MAKERSPACE BIBLIOGRAPHY
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Bevan, B. (2017). The promise and the promises of Making in science education. *Studies in Science Education, 53*(1), 1-29. Retrieved from **https://tinkering.exploratorium.edu/sites/default/files/sites/default/files/pdfuploads/bevan_making_sse-min.pdf**

> *Making* is a rapidly emerging form of educational practice that involves the design, construction, testing, and revision of a wide variety of objects, using high and low technologies, and integrating a range of disciplines including art, science, engineering, and mathematics. It has garnered widespread interest and support in both policy and education circles because of the ways it has been shown to link science learning to creativity and investigation. Making has taken root in out-of-school settings, such as museums, science festivals, and afterschool and library programmes; and there is now growing interest from primary and secondary educators in how it might be incorporated into the classroom. Making expands on traditions associated with Technology Education and Design-Based Learning, but differs in ways that can potentially broaden participation in science and STEM learning to include learners from communities historically underrepresented in STEM fields. STEM-Rich Making is centrally organised around design and engineering practices, typically integrating digital tools and computational practices, and positions scientific and mathematical concepts and phenomena as the materials for design. This paper takes a critical view of the claims about Making as a productive form of science teaching and learning, and reviews the current research literature's substantiation of the ways in which Making supports students' agency, promotes active participation in science and engineering practices, and leverages learners' cultural resources. (p. 1)

Brahms, L., & Crowley, K. (2016). Learning to make in the museum: The role of maker educators. In K. A. Peppler, E. Halverson, & Y. B. Kafai (Eds.), *Makeology in K-12, Higher, and Informal Education: The Maker Movement and the Future of Learning* **(Vol. 1). Taylor & Francis. Retrieved from http://upclose.lrdc.pitt.edu/articles/Brahms_Crowley_Maker_Educator2016.pdf**

> The growing presence of maker spaces in designed informal learning environments presents the opportunity for making to widely, and potentially more deeply, reach a diverse audience of children, families and youth. Yet, this wave of making is, in many respects, changing the ways in which these institutions function and are used by visitors. . . . We explore making as a learning process in the context of a museum-based maker space designed for family participation. In particular, we focus on young children, and their adult learning partners, as an important demographic to consider and for which to design making environments and experiences. Importantly, we take a close look at the evolving role of museum educators in supporting young children's meaningful participation in making as an informal learning process. Through the presentation of a single case of a child's making in the museum, we identify key factors that support and engender young children's participation in making in the context of a museum, and

examine the ways by which a young child may establish a meaningful trajectory of participation through making in this context (Greeno & Gresalfi, 2008). (1. Introduction section, para.1-2)

Calabrese Barton, A., Tan, E., & Greenberg, D. (2016). The makerspace movement: Sites of possibilities for equitable opportunities to engage underrepresented youth in STEM. *Teachers College Record, XX*(X)**. Retrieved from** http://invincibility.us/wp-content/uploads/2015/08/EquityMakerspaces.TCR_.pdf

> Large gaps in achievement and interest in science and engineering [STEM] persist for youth growing up in poverty, and in particular for African American and Latino youth. Within the informal education community, the recently evolving "maker movement" has sparked interest for its potential role in breaking down longstanding barriers to learning and attainment in STEM, with advocates arguing for its "democratizing effects." What remains unclear is how minoritized newcomers to a makerspace can access and engage in makerspaces in robust and equitably consequential ways. . . . This paper describes how and why youth engage in making in an after-school, youth-focused, community-based makerspace program "Making 4 Change." Four in-depth stories of engagement are shared. Using a mobilities of learning framework, we discuss how youth appropriated and repurposed the process of making, and unpack how the program attempted to value and negotiate youths' ways of making from an equity-oriented perspective. (Background/Context and Purpose sections)

Colegrove, T. (2013). Editorial board thoughts: Libraries as makerspace? *Information Technology and Libraries, 32*(1), 2-5**.** http://doi.org/10.6017/ital.v32i1.3793

