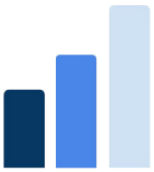


# Design Squad Maker: Summative Evaluation Report

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SUBMITTED TO
WGBH EDUCATIONAL FOUNDATION

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**About Concord Evaluation Group (CEG)**

CEG is a woman-owned, small business in the Boston area.

We use a variety of evaluation research methods to assess the impact of educational programs and media.

Our mission is to use our evaluation expertise to help improve learning outcomes and enhance the quality of life, especially for underserved communities.

CEG works with a range of audiences--from preschoolers through adults--within the US and abroad.

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# Executive Summary

With funding from the National Science Foundation (NSF 1811457), the WGBH Educational Foundation (GBH) and the New York Hall of Science (NYSCI) collaborated to implement the Design Squad Maker (DSM) project. DSM employed an iterative, design-based research approach to develop new educational practices, specifically a Toolkit (including hands-on activities, a digital app, and take-home activities), to support engineering design process learning across out-of-school settings—digital, museum/maker spaces, and home. Concord Evaluation Group (CEG) conducted a summative evaluation study analyzing outcomes among participating families that used DSM Toolkit resources at eight maker spaces across the country. Seventy adults and 87 children attended the workshops. Fifty-seven out of 70 adults completed pre-test surveys, for a pre-test response rate of 81%. Fifty-one adults completed post-tests, for a post-test response rate of 73%.

The evaluation was an effectiveness study designed to examine the impact of the DSM Toolkit under real-world conditions. The summative evaluation used mixed methods and was primarily descriptive and qualitative, using a single group, pre- and post-test design.

The evaluation study provided evidence that the DSM Toolkit (including facilitated workshops, a digital app, and take-home materials) had positive outcomes on parents, children, and educators. Specifically, the **DSM Toolkit appears to have helped parents feel more familiar with the stages of the engineering design process**. This was especially true for parents who did not have a college degree. In fact, we found evidence that parents with less than a college degree **experienced even greater familiarity with the engineering design process over time relative to parents who had higher education levels**.

The evaluation also provided evidence that **the DSM Toolkit helped parents feel more confident helping their children with engineering design projects—especially parents with less than a college degree.** This outcome was less significant among parents with higher levels of education, likely because they were already confident about their background knowledge.

We found evidence that **the DSM Toolkit helped children feel more familiar with some of the stages of the engineering design process** than they were at the start of the program. Not only did the DSM Toolkit help children who were previously unfamiliar with the design process learn how to plan a project and learn how to build a prototype, the Toolkit also (not surprisingly) helped these children learn how to design something.

**The evaluation also provided evidence that the DSM Toolkit helped children who were previously unfamiliar with the design process become more interested in the process** over time. During our observations, we confirmed the children's high levels of interest, noting that children were very enthusiastic about the brainstorming and building processes. All the children we observed were lively, talkative, and engaged as they used the app, built their projects, and interacted with the facilitators during the workshops.

**Moreover, the DSM Toolkit resources were robust enough to have a positive impact on families even in cases where all three components of the Toolkit were not fully implemented.**

Families reported, and we independently observed, that they had fun participating in the DSM workshops (doing activities and using the app). **Parents rated the experience an average of 4.84 out of 5.00 and children gave it an average rating of 4.65 out of 5.00.** In addition to having fun with the experiences, families reported that:

- It was helpful to be able to see the design on the app.
- The app was useful for children who wanted to work independently at home.
- The app "slows children down" so they can walk through the engineering design process steps carefully.
- Being able to create something useful was meaningful to families.
- The experience allowed them to be practice being creative.
- Having a professional facilitator for the workshops made the design process educational for families.
- Working together with each other and with other families made the experience memorable.

Some of the challenges families reported when working on projects at home included not being able to find suitable building materials, having trouble coming up with ideas, and not always producing solutions that worked the way they wanted the first time. Several families also reported that it was challenging for their children to find sufficient time to work on their projects at home.

A major goal of the DSM project was to create a program that would encourage sustained engagement across learning environments—extending the learning from informal educational spaces to home. *Among the families who received take-home materials*, the evaluation found that this goal was achieved. **The data demonstrated that there was evidence of sustained engagement at home after participating in the workshops:**

- All parents (100%) reported that they planned to return to the informal educational spaces where they attended the workshops.
- Nearly all parents (95%) reported that they were likely or very likely to attend another DSM workshop again.
- Nearly all families (90%) reported that they shared their prototypes with others.
- Most children (80%) expressed an interest in continuing to do projects like these in the future and 64% of parents attributed this level of interest directly to their experience with DSM.
- More than half of the families (55%) reported that they continued working on projects at home.
- Half of the families (50%) reported that they continued using DSM materials at home, including the app, and/or the booklet and that they were likely or very likely to use the app again in the future. Nearly half (45%) reported that they were likely or very likely to use the booklet again in the future.

**All of the educators (100%) reported that the workshop topics offered in the Toolkit were engaging for their audiences**. The most popular topic, by far, was Animals. Educators reported that families had fun and engaged in conversations with each other about their ideas and plans, and to share their projects with one another. Some sessions ran over the allotted time because families wanted to keep working on their projects.

**Educators felt well-supported by and able to make adaptations to the Toolkit materials**. They told us that the Toolkit was highly adaptable for their target audiences and that they felt capable of making any adjustments that might be needed. The training included in the Toolkit helped them prepare their own staff members to facilitate sessions. Educators reported that the resources were well-crafted and supported their curricula.

**Educators were satisfied that children and parents learned something from the workshops.** Most families ended the workshops with a prototype of their solutions. Educators reported that the theme approach was helpful to teaching about the design process. Some also reported that having sample prototypes ahead of time was helpful to illustrating the process.

**Parent engagement was a challenge for some educators, but most reported having success overall.** While some parents were more or less engaged than expected, educators were able to address this challenge. Educators theorized that some parents had misunderstood the expectations for their involvement in the projects or lacked the confidence to fully engage, while other parents overcompensated for their lack of confidence by taking the lead. But, it does not appear that parent engagement was a major problem across sites. In fact, in a couple

of sites that did not typically engage families together to work on projects, they reported eventually having success with parents after trying different strategies to engage them.

**Educators reported that while the app was not necessary for them to help families learn about the engineering design process *when they were there to facilitate*, it was potentially very supportive to parents working with their children.** Educators reported that parents used the app to guide their children, that it helped the children slow down so they could learn the steps, and that it was straightforward and useful. Educators enjoyed that children could draw on the app, take pictures, make notes, and that it reinforced what the children were learning by building. Educators also noted that the app was a great "hook" to encourage children to attend the workshops since so many of them are interested in using apps.

The most common challenge faced by educators was recruitment of families. Again, the pandemic likely played a significant role in the ability or inability of sites to entice families to attend workshops. This is likely especially true for the audiences that sites were hoping to reach—families who were not traditionally served by their programming. While sites at first viewed the evaluation study and the DSM Toolkit as an opportunity to engage new families in engineering programming, the lingering uncertainties surrounding the pandemic likely negatively impacted their plans. In addition, educator concerns about over-burdening already-busy families may have prevented a couple of the limited implementation sites from more actively offering take-home materials to families.

**Despite these challenges, all of the educators (100%) reported that they planned to continue using the DSM Toolkit (including the workshops, app, and take-home materials) and that they would recommend it to other organizations like their own.**