3D Printers in Library Learning Labs
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Introduction
3D printers allow students to participate in the entire creative process from idea conception and design to creating a finished product. The existing literature largely addresses staff training and printer use, without attending to how and why students use 3D printers or the role of 3D printers in the process of creating information. This project explores the use of 3D printers in a school library learning space and presents implications for librarians.

Program Description
Supported by the Institute for Museum and Library Services (IMLS), the University of Oklahoma School of Library and Information Studies in partnership with Norman Public Schools and Oklahoma Climatological Survey developed a meteorology-themed after school program in Fall 2014. The project extended over 12 weeks at Irving Middle School Library enabling 19 students to explore and learn about science and technology. The research team conducted weekly interviews, observation, pre- and post-surveys, and final group and individual interviews to investigate how students create information and learn by making.

3D Printer & Software
The 3D printer generated enthusiasm for the program and was used for different projects. Students used a MakerBot Mini, and TinkerCad and SketchUp for design.

Student Use of the 3D Printer
1) Student Perception of the 3D Printer
- There were different perceptions of the 3D printer. Some viewed it as exciting, others as difficult yet usable, and others forfeited completely.
  "My favorite part of everything was learning how to use the technology in the 3D printer and what’s best to use for the 3D printer. That was my most favorite part about this. I’m hoping that once I get out of college I’m going to have enough money saved up to buy a bigger scale 3D printer."

- "I couldn’t use the 3D printer software, it just didn’t make sense to me. I couldn’t make what I wanted to make from it."

2) 3D printer as a tool for information creation.
- Two students chose to use the 3D printer for their final creation. They stated that using the 3D printer was the highlight of the program for them. Students demonstrated and taught how to use a 3D printer to the audience at the final Makers’ Club fair.

School Librarian Use of the 3D Printer
1) Teachers as mentors
- Teachers helped students set up the 3D printer, install the filament, and get started with Tinkercad and SketchUp. Most students wanted independence with their projects and preferred to consult teachers as needed, rather than having them hover.

2) Encouraging creativity
- In the beginning, students would largely copy designs from Thingiverse (a web-based, crowd-sourced, database of designs) and print them. To encourage students’ original creation, the school librarian required that students at least modify a design before it could be printed.

3) Encouraging problem-solving
- The school librarian presented a “challenge of the week” to encourage students to think critically about the 3D printer and its use, as well as to empower them to view themselves as agents of change in their school. These challenges consist of scenarios that require students find a solution to a problem by printing a device, piece, or tool on the 3D printer.

She selected a “challenge of the week” based off a need in the library or the school. For example, she requested students design and print an item to repair a broken stand in the library. She also selected challenges from Instructables.com’s 3D printer monthly challenge, which consists of reproducing a printed object by following a complex list of instructions and designs.

Implications
- 3D printers may be perceived as new and exciting and attract students to a library program; however, not all students will exhibit the same degree of enthusiasm and interest.

- To be successfully integrated into student learning, 3D printers must be accompanied by appropriate guidance so that they serve an actual educational purpose instead of just acting as an interesting machine.

- Librarians and teachers can promote creativity and critical-thinking using 3D printers by helping students identify existing problems and challenges in their environments. Additionally, they can promote idea testing and demoing throughout all stages of creation. Encouraging the use of the 3D printer throughout the learning process, from idea conception to completion, can facilitate students’ inquiry-based learning.

- 3D printers can be used as a tool for community and relationship building. Giving youth the opportunity to teach and assist others in the use of 3D printers builds their confidence and sense of agency, as well as builds friendships.

- Practitioners should be mindful of the fact that youth prefer to have a certain degree of freedom and independence while learning with a 3D printer.