



Learning through doing: Creating a makerspace in the academic library

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Makerspaces are becoming increasingly common in higher education institutions, and academic libraries can be regarded as an ideal location for such collaborative learning environments, as they provide a neutral space which encourages cross-disciplinary engagement and collaboration. This paper discusses the potential role of the library in facilitating the development of important lifelong learning skills through hands-on, problem-solving, and participatory making activities. It describes Curtin Library's initial steps to establish a makerspace, which it is doing by providing a physical and virtual space, organizing events, workshops and activities and engaging in collaborative projects.

Keywords: makerspaces, libraries, creativity, collaboration

Introduction: What is a makerspace?

Makerspaces are collaborative learning environments where people come together to share tools, materials and expertise, and develop digital literacy and other skills through hands-on 'making' activities. Fostering community building, they encourage collaboration, creativity, experimentation, exploration, and the sharing of knowledge and experience. They provide opportunities to engage in problem solving activities using technologies such as 3D modelling and printing, electronic circuitry, robotics, coding, data visualisation, virtual and augmented reality, video-creation, animation and digital storytelling, as well as art, craft and design. There are many kinds of makerspaces: they come in many different shapes and sizes and can take any form - big or small, portable or permanent. They are adaptable, and can be shaped to educational goals or the interests of individuals or groups.

As a learning environment, a makerspace is generally underpinned by a constructivist approach, which holds that effective learning occurs by involving the learner in the primary construction of knowledge through hands-on enquiry based learning. It also applies connectivist learning theories, emphasising learning through doing in a socially networked environment and that recognizes the student as a creator of information, not just a consumer (Dunaway, 2001). These theories have informed the way maker cultures are built, incorporating multiple learning styles and allowing students to take control of their own learning, providing an intersection between formal and informal learning to include "designing, playing, tinkering, collaborating, inquiring, mentoring experimenting, problem solving and inventing" (Loertscher, 2012). By fostering learning in this way, it encourages the development of valuable, essential skills that students need to meet society's challenges, both now and in the future.

Makerspaces exist in a variety of contexts, as shared environments for 'making' things have essentially been around for many hundreds of years. However in the past decade or so makerspaces have been established as dedicated learning environments in community organisations (an exciting example being [The Tinkering Studio](#) at the Exploratorium); educational institutions (such as [Makernow](#), the Digital Fabrication Lab at Falmouth University, Cornwall); and public libraries (of which [The Edge](#), in Brisbane, Queensland is a successful Australian example). In the higher education sector the academic library is beginning to position itself to play a central role in this emerging trend. In the US some fine exemplars are the University of Virginia [Scholars Lab and Makerspace](#), and the [De La Mare Science and Engineering library](#) in Nebraska.

Changes in technology, education, and the needs of their communities have seen academic libraries adapt by repositioning their spaces as well as rethinking their purpose. By establishing makerspaces many academic libraries "aim to fulfill aspects of their current and emerging roles, such as fostering life-long learning, acting as catalysts for collaboration, and providing support and resources for the creation of knowledge" (Miller, 2015). Such a shift provides an opportunity for academic libraries to expand their traditional areas of teaching information literacy to experiment with different approaches,

thus enabling libraries to learn about new and emerging learning technologies and innovative approaches to teaching and learning. This means exploring, and being informed by, new concepts of information literacy that are redefined to empower learners. It also means being informed by changes in technology, encompassing emerging literacies such as digital literacy, mobile literacy and visual literacy within an overarching and unifying framework of “metaliteracy” (Mackey & Jacobson, 2011).

To establish and facilitate a makerspace, the library does not need to be an expert in the technologies or in the skills that are taught through the makerspace activity. There is little doubt that maker education inspires deep learning and encourages student ownership of their own learning. The benefits are clear in that an educational makerspace:

fosters curiosity, tinkering, and iterative learning, which in turn leads to better thinking through better questioning. This learning environment fosters enthusiasm for learning, student confidence, and natural collaboration. Ultimately, the outcome of maker education and educational makerspaces leads to determination, independent and creative problem solving, and an authentic preparation for the real world by simulating real-world challenges. (Kurti, Kurti & Fleming, 2014, p. 11)

Curtin Library Makerspace

During 2015, Curtin University Library is currently implementing a strategic initiative to build a maker community through the establishment of a makerspace. It aims to do this by facilitating ‘making’ events, activities and projects, both within the library and the wider Curtin community, as well as seeking opportunities to engage with the community more broadly. In collaboration with Curtin Teaching and Learning, the Curtin Library makerspace intends to be primarily a learning space which encourages openness, sharing, experimentation and play, and facilitates cross disciplinary interaction inquiry, learning, collaboration, outreach and research.

