

## **Making Is Learning**

### **Background**

The Maker Movement is inspiring thousands of young people across the nation to tinker with and tackle problems involving design, engineering, and programming. There is a strong sense that young makers are accomplishing much more than producing objects—they also seem to be acquiring a host of valuable knowledge and skills. Because making is a relatively recent phenomenon, there are not yet frameworks in place for identifying and documenting these benefits to youth. What are makers learning? How is making changing the way young people engage in science, technology, engineering, and math (STEM)?

The New York Hall of Science (NYSCI) has been at the forefront of embracing authentic approaches to STEM learning that engage young people's desire to explore, create, build, and make. NYSCI embraces a triad of universal, freely chosen methodologies called Design-Make-Play (DMP), which young people use to investigate how “real stuff” works in order to solve problems, build devices that improve, and repurpose the creations of others. The focus on “how stuff works” overlaps extensively with the processes that lead to creative thought and innovation in STEM learning.

As the host site for World Maker Faire, NYSCI has been convening national leaders to converse about learning and engagement as they relate to young people's passions about making. NYSCI hosted a series of annual conferences; the first two yielded learning frameworks related to DMP methodologies. The third built on the previous meetings and took a critical look at how to describe and document the learning that takes place when young people make. The symposium brought together nearly 150 makers, funders, educational researchers, educators from K–12 and informal settings, museum and community-based leaders, and policymakers. The aim of this national symposium was to craft a strategy for documenting the variety of learning and engagement that making methodologies foster.

A distinguishing feature of the symposium was the creation and sharing of a collection of young maker profiles, produced during Maker Faire by six experts known for their creative approaches to learning and assessment in STEM fields. Guided by the DMP learning framework generated during the previous symposium, each expert assembled a profile of an individual or a group of makers in which they examined the makers' work and thinking. The profiles included images, videos, written descriptions, interpretations, and reflections on DMP.

### **Documented Results**

During the symposium, the participants were asked to apply their expertise and experience to reflect collaboratively on the young maker profiles. What resulted was the emergence of four focal points that highlight the affordances of the DMP framework.

**(1) Motivation and Persistence.** The young maker profiles suggest that makers develop the confidence to view failure as a necessary step in the iterative process of design, in which acquiring the ability to evaluate one's own progress is a natural outcome. The ability and desire to persist in the face of challenges also emerged from all the profiles and took various forms, including investments of many hours and a search for solutions that required multiple

attempts. Another distinguishing feature of making is the role that personal choice and initiative take in driving learning—the makers who were the focus of the profiles were there of their own accord, rather than as a result of externally imposed pressures. Because maker projects are fueled by personal interest, they have the potential to engender interest.

- (2) **Context and Support.** The profiles and meeting deliberations revealed the importance of context for enabling young people to engage in making, as well as for attending to equity considerations. All the makers benefited from supports, whether from their family, schools, or afterschool clubs. Supports include the provision of materials, intellectual constructs, emotional encouragement, and/or opportunities to explore through making.
- (3) **Process, Problem Solving, and Learning.** The essence of making is doing what it takes to first articulate and then solve a problem, including seeking support and new information. Within the diversity of maker projects and the variety of challenges encountered, makers acquire and draw upon a wide range of general and content-specific skills and knowledge to solve problems. Moreover, in contrast to so much formal instruction in which topics are learned and then left behind, the ability to apply strategies learned in an earlier project to the project at hand is a cumulative skill that grows with the maker's experience. Whether novices or experts, the makers all took pleasure in hands-on learning in which they physically engaged with the processes and products of making.
- (4) **Storytelling and Sharing.** The makers also had in common a desire to share their experiences with a broader community. They were eager to share their process as well as their challenges, and eager to offer advice and to seek it. Identifying and communicating the challenges of each project required makers to hone flexible and effective communication skills. There was even evidence that some young people, who would otherwise be less inclined to engage socially, had found a context in making that promoted their participation in a broader social community.

### **Potential Applications**

This research has led us to envision a tool that will honor the sense of efficacy and agency that young makers bring to their work, while at the same time supporting opportunities to document the benefits that accrue through DMP engagement.

The NYSCI Maker Space has developed an approach to creating maker activities informed by the DMP framework. The approach—a work in progress—focuses on investigating the materiality of objects and exploring the potential of tools.

### **For More Information**

Design-Make-Play: <http://nysci.org/design-make-play/>

Making Meaning Report:

[http://informalscience.org/images/research/2013-05-24\\_Making%20Meaning%20Report.pdf](http://informalscience.org/images/research/2013-05-24_Making%20Meaning%20Report.pdf)

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