The STEAM Journal

Volume 2
Issue 2 *Pitfire*

Article 4

November 2016

Maker Education: The STEAM Playground

Amanda Opperman
Wonderlic; Helios Education Lab

STEAM is a bi-annual journal published by the Claremont Colleges Library | ISSN 2327-2074 | http://scholarship.claremont.edu/steam

Maker Education: The STEAM Playground

Abstract

Educators who are committed to teaching STEAM in their classes and programs will be inspired and encouraged by the capabilities for multidisciplinary instruction and project based learning offered by an emerging pedagogy known as Maker Education. While making was previously thought of as STEM-focused, it can easily be integrated across all subjects. Maker Ed's Resource Library has a section on Projects and Learning Approaches, which includes many cross-curricular project ideas that expand this model of education from STEM to STEAM and beyond.

Keywords

Maker education, STEM education, multidisciplinary instruction, project based learning

Maker Education: The STEAM Playground

Amanda Opperman

Introduction

Educators who are committed to teaching STEAM in their classes and programs will be inspired and encouraged by the capabilities for multidisciplinary instruction and project based learning offered by an emerging pedagogy known as Maker Education. While making was previously thought of as STEM-focused, it can easily be integrated across all subjects. Maker Ed's Resource Library has a section on Projects and Learning Approaches, which includes many cross-curricular project ideas that expand this model of education from STEM to STEAM and beyond.

Background

Maker Education is being increasingly adopted in classrooms that range from middle school to community college and from adult basic education to university labs. Born and bred in Harvard's Graduate School of Education, Maker Education draws upon previously validates pedagogies such as constructivism, constructionism, inquiry, hands-on, and project-based learning and weaves in newer, innovative methodologies like design thinking and effectuation. It has been praised for "reimagin[ing] a progressive approach to learning through modern affordances" and for "democratiz[ing] the tools of creativity and empowers the learner" (Harvard). According to researchers and practitioners, this approach to learning develops a maker mindset that is "playful, asset- and growth-minded, failure positive, and collaborative" (Martin, 2015).

While traditional instruction focuses on filling students' mind banks with content knowledge, maker-centered learning is oriented around the learner's context. Because it allows the learner to actualize his or her own ideas, maker education is a framework for learning that can be applied to any subject area. When it comes to STEAM and beyond, maker education utilizes authentic materials and equipment as a vehicle for learning the *how* of a concept, including the process, the socio-emotional component, and the application of 21st century skills such as problem solving, collaborating, and persisting. Bringing content alive by situating it in a meaningful context for students is what makes it possible for them to engage with content on their own terms, becoming makers who produce their own knowledge and experience in classrooms, or maker spaces.

To the chagrin of some and the approval of others, Maker Education actually got its beginnings outside of education. The maker movement began roughly a decade ago and coincides with the annual Maker Faire. According to its founders, "Maker Faire is the Greatest Show (and Tell) on Earth—a family-friendly festival of invention, creativity and resourcefulness, and a celebration of the Maker movement." To an outsider, the Maker Faire would likely feel like a science fair, county fair, and inventors' exhibition all rolled into one. The Maker Faire tech enthusiasts, crafters, educators, inventors, scientists, writers, artists, and students of all ages, in addition to commercial vendors. All of these makers gather at the Maker Faire to showcase what they have made and to share their learning.

The Maker Faire fosters innovation and experimentation by bringing together a community of enthusiastic makers and providing them with a venue in which they can showcase their ideation. Many makers claim they have no other space to share what they do because the Do-It-Yourself movement has only just begun to become visible in online communities in the

past couple of years. For the younger generation, this lack of maker space will not be a concern, because the spirit of the Maker Faire has been brought into the classroom.

In the Classroom

Being in a classroom full of students working on a maker project is invigorating. Just watching the activity of the makers gives an observer the feeling of hustle and bustle. There's energy in the air as students circulate the room, troubleshooting problems, plotting out next steps, making recommendations to each other, and taking turn modeling skills. Each maker group works on a different project; one might be planning for the construction of a new hospital wing, while another is programming and designing a website, and yet another may be building a robotic arm. Their teacher leads, supports, and educates by acting as a "guide on the side" and giving the makers space to figure things out using the scientific method, deign thinking, and trial and error.

How to assess Making:

A natural byproduct of the making process is an artifact that can be evaluated as evidence of learning. The artifact that is produced by the makers verifies the learning that occurred and the level of mastery. In addition, close observation of the making process itself (through evaluation tools such as observation rubrics) captures important data that can be used to assess student development and growth. As with any form of assessment, the most critical piece is to have clearly identified learning outcomes and effective instruments for measuring those outcomes. When assessing 21st-Century Skills, for example, learning outcomes include observable skills such as practicing a specific way of thinking in a given context, applying problem-solving strategies to a challenging task, or demonstrating traits associated with being an empathetic and

creative collaborator. Performance assessment rubrics are one of the preferred ways that educators in maker classrooms opt to assess learning outcomes by observing the ways that students apply knowledge and skills during maker tasks.

Digital portfolios also capture data needed to assess the sort of deep, multi-layered learning that is part of the maker process. Maker Ed's Open Portfolio Project is currently developing a common set of practices for open portfolio creation, sharing, and evaluation because this community of educators assert that portfolios can demonstrate maker ability and thinking in a more meaningful and substantive way than mere test scores and grades. Just a few of the benefits that are associated with portfolio creation are

> "the process of self-reflecting, curating what's most appropriate for the intended audience, and designing an artifact to articulate that evolution of learning and making. These are the critical thinking processes that we strive to develop in youth, and maker portfolios automatically spark the making of the meaning."[1]

Conclusion

Consider how we train and measure the success of artists, athletes, and entrepreneurs. Reflect on how we evaluate their contributions to society, and make note of how rarely we use traditional assessment when making such evaluations. If we want to equip our students with the skills they need to navigate the future world, then maker education should be part of that equation.

[1] http://www.edutopia.org/blog/assessment-in-making-stephanie-chang-chad-ratliff