> Recently there has been tremendous interest in "makerspace" and its potential in libraries: from middle school and public libraries to academic and special libraries, the topic seems very much top of mind. A number of libraries across the country have been actively expanding makerspace within the physical library and exploring its impact; as head of one such library, I can report that reactions to the associated changes have been quite polarized. Those from the supported membership of the library have been uniformly positive, with new and established users as well as principal donors immediately recognizing and embracing its potential to enhance learning and catalyze innovation; interestingly, the minority of individuals that recoil at the idea have been either long-term librarians or library staff members.
> I suspect the polarization may be more a function of confusion over what makerspace actually is. This piece offers a brief overview of the landscape of makerspace—a glimpse into how its practice can dramatically enhance traditional library offerings, revitalizing the library as a center of learning. (p. 2)

Fontichiaro, K. (2016). Sustaining a makerspace. *Teacher Librarian, 43*(3), 39-41**. Retrieved from** http://hdl.handle.net/2027.42/117499

> Have you ever run out of maker materials before the activity even began? Exhausted yourself because you took on too much? Panicked because your

students are blowing through the semester's new tools and toys . . . and it's only February?

If that's the case, then you might have a sustainability problem. Thinking differently about makerspace sustainability—about the long-term vision, budget, activities, human power, and goals of the program—can help in making more robust choices, conserving energy and budget, and forging valuable partnerships. I've been making these decisions for 4 years as the lead for the Michigan Makers project, which partners graduate student mentors with middle-grade makers, and Making in Michigan Libraries, which positions libraries as hubs for maker conversations in rural and underserved communities. In this article, we look at strategies to help you create sustainable maker culture and projects. (p. 39)

Good, T. (Eds.). (2013). Three makerspace models that work. *American Libraries Magazine, 44*(1/2), 44-49. Retrieved from https://americanlibrariesmagazine.org/wp-content/uploads/2013/01/AmericanLibraries_0113.pdf

Kids gather to make Lego robots; teens create digital music, movies, and games with computers and mixers; and students engineer new projects while adults create prototypes for small business products with laser cutters and 3D printers. Many libraries across the US have developed makerspaces—places to create, build, and craft—and they are experiencing increased visits and demand as a result. For public libraries, they are places to promote community engagement. For academic libraries, they are places where students and faculty feel welcome to do classwork and research. . . . In the next few pages, you'll find expert opinions and advice from author Cory Doctorow and MAKE magazine writer Travis Good, as well as practical pieces on the costs and resources involved. (p. 44)

Graves, C. (2014). Teen experts guide makerspace makeover. *Knowledge Quest, 42*(4), 8-13. Retrieved from http://www.ala.org/aasl/sites/ala.org.aasl/files/content/aaslpubsandjournals/knowledgequest/KQ%20MarApr14%20FINAL_TAGGED.pdf

Envision a middle school library where teens congregate after school, excited—even at the end of the school year—about creating and making something they've never tried to do before. Hear the chatter of excited voices asking the school librarian what the next "Mayker Monday" workshop will be. Picture students among the stacks, clustered around pine tables, busy building and creating. Instead of constructing yet another paper football, they are, in fact, collaborating on how to build their own app. Imagine students getting excited about creative technologies and engineering and hoping to one day attend MIT.

That's the power of a makerspace in a school library. (p. 8)

Han, S.-Y., Yoo, J., Zo, H., & Ciganek, A. P. (2017). Understanding makerspace continuance: A self-determination perspective. *Telematics and Informatics, 34*(4), 184-195. http://dx.doi.org/10.1016/j.tele.2017.02.003