The makerspace will allow the Library to supplement its traditional information literacy teaching role to facilitate the development of digital literacy and other skills, not only by providing a creative space for people to use for their own maker projects, but by coordinating and facilitating workshops, drop in sessions and events, as well as by participating in shared projects, including research. A further important role is to act as a conduit for the various making facilities that exist within the university, to enable the sharing of the wealth of facilities, equipment, knowledge, skills and experience for mutual benefit.

As a current initiative, the library makerspace is still embryonic at the time of writing. We are in the midst of establishing a small space (approx. 30m²) and a fledgling maker community, with library staff gradually acquiring the necessary skills, experience and knowledge to facilitate the resource. Remaining open minded as to how it develops as a space, we aim to be responsive to the changing needs of the communities we serve, with its evolution driven by the community itself. However, some of the themes we are interested in encouraging, and which reflect new developments in teaching and learning within the university include:

- visualization technologies, including augmented reality and virtual reality
- coding, programming, electronics, circuitry, robotics
- media, animation, digital storytelling and games based learning
- 3D scanning, modeling and printing

In addition to these themes there are four main areas that we are focussing on to establish the makerspace. First, equipping a space with appropriate resources; second, running events to build the maker community; third, facilitating learning; and finally, collaborating on cross-disciplinary maker projects.

Space/ resources

The physical space was established in July 2015 in a small room located next to the student lounge area, to provide an area to meet and work, and some tools, equipment and software to enable creative activity to occur. The makerspace also spills into the open lounge area by making craft activities available, such as knitting, crochet, origami and papercraft, as well as board games and

puzzles, to library visitors.

Events / community

Arguably it is the makerspace community that is the most important aspect of the makerspace. We have sought to connect with the Curtin maker community, not only through discussions with individuals and groups, but through organising events. In March 2015 Curtin Library ran a 'popup' makerspace during the Curtin Festival of Learning, a week long event that showcases innovative teaching and learning practices from Curtin teaching staff and researchers. We offered a range of hands-on 'making' activities around 3D scanning and printing, virtual and augmented reality, coding and electronics, as well as non-digital art, craft and design activities. Again, in August 2015, funded by a small grant for National Science Week, we ran another week-long makerspace event on the theme of 'light', offering workshops that include illuminated origami, paper and soft circuitry, electronics and coding using Arduinos, virtual reality and light painting. More recently we have participated in campus events such as Loud Shirt Day and Curtin Creative Festival. These events have been a very important way to engage with the maker community both internal and external to the university.

Learning / activities & workshops

A tangible way in which we have explored the new learning approach that making enables was by creating games-based learning activities that involved both mobile devices and augmented reality to develop digital literacy skills, teach research skills and raise awareness of the Library's services and resources. We are also in the process of developed a number of maker activities, as well as drawing on the existing expertise of those within the Curtin community. For example, an engineering academic has run Arduino workshops for us, and student mentors have developed Makey Makey activities to use with groups.

Projects / collaborations/ research

An example of a collaborative project based in the library makerspace involves creating a 360 degree panoramic 'virtual tour' of Curtin Library with digital storytelling elements embedded in it, providing library clients with an immersive 3D virtual experience of the physical spaces of the Library. While navigating around and experiencing the 3-dimensionality of the spaces online, clients will be able to interact with a range of learning objects embedded throughout the virtual tour. The Library is collaborating with Curtin's HIVE (Hub for Immersive Visualisation) as well as visualisation students studying Film & TV through Curtin's Work Integrated Learning Program. There are many other opportunities to foster collaborative projects, for example in of K-12 education/STEM research, and through school outreach or community programs such as Curtin AHEAD (Addressing Higher Education Access Disadvantage), both internal and external to the university. One of the most exciting opportunities in establishing the makerspace is to undergo research studies of the makerspace itself, and its development.

Conclusion

Curtin Library's initiative to establish a makerspace in the library has been both challenging and rewarding as it has attempted to be flexible and adaptable to its particular circumstances, and responsive to the needs of the community it serves. Above all, it has invested in fostering the maker community by forging collaborative relationships, undoubtedly the key to a successful makerspace. Our approach has been to start small, and shape it as we respond to the ideas and desires of our growing maker community. The challenge ahead is to find ways to foster the continued organic evolution of makerspace. Issues to consider include:

- The legitimacy of the role of the library in the higher education context in fostering learning through making
- The importance or otherwise of the digital literacy skills that can be acquired through makerspace activities, and its contribution to 'lifelong learning'
- Role of the makerspace in developing knowledge about learning technologies and their use in the higher education environment
- How to evaluate the benefits, measure success and demonstrate efficacy of the makerspace

- Formulating research questions which could make a contribution to scholarship in this area

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