



The Maker Movement in Education

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Have you ever **made** something? Have you ever **shared** your gift with another?

Making and sharing is part of what makes us human. A **makerspaces** is a facility where people share resources and collaborate to build and innovate products. Makerspaces make tools available to people who want to design and create something new. The maker movement has allowed ideas to be turned into inventions by giving people access to the tools and collaborative space that they need to prototype a design. Before makerspaces were developed, an innovative idea could cost anywhere from \$50,000-\$300,000 to turn into a prototype. It had to be researched, designed, prototyped, and then it would be market tested. If the results were favorable, it had a chance at making it out of the gate as a new product. A beginning entrepreneur had few options but using his or her own funds or borrowing funding to make the project happen. Makerspaces have made it much more efficient to innovate. A new idea can now be researched, designed, prototyped, and market tested by the entrepreneur. A person no longer needs to send something out to engineers to be designed, and cut. An entrepreneur can do it themselves by taking classes at a makerspace and filling in any gaps of knowledge online. If they have a worthy idea, they can pursue it and see if people would be willing to purchase a product that they are interested in making through a Kickstarter campaign (Hatch, 2014). Because of this radical change to the time and amount of money that it takes to innovate new products, the Maker Movement has been called the third Industrial Revolution by Chris Anderson and other leaders in the maker community (Hatch, 2014). We are no longer just consumers in the market, we are creators and consumers.

The need for makerspaces has risen out of 3 things:

1. The need for qualified STEM professionals entering the workforce (US Dept. of Commerce expects 17% growth in STEM fields between 2014-2024)
2. Need to diversity student learning experiences and build critical thinking and problem-solving skills – the kinds of skills that are learned through hands-on projects
3. To build critical thinking and problem-solving skills

Types of Makerspaces

There are all kinds of makerspaces. The two major kinds are educational and entrepreneurial makerspaces.

- Educational makerspaces are housed in an educational setting, most being in either a school or a library.
- Entrepreneurial makerspaces are set up as innovation centers that are for entrepreneurs who are looking to collaborate while making something. They are large in size and have a variety of tools and resources.

Educational Makerspaces

Educational Makerspaces will be the focus of this article. While makerspaces have a seemingly direct impact on the design process in industry, the focus is less clear when it comes to education. Teachers and education professionals can use makerspaces in a variety of ways. The most common and effective use of a makerspace in an educational setting is for a teacher to incorporate it into a lesson that is already taking place in the classroom.

How Can an Elementary Teacher Use a Makerspace?

If a teacher is teaching a unit themed around electricity, for example, he or she could use the makerspace as a way to discover or design a problem around the concept of electricity.

Let's use Ms. Beard and her fifth grade class as an example. Ms. Beard is in the middle of a lesson on electricity. How can she introduce the concepts to students? A makerspace would be the perfect place for Ms. Beard to begin this lesson. The students could use the Lectrify Very Useful Circuit kits (similar to littleBits) to apply the concepts learned in class. Ms. Beard could design or find a lesson to go with the or allow the students to just explore the possibilities of Lectrify Very Useful Circuits; both would be valuable experiences for her fifth-grade students. The makerspace is the ideal environment for bringing theory and practice together across a wide variety of disciplines (Fleming, 2015).

Educational makerspaces are either inside of a school building or in a library. Some are found inside of a school building but in a school library. No matter where the makerspace is located, the important thing is that the administration, teachers, students, and parents know where it is located and how they can take advantage of the tools that are available for them to use.

Forms of a Makerspace

Just like teachers and classrooms, makerspaces take many forms. What is more important than the physical space is the learning that is enabled.

- **Dedicated Space** – When most people think of a makerspace in an educational setting, they are thinking of a dedicated space. This may be anywhere in a school, library, or other educational atmosphere, but the idea is that the tools and activities in the space are just for maker use.
- **Maker Carts** – Sometimes space is not available in a building or the space that is available is not quite right for a maker environment, and in that case you might consider “maker carts”. On a maker cart, maker activities are included on carts in bins or boxes that can be easily organized. The ease of a cart is that it can be easily moved from one classroom to another without the students moving. This is a benefit to many teachers in an elementary setting, especially because the activities on a maker cart can be simple at the elementary level.

- ***Classroom Space and Physical Labs*** – At the secondary level, some courses require a deeper dive into project-based learning methods in order to accomplish the goals of the course. In those courses, schools may opt to put equipment in a lab space or in the classroom in order to accomplish the standards and learning objectives of the course. Courses in career and technical education, including engineering and technology courses, are good examples of potential examples of classrooms that may require their own makerspaces.

Makerspaces and the Standards

Many educators worry about teaching the standards when using a makerspace. Do teachers really need to choose between teaching to a plethora of standards or pursuing worthy long-term intellectual goals? It is more than possible to do both, to improve teaching and learning by aligning the practice and formative development of skills and ways of thinking to the standards, and by means of a wide variety of creative and innovative pathways of learning (Fleming, 2015). The makerspace itself is not a standard and does not align to a set of standards. However, it is possible for every educator to plan valuable cross-disciplinary activities in a makerspace that align with many different standards. The learning that happens in a makerspace is often beyond the “comprehension” level of Bloom’s Taxonomy. Rather, it is a higher order of thinking like the application, analysis, synthesis, evaluation and knowledge level of Bloom’s that students are experiencing when they conducting student-led and driven activities.