Makerspaces are informal physical spaces located in community settings or educational institutions where people immerse themselves in creative making. Makerspaces hold incredible potential for fostering essential skills needed for the

future and are increasing in number worldwide. Previous research has identified many diverse makerspace initiatives and has demonstrated their potential, but few research has examined makerspace sustainability. Makerspace sustainability is a significant issue as diminished participation, activity, utilization, and retention limit its success. This study examines makerspace sustainability by understanding which factors influence makerspace continuance intention. This study proposes and empirically tests a conceptual framework based on self-determination theory to identify the motivations of makerspace users. An analysis of data collected from 121 South Korean makerspace users indicates that makerspace environmental support is significantly related to a makerspace user's basic psychological needs. Those psychological needs positively impact intrinsic motivation, which ultimately influences makerspace continuance intention. This research has several implications for academics while recommendations are proposed that have immediate application for practitioners which are informed by the study results. (p. 184)

Kurti, R. S., Kurti, D. L., & Fleming, L. (2014). The philosophy of educational makerspaces: Part 1 of making an educational makerspace. *Teacher Librarian, 41*(5), 8-11. Retrieved from http://www.teacherlibrarian.com/wp-content/uploads/2014/07/Kurti-article.pdf

Educational makerspaces (EM) and maker education (ME) have the potential to revolutionize the way we approach teaching and learning. The maker movement in education is built upon the foundation of constructionism, which is the philosophy of hands-on learning through building things. Constructionism, in turn, is the application of constructivist learning principles to a hands-on learning environment. Thus maker education is a branch of constructivist philosophy that views learning as a highly personal endeavor requiring the student, rather than the teacher, to initiate the learning process. In this philosophy of learning, teachers act as guides for inquiry-based approaches to the development of knowledge and thinking processes. Upon reflection, it is natural to believe that the learner should initiate learning, as it is physically impossible for any teacher to mechanically rearrange and reinforce the physical neuronal pathways developed in the brain during the learning process.

In practical terms, educational makerspaces are the ideal environment for maker education. Thus it is necessary to explore maker education to properly understand educational makerspaces. In an ideal constructivist environment, the line between learner and instructor becomes blurred. . . . The primary objective of the teacher . . . is to facilitate the acquisition of concepts by building a specific project. This is the ideal learning environment of an educational makerspace. (p. 8)

Kurti, R. S., Kurti, D., & Fleming, L. (2014). The environment and tools of great educational makerspaces: Part 2 of making an educational makerspace. *Teacher Librarian, 42*(1), 8-12. Retrieved from http://www.teacherlibrarian.com/wp-content/uploads/2014/10/makerspace-article-2.pdf

In this second installment [of the series], we will explore the look and feel of the environment and the selection of tools to inspire and equip makers to tinker, create, and invent. Innovation is fundamentally an inspired activity, and the right environment has the potential to inspire new thoughts and creative endeavors. When choosing tools for an educational makerspace, begin by considering the purpose of the space. This idea appears obvious, yet it is anything but obvious. We would expect that the space and tools would be mostly technical in nature, yet evidence suggests that we should challenge our beliefs about creative, innovative thinking and the environments in which that thinking is fostered. Educational initiatives often encourage exploration of STEM subjects (science, technology, engineering, and mathematics) to encourage creativity, but the energy to propel creative journeys remains conspicuously absent in many programs. The power comes by adding one simple aspect that has been too lightly discarded from our educational environments: art, the A that drives dry STEM programs to STEAM ahead. (p. 8)

Kurti, R. S., Kurti, D., & Fleming, L. (2014). Practical implementation of an educational makerspace: Part 3 of making an educational makerspace. *Teacher Librarian, 42*(2), **20-24. Retrieved from http://www.teacherlibrarian.com/wp-content/uploads/2014/12/Kurti-3-for-tl-website.pdf**

> A culture of innovation in an educational makerspace arises from student ownership rather than from the presence of high-tech tools. Owning the learning experience opens unexplored horizons to students because independent thinkers have the uncanny ability to strike out into uncharted territory. Educational makerspaces are the ideal environment to foster such independent exploration, but the map for creating engaging educational makerspaces remains relatively sparse. Even though the map to educational makerspace success remains vague, pioneers in the field are pushing forward and reporting their findings. . . . This final part of the series exposes a real-life case study of a makerspace in an average school in an average district, with results that are anything but average. (p. 20)

