented by:  
The Nonprofit Institute  
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University of San Diego  
SCHOOL OF LEADERSHIP  
AND EDUCATION SCIENCES

In January 2017, Kid Spark Education (Kid Spark), a nonprofit organization focused on invention education for children, commissioned The Nonprofit Institute (NPI) at the University of San Diego to conduct a research study exploring the implementation of their early childhood curriculum (PreK-1) in public kindergarten classes. Kid Spark provides applied Science, Technology, Engineering, and Math (STEM) programs to elementary and middle schools and other youth-serving organizations. Each program consists of grade-level aligned curricula and Mobile STEM Labs that contain engineering materials such as construction blocks, wheels, and joints.

*“The students learned what engineers are; that there is a whole world of engineering out there; they won’t be intimidated by it.”*

– Teacher

This study sought to identify the conditions necessary to implement the curriculum in an elementary school setting. The study was conducted in two phases between September 2017 and June 2018. In Phase 1, NPI researchers and teachers partnered through an iterative process to enhance the original curriculum, implement it in kindergarten classes, assess its strengths and weaknesses, and further refine the curriculum. In Phase 2, NPI researchers assessed the impact of the revised curriculum on student and teacher learning.

The analysis of data from teacher focus groups and interviews, classroom observations, and photographs of students’ constructions provide evidence that Kid Spark impacted students’ and teachers’ development of a STEM identity.

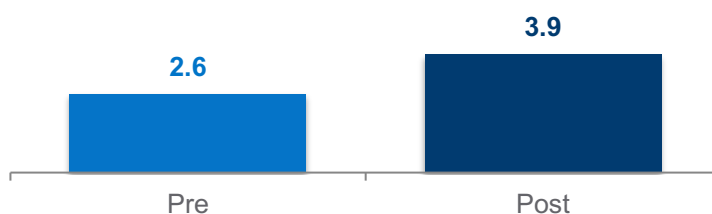
### Key Findings for Students ...

Students showed evidence of growth in building foundational STEM fluencies, engaging in science and engineering practices, and developing knowledge of the field of engineering.

#### Average Pre and Post STEM Fluency Score

( $n=56^*$ ; Scores could range from 0 to 6.5)

\* Statistically significant difference ( $p<.05$ )

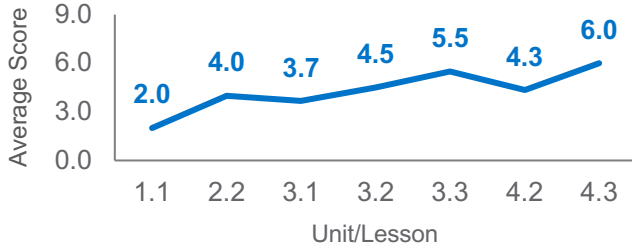


*Students’ free play construction builds were photographed and scored based on a rubric that coded each construction’s complexity, pattern-making, and symmetry.*

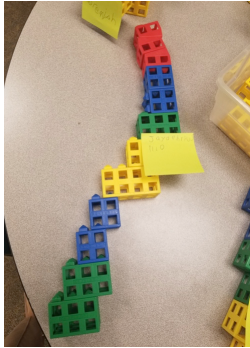
## Key Findings for Students Continued...

### Average Student Score of Spatial Reasoning (Mental Rotation and Symmetry) Across Lessons

(Possible student scores ranged from 0-6.5)



First Free Build



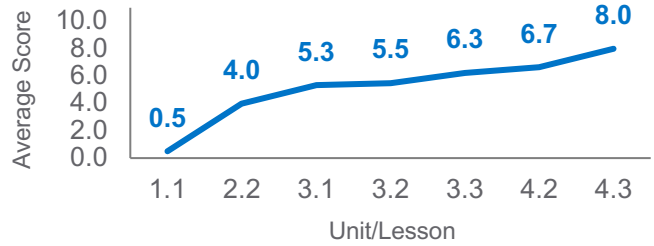
Last Free Build



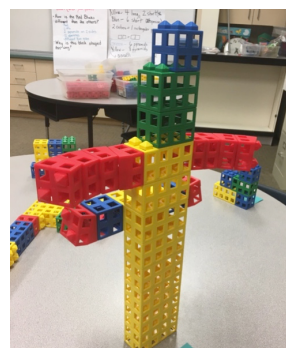
STUDENT A

### Average Student Score of Engineering Practices (Gathering Information, Explaining How Things Work, Problem Solving, and Hypothesis Testing) Across Lessons

(Possible student scores ranged from 0-10.5)



First Free Build



Last Free Build



STUDENT B

## Key Findings for Teachers...

Teachers demonstrated increased self-efficacy and value for the teaching of engineering as well as increased knowledge in basic engineering concepts and practices.

4 Out of 5 Teachers  
Increased Self-Efficacy  
Post Kid Spark Curriculum



5 Out of 5 Teachers  
Valued Teaching Engineering More  
Post Kid Spark Curriculum



Teachers' Use of STEM Vocabulary  
During 17 Kid Spark Lessons