Teaching in a Makerspace Environment

Any teacher who has embraced the makerspace mentality will tell you that teaching in a makerspace is less formal teaching and more facilitating. It can be challenging to find yourself in a place full of new technology. The important thing it focus on is that it is less on the construction of objects and more on the social, shared learning experiences created by the learners themselves (Fleming, 2015). Teachers do not need to be experts in using all of the technology in a makerspace in order to take their students; a makerspace by definition is a place where all are learners. The most important pedagogical change for a teacher is that they are not the main distributor of information; the students are discovering the information for themselves. This is a major switch from the way that information is distributed in many classrooms. Many educators find themselves uncomfortable when a student asks a question that does not have an answer. However, that is the purpose of a makerspace and is a hard switch for an educator to make. As we move away from the information age, teaching needs to change as well. A person can look up information anywhere. Teachers today are not endless sources of information, but rather are facilitators of knowledge. Learning how to manage student group work and to truly facilitate project-based learning takes both professional development and commitment from building administration and teachers throughout an educational community.

Planning Your Makerspace

By now you should already understand the purpose and uses of a makerspace. Do you have a makerspace around you that you can utilize? If so, get involved! If you don't know of any makerspaces around you that you can use with your students, then it is time for you to set one up. The time has never been better to set up a makerspace in your school or library. The most important thing to start with when setting up a makerspace is your institution's vision and strategy for learning. How can your learning space be seen as a representation of that strategy? One of the most important things to consider when designing a makerspace is that you want it to feel welcoming to all. Both teachers and students can feel nervous about new technology or trying something new, so an inviting place can help lessen that stress and make them feel welcome.

Considerations for Setting up a Makerspace

When setting up a makerspace, one should consider the following items:

1. What form of a makerspace is best for your learning environment?
2. Does it have the right utilities, including electrical outlets?
3. Test network wifi accessibility for number of students expected at any given time
4. Hard floors and sinks if messy projects will be common

The guiding principle in designing space is that you should get input from students and staff in the building. Consider who the users of the space are going to be and keep them in mind throughout your design process.

Funding a Makerspace

A makerspace can be an expensive project. With the current focus on STEM education from both local and national education sources, grant funding is often focused in STEM areas. A project focused on creating a makerspace has a good possibility of becoming funded. If a school is unsuccessful at finding outside funding, try looking to the local education foundation for assistance. Many education foundations ensure grants for school projects that are focused on local efforts. The applications are usually short and the amount varies depending on the foundation.

When starting a makerspace, it is good practice to create a budget for yearly supplies. You may not yet know many supplies will be used up in the first year, but always err on the side of abundance.

Setting up Your Makerspace

The items to include in your makerspace will ultimately depend on your budget and expected projects. Many makerspaces include robotics kits, Legos, littleBits and other educational STEM themed kits. These ideas are just a few to get started. Many makerspaces contain many more objects and tools and some makerspaces are much more basic. For an educational makerspace, the ultimate consideration is the students and teachers that are being serviced and the tools that will best accomplish that mission. Both teachers and students are most likely to use tools and resources that they have heard of before and feel comfortable with.

Creating a Maker Culture

Once you have a makerspace, it is essential to share the projects and knowledge learned in your makerspace. Share it in any way that you would like; the important thing is that you let everyone know the important and creative learning that is happening in the makerspace. In no instance should it be a well-kept secret in the back of the school building!

Many makerspace directors choose to share the work that is happening through social media. Instagram, Twitter, and Facebook can be great outlets to share the work that is happening in your Makerspace. Use a consistent hashtag like #Makerspace and share on the school's page to give your makerspace its own brand. It is also important to share through the school newsletter, in emails to teachers, and in any other way that you can think of! Creating a culture of making involves sharing what the students are doing or have already done.

Conclusion

Makerspaces encourage tinkering, sharing, and open-ended exploration. In many ways, makerspaces encourage us to move beyond formal learning and curricular structures. This pendulum swing actually takes us back to John Dewey's thoughts on curriculum design. Dewey stated in *Democracy and Education*, "“give the pupils something to do, not something to learn; and the doing is of such a nature as to demand thinking...learning naturally results” (1916). In the makerspace world, informal, networked, peer-led, and shared learning are king, both in an educational and industry makerspace setting. It encourages students to think of problems that do not yet have an answer and create a solution. Makerspaces allow students to think of themselves as both *creators* and consumers. As the world and economy switches to demand STEM professionals who can be technologically literate and use critically thinking skills, we must ask ourselves as educational leaders, what kind of curriculum is going to prepare students for a future job that does not yet exist? Makerspaces could be part of the puzzle to preparing students for the unknown future they will face by developing essential skills and engaging students in a world of inventions and innovations.

References

- Fleming, Laura. (2015). *Worlds of Making: Best Practices for Establishing a Makerspaces for Your School*. Thousand Oaks: Corwin.
- Hatch, Mark. (2014). *The Maker Movement Manifesto: Rules for Innovation in the New World of Crafters, Hackers, and Tinkerers*. New York: McGraw Hill.
- United States Department of Commerce. (2014, July). *STEM: Good jobs now and for the future*. Retrieved from http://www.esa.doc.gov/sites/default/files/stemfinaljuly14_1.pdf



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