McKay, C., Banks, T. D., & Wallace, S. (2016). Makerspace classrooms: Where technology intersects with problem, project, and place-based design in classroom curriculum. *International Journal of Designs for Learning, 7*(2), **11-16. Retrieved from https://scholarworks.iu.edu/journals/index.php/ijdl/article/view/20267/28271**

> In considering the integration of technology in the classroom it is necessary to factor in the ways in which teachers design for their use. Makerspaces and their use of digitally-based rapid prototyping tools such as laser cutters and 3D printers are serving as new models for technology integration in learning environments. While there has been some research on the educational affordances of such technologies little research has been done to understand their use in the traditional classroom environment by teachers. This paper explores the design of curricular and instructional activities by two teachers who have been re-designing their class into a makerspace-oriented classroom. (p. 11)

Seymour, G. (2016). The compassionate makerspace: Grief and healing in a high school library makerspace. *Teacher Librarian, 43*(5), 28-31. Retrieved from **http://search.proquest.com.er.lib.k-state.edu/docview/1830306942?accountid=11789**

> In addition to traditional resources in the library, the school library makerspace recently proved invaluable during [the death of a recent graduate] for students and staff. We found it could also be a center for grieving. It was within this space that our students gathered to create a meaningful memorial for a classmate who passed away. . . . We needed the support of our school mental health facilitators, as well as books and apps, but still there seemed to be a strong desire among students and staff to do something more, something physical. This feeling is common and often proposed as the "best way to get back some of the power you have lost" after a death (Gootman & Espeland, 2005, p. 41). . . . The makerspace is not a replacement for traditional forms of bereavement counseling. However, reflecting upon this activity, I can see how librarians can use their makerspace to offer infinite possibilities for creating memorials to a loved one or colleague. (pp. 28-29)
>
> *author's blog*: **https://ginaseymour.com/category/the-compassionate-maker/**

Vossoughi, S., Hooper, P. K., & Escudé, M. (2016). Making through the lens of culture and power: Toward transformative visions for educational equity. *Harvard Educational Review, 86*(2), 206-232. Retrieved from **https://pdfs.semanticscholar.org/fa5b/4e88c78f380b4727d445afa33bea5212a21d.pdf**

> In this essay, Shirin Vossoughi, Paula Hooper, and Meg Escudé advance a critique of branded, culturally normative definitions of making and caution against their uncritical adoption into the educational sphere. The authors argue that the ways making and equity are conceptualized can either restrict or expand the possibility that the growing maker movement will contribute to intellectually generative and liberatory educational experiences for working-class students and students of color. After reviewing various perspectives on making as educative practice, they present a framework that treats the following principles as starting points for equity-oriented research and design: critical analyses of educational injustice; historicized approaches to making as cross-cultural activity; explicit attention to pedagogical philosophies and practices; and ongoing inquiry into the sociopolitical values and purposes of making. These principles are grounded in their own research and teaching in the Tinkering Afterschool Program as well as in the insights and questions raised by critical voices both inside and outside the maker movement. (p. 206)

Wohlwend, K., & Peppler, K. (2015). All rigor and no play is no way to improve learning. *Phi Delta Kappan, 96*(8), 22-26. Retrieved from **http://kpeppler.com/Docs/2015_Peppler_All-Rigor-No-Play.pdf**

> Play is losing to rigor in American classrooms as more and more structured reading and math replaces traditional playtime, thanks in large part to pressure to meet the Common Core State Standards. Young children, in particular, are losing out because this increasing standardization of the curriculum restricts the variety of ways they could and should be learning. . . . We argue for a path forward that

rejects familiar binaries of work vs. play and old vs. new technologies and that follows the children's lead by asking:

- What are children able to do when we expand learning to include dolls and books, digital cameras as well as paper and pencils, and Play-Doh® as well as science experiments?
- What happens when we dismiss the supposed oppositional relationship between imaginative play and rigorous standards?
- Is it possible to rethink our ideas about play and rigor to design and facilitate expanded learning, where play, collaboration, and arts are on equal footing with science and technology? (pp. 22-23)

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