Makerspaces in Education

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Teaching and learning has changed over the years. The way content was taught in the past may not always be as effective for students today. Lessons today encourage students to take a lead role as they work collaboratively with their peers and for teachers to act more as facilitators. Students need to be engaged in the content through active learning and a hands on approach. The design of a classroom is also a key component in providing students the space to be engaged with content. Classrooms or specific rooms in schools are now being renovated to prepare our students for the future by creating makerspaces.

 Makerspaces are rooms identified where students can gather to work collaboratively to share resources, work on their projects, and build. They provide the necessary tools and space needed in order to construct and complete their projects. Teachers are available to provide assistance, but students usually get help from each other through collaboration. Makerspaces encourage collaborative learning that has a focus on interpersonal and small group skills as well as creating a sense of accountability (I-Sha, Tiong, and Seng, 2008). This type of learning environment also helps to build strong relationships among students and staff which results in effective teaching and learning.

 “Used by students and staff, makerspaces have become arenas for informal, project-driven, self-directed learning, providing workspace to tinker, try out solutions, and hear input from colleagues with similar interests” (Educause, 2013). Makerspaces allow students to take pride and ownership of their own learning and their projects. Makerspaces also create excitement in students as they learn through a hands-on design by using the latest technologies which results in an increase of their critical and higher order problem solving skills. They can also be used across various content areas by promoting interdisciplinary thinking, which enriches the projects that are built and the effectiveness of the makerspace as an educational setting.

 Makerspaces require many different tools to support students’ creativity and design. These tools can range from 3D printers, 3D modeling software, and robotics, to milling machines and laser cutters. “Whatever the supplies, the overarching goal of a makerspace is to be a place where people are free to experiment and make things on their own as part of a productive community” (Johnson, Adams, Estrada, and Freeman, 2015).

 One of the key factors to take into consideration when creating a makerspace in a school is the supportive environment needed to promote academic success. The environment is based upon three aspects: the impression, the expectations, and the leader.

**Impression**

 The impression is based off how we expect students to feel about the makerspace. We want them to be inspired and motivated to learn by allowing them to be curious and explore. Makerspaces must allow students to have more “Wow!!” moments as they wonder how certain things happen. Students should also be encouraged to play as they engage in the makerspace. Students are usually timid or feel discouraged to become more hands-on because this approach is usually not seen in a typical classroom. Play in makerspaces must be promoted. In order to have consistent motivation to learn in makerspaces, students must also be acknowledged for their accomplishments and given opportunities to display and share their work.

**Expectations**

 In many schools today, it is commonly frowned upon to have students think that it is okay to fail. Great pressure has been placed on students to succeed academically with failure not being an option. Makerspaces need to establish academic expectations where students are aware that it is okay if you fail the first time. They need to be aware that if something breaks, they will have to come up with a way to fix it. “Educational makerspaces must be failure tolerant, and it would be even better if exploration and productive failure were explicitly encouraged by signs, words, and responses to failure. Big ideas are built on the lessons learned from smaller failures!” (Kurti, Kurti, and Flemming, 2014).

**The Leader**

Makerspaces have leaders who create and manage the space. Leadership will always have challenges. Makerspace leaders must be lifelong learners, resourceful, and never afraid to fail. As students are expected to work in collaboration; leaders must also be collaborative. Students will always be aware of the expectation as the leader leads by example. Makerspace leaders must also allow students think critically in order to find a solution. If the leader provides all of the solutions then the student will never learn, which defeats the purpose of a makerspace.

Once the three aspects of the environment have been considered, the next major consideration is funding. Where are the funds coming from that are needed to create the makerspace? Funding can be an issue many school districts due to many financial reasons.

**Funding a Makerspace**

A few sources for funding a makerspace is by reallocating funds from existing budget lines, applying for grants from outside sources such as grants.gov or scangrants.com, and requesting donations from the community by creating a GoFundMe page or through DonorsChoose.org. Since many makerspaces try to emphasize their connection to STEM fields and encourage children to go into these fields, consider looking into grants devoted specifically to STEM. (Bagley, 2014).

**Professional Development**

 As makerspaces begin to move into school classrooms, there is a growing need for professional development to help K-12 educators understand what a makerspace is, the benefits of having a makerspace, running a makerspace, and teaching from a from a makerspace (Oliver, 2016). Since makerspaces are slowly being implemented in K-12 settings, there are not many opportunities available for professional development. The Makerspace Playbook (2012) points out that those who use the space do not need to be an expert, not even the teacher. Passion and curiosity about making in many various forms is the most important characteristic to have when teaching from a makerspace. Once safety, competency, and expectations have been established, members can teach themselves what they need to know. Projects in which members are most passionate about, result in being the main motivators for learning.

**Conclusion**

Starting a Makerspace can be overwhelming and seem like a major project, but making is like any other part of the curriculum: it is in the vision and mental enactment of student activities that educators clarify their expectations and refine their purpose (Fontichiaro, 2016). The culture of making encourages and allows you to approach it in your way through creativity, risk taking, being failure tolerant. By exploring different options, you can identify what works and what doesn’t in regards to instructional design elements, styles of instruction, tools, and supplies. Through experimentation, you’ll be able to modify your makerspace when needed until it becomes the successful creator of innovators it is intended to be.

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