Chapter 10
Libraries, New Technology, and Education: The 3D Printing Challenge

Patricia Fidalgo
Emirates College for Advanced Education, UAE

Joan Thormann
Lesley University, USA

Andrea Davis
San Francisco Public Library, USA

ABSTRACT
This chapter presents a snapshot of the current status of the use of 3D printers by libraries in the U.S. through a review of the literature and a survey with librarians to share information and expand the current knowledge of 3D printing services in libraries. Information about use of 3D printers in academic, public, school, and governmental libraries is described. Incorporating 3D services into libraries, how to set up a program, sample guidelines, online resources, management, funding, and challenges are shared. The original research addresses challenges, opportunities afforded, programs, activities, school/library relationships, and library policies. In conclusion, libraries accomplish one of their goals as a public institution by offering access to emerging technologies as a way to enhance educational opportunities with an interdisciplinary approach.

INTRODUCTION
This chapter aims to provide greater insights on how to facilitate and support the integration of 3D printer technology in libraries. Libraries are democratic places where interdisciplinary fields of learning are happening and can support opportunities to enhance the educational experience.

This chapter will explore the use of 3D filament printers in government, public and academic libraries (K-12 and higher education) in the United States. A review of the literature was performed and original

research was conducted about the use of 3D printers in libraries. The purpose was to discover the challenges, opportunities afforded, programs, activities, school/library relationships and library policies.

**BACKGROUND**

The current literature concerning the use of 3D printers in libraries can assist many organizations that are interested in purchasing and setting up 3D printer programs as well as those programs that have already been established. According to the American Libraries Association (2018) one of the guiding principles and mission is “to provide access to information to all users” (p.1) and by doing this they have the potential to help communities create knowledge. Thus, the availability of 3D services complements the purpose by being a space of creativity and innovation. 3D printers (and books) are just tools that help achieve that main purpose. Kalish (2011) also mentions that libraries are a “learning business” that help minds expand by providing resources to the community that are not available to most individuals.

Another important goal of many libraries in the U.S. is to encourage and support children to learn and get them interested in learning. Associated with this is the philosophy of helping students to follow their interests and passions. Most students as well as adults find using new technologies highly motivating. Thus, libraries are purchasing 3D printers to assist students and adults to get hands-on experience using emerging technologies. There are numerous ways to introduce library patrons to 3D printers. One way is to establish a Makerspace which is defined as a combination of “manufacturing equipment, community, and education for the purposes of enabling community members to design, prototype and create manufactured works that wouldn’t be possible to create with the resources available to individuals working alone” (Maker Media, 2017, p.1). The Maker movement is a do-it-yourself community that share interests, clubs, fairs, projects and festivals. The movement can be tracked to 2006 in San Francisco when Make Magazine organized an event called Maker Faire that was considered one of instigators of the Maker movement. Rivero adds that: “Schools and educators have taken to the movement’s model quite naturally, as it’s very much at the intersection of theory and practice, of study and fun: of science, technology, engineering, and mathematics, or STEM.” (Rivero, 2017, p.5)

Using an approach similar to Makerspaces is a project called Connected Learning which is also being used in several libraries around the U.S. to support student learning. The main concept is to harness the personal interests of students to actively engage them in creating as well as solving problems that they care about.

Wapner (2015) stated that there are around 120,000 libraries (16,000 are public libraries) in the U.S. and each year more of these libraries provide 3D printing services. “In public libraries, 428 branches offer the service, up dramatically from 250 the year before” (Wapner, p.1). According to this author, to use and make the most of the technology associated with 3D printing, there is a need for minimal knowledge of how to operate this type of technology. Libraries can provide demonstrations and training not only on printing but also on how to use software to build 3D models. Instructors and librarians are integrating 3D printing in the learning process as a way of preparing the next generation to face future challenges from “high-demand science, engineering and technical subjects” (Wapner, p.3).

A 2017 survey conducted by Library Journal found that use of 3D printing in Makerspaces was among the most popular programs. Use of 3D printers doubled since the previous survey conducted in 2014 (Dixon, 2017). Fontichiaro (2016) discusses 3D printers in the context of Makerspaces. She writes about