

Informal Pathways to Engineering Study with

DESIGNsquad[®]

Nation

PI: Marisa Wolsky,
WGBH Educational
Foundation, in

collaboration with Dr. Christine Andrews Paulsen, Concord Evaluation Group, and Dr. Monica E. Cardella, Purdue University

Award #: EEC-1129342

TARGET AUDIENCE

Middle-school children and informal engineering community

IPE STUDY: THE NEED

Over the past 20 years, informal engineering programs have offered experiences designed to spark children's interest in engineering, raise awareness about engineering careers, and provide opportunities to engage in hands-on engineering activities. These informal experiences form a loose system through which kids forge their way from initial interest in engineering to (for a select few) a career as a professional engineer. Although individual program evaluations have revealed successes and failures within discrete programs, much less is known about the pathways through the system. IPE study is designed to address this gap in knowledge.



APPROACH

- Qualitative, single-group, interrupted time series study, following a sample of 60 kids over a period of 31 months (starting in 5th grade) before, during, and after they use the DESIGN SQUAD website and related resources
- Based on a Social Cognitive Career Theory (SCCT) framework, which will help determine the extent to which children's early experiences with engineering build their self-efficacy and influence their personal beliefs and goals, and eventually prompt them to seek out additional engineering experiences
- Baseline data collected using a combination of existing, validated instruments and custom instruments, including: student and parent surveys, student and parent in-person interviews, and informal and formal educator in-person interviews
- Monthly online surveys documenting students' engagement in engineering activities
- In-person interviews with parents and informal and formal educators conducted at the mid-point and at the end of the study

RESEARCH QUESTION:

How do informal engineering programs (such as DESIGN SQUAD) support engineering-related learning over time?

Secondary questions:

- a. What is the profile of children who benefit the most after exposure to programs like DESIGN SQUAD?
- b. How much exposure to programs is sufficient to support positive outcomes?
- c. What type of exposure to programs is sufficient to support these positive outcomes?
- d. What are the elements of programs that support positive outcomes?
- e. What engineering pathways do children pursue, if any, after using programs?



BENEFITS

- Provide a nuanced view of how children's interest in engineering develops over time and how children pursue their own interest in engineering
- Contribute to the larger knowledge base about informal engineering education
- Provide both a template for other informal engineering programs to assess their effects on students, as well as data with which to compare their results

DESIGN SQUAD NATION: INTENDED OUTCOMES AND DELIVERABLES

The IPE study will use DESIGN SQUAD as the vehicle for researching the effects of informal engineering programs on children.

INTENDED OUTCOMES

- Create pathways through existing DESIGN SQUAD assets and provide opportunities for sustained exploration of engineering
- Encourage more collaboration among website visitors
- Take advantage of social media to reach parents
- Build stronger bridges to DESIGN SQUAD strategic partners (Project Lead the Way, Girl Scouts of the USA, National Engineers Week Foundation, National Girls Collaborative Project, FIRST, International



Technology and Engineering Educators Association, and Association of Science-Technology Centers) to facilitate students' progression along engineering pathways

DELIVERABLES

- Web site redesigned to create pathways through new and existing assets, embedded in an overarching game experience where players receive engineering challenges via their mobile device, the website, or email
- Series of new video shorts to hook the YouTube generation with engineering stunts, inspiring do-it-yourself projects, and the chance to get their own questions answered by our hosts on camera
- Contests designed to get kids innovating and building
- *Design Wall* website feature so kids can combine their ideas to express solutions to a challenge
- Trainings for engineers and afterschool leaders in collaboration with Girl Scouts of the USA, National Girls Collaborative Project, and National Engineers Week
- Public events in four cities across the country to celebrate the achievements of young inventors and makers in the community