

## 学校教育高度化センター後援事業

### Kevin Crowley客員教授の活動

報告者 岡田 猛 (教育学研究科 教授)

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During his time at Todai, he worked on launching a new line of research focused on educational activities that prepare students for success in science, technology, engineering, and mathematics (STEM). This particular research focuses on the educational implications of the Maker Movement.

Born from individual basement tinkers and garage-mechanic hobbyists, the Maker Movement has evolved to support a strong community among makers, which has been formed through three primary means of social meeting and exchange: Remotely, through the widely distributed publication *Make Magazine*, as well as through the development of online communities such as etsy.com, ravelry.com, DIY.org and many others; internationally, through the momentous growth of Maker Faires, annual showcases of makers' inventions and investigations which have become celebrated meccas of maker culture, attracting hundreds of thousands of makers of all ages and interests; and locally, through the development of makerspaces, hackerspaces, tech shops, and fab labs, where groups composed of diverse ages, genders and backgrounds are motivated to learn with and from one another how to use and combine materials, tools, processes, and disciplinary practices in novel ways.

While the Maker Movement has been well documented through popular publications such as *Make Magazine*, and as spaces dedicated to making are becoming widely recognized for the learning potential they afford, educational researchers do not yet have empirical evidence of the current phenomenon of making as a learning process.

As the Maker Movement gains momentum, the field demands a better understanding of making as a learning activity that is designed with intention, and reflective of its learning context, be it schools, museums, libraries or living rooms. In the work he completed at Todai, he and his colleague analyzed *Make Magazine* to identifying the practices that are at the core of the Making learning community. In doing so, he hopes to begin a conversation about how he might design new educational maker spaces.

Their analyses of the textual contents of *Make Magazine*, volumes 30-33, revealed a set of eight core learning practices that work to collectively characterize recognizable participation in the maker community.

*Question & Explore:* Makers generally approach a project or making process through the practice of questioning and exploring the context of activity and/or problem space. Makers are curious people, whose interest in and wonder about a particular topic leads to inquiry and exploration. Makers interrogate the past, researching and referencing former projects and ideas related to their future intentions.

*Tinker; Test & Iterate:* Makers explore materials and processes through purposeful play, experimentation, and ongoing evaluation. Makers are doers, rather than planners. Yet, the doing is iterative and sequential. Makers model designs with software, they build and test paper prototypes, and they evaluate their process to

discover what is possible or to improve upon what has come before. Makers try, make mistakes, and fail—a lot. Makers value the iterative process of engagement in making and testing out ideas, as much as the finished product.

*Seek out Resources:* Makers are resourceful. They seek out and rely on the expertise of others. Makers know where and to whom to turn for guidance and collaboration. They willingly seek and give advice and feedback. They interact flexibly with the distributed tools, materials and expertise of the community.

*Collaborate:* Related to makers' practice of seeking out resources, makers collaborate, utilizing each other's individual strengths in the enactment of a collective project or pursuit, adding depth and dimension to the making endeavor.

*Hack & Repurpose:* Makers see the world as made of component parts; pieces and platforms that can be opened, deconstructed, modified, and repurposed to create something new, improved, altered, or recombined to better suit the needs and desires of an individual or community. Makers would rather repurpose a found object or salvaged component than buy something new.

*Combine & Complexify:* Makers look towards a future of endless innovative possibility. Yet, they do so with the recognition that they are standing on the shoulders of giants; makers of the past who created tools, products and platforms, both analog and digital, which can be harnessed, combined and adapted to enable future ingenuity. The practice of putting existing pieces and processes together differently extends what is possible and leads to innovative thinking and action.

*Customize:* Making is a personal pursuit. The subtitle of *Make Magazine* originally read, "technology on your time." Through the practice of customization, makers modify products; tailor features and function to make technologies and technological processes their own.

*Share:* Makers openly share and access the stuff of making with the entire community of makers through diverse platforms for presentation, reception, and communication. Often characterized as "open source," the make community works to develop repositories of information, kits and systems of communication, which make tools, materials, methods of design and fabrication, and products accessible, customizable, and usable by the entire community.

**Next Steps.** Having identified the core practices of the Maker Community, his next steps will be to map those practices to the core practices of science, technology, engineering, and mathematics disciplines and then to design informal learning environments that support children and families in learning the core Making practices.