

# Investigating STEM Literacies in Maker Spaces

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Many communities across the country are developing "maker spaces," environments that combine physical fabrication equipment, social communities of people working together, and educational activities for learning how to design and create works. Increasingly, maker spaces and maker technologies provide extended learning opportunities for school-aged young people. In such environments participants engage in many forms of communication where individuals and groups of people are focused on different projects simultaneously. The research conducted in this project will address an important need of those engaged in the making movement: evidence leading to a better understanding of how participants in maker spaces engage with science, technology, engineering and mathematics (STEM) as they create and produce physical products of personal and social value.

Specifically, this research will generate new knowledge regarding how participants:

- pose and solve problems;
- identify, organize and integrate information from different sources;
- integrate information of different kinds (visual, quantitative, and verbal); and
- share ideas, knowledge and work with others.

To understand and support STEM literacies involved in making, the investigators will study a number of different informal learning sites that self-identify as maker spaces and serve different-aged participants. The project will use ethnographic and design research techniques in three cycles of qualitative research. In Cycle One, the researchers will investigate two adult-oriented maker spaces in order to generate case studies and develop theories about how more experienced adult makers use the spaces and to create case studies of adult maker spaces, and to develop methodological techniques for understanding literacy in maker spaces. In Cycle Two, the study will expand into two out-of-school time youth-oriented maker spaces, building two new case studies and initiating design-based research activities. In Cycle Three, the team will further apply their developing theories and findings, through rapid iterative design-based research, to interventions that support participants' science literacy and making practices in two maker spaces that exist in schools. Through peer-reviewed publications, briefs, conference presentations, presence on websites of local and national maker organizations, project findings will be widely shared with organizations and individuals that are engaged in broadening the base of U.S. science and mathematics professionals for an innovation economy.