



Maker: A Practical Approach to Student Use of University Owned Rapid Prototype Machines

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Debbie Morrow currently serves as Liaison Librarian to the School of Engineering and the other units within the Padnos College of Engineering & Computing at Grand Valley State University, and to the Mathematics and Statistics departments at GVSU. In that position her primary role is to support students in courses in her liaison areas both in and outside of their classrooms. Helping students make connections between information literacy skills and the "life long learning" skills ABET seeks to see in engineering program graduates is an ongoing challenge. Prior to becoming a Liaison Librarian, Debbie served as Systems Librarian at GVSU and at Michigan Technological University for 25 years. She earned her MLIS at the University of Illinois Urbana-Champaign in 1983.

A Successful Model for Student Use of University Owned Rapid Prototype Machines

Rapid prototyping technology, especially in the form of 3D printing, isn't just for high-tech industry anymore. Both on university and college campuses and in communities around the world, affordable consumer equipment such as several models of MakerBot 3D printers and scanners are becoming available for use by non-technical students and citizens. Libraries are often the shared public space where people can come to use the technology. A news release about the new "MakerBot Innovation Center" at University of Massachusetts at Amherst cites an estimated 500 libraries across the U.S. with MakerBot 3D printers and scanners.¹

At Grand Valley State University students have access to 3D printing with MakerBots. This paper discusses in detail the practical aspects of creating a space for new technologies and maintaining the equipment. This includes balancing the availability of the machines while limiting overuse and or abuse. The purpose of this brief paper is to provide a model for other institutions that are implementing or have implemented student access to rapid prototype machines.

This paper describes the methods currently being used in one of the University Library locations at Grand Valley State University and in the Art & Design Department to allow students access to the rapid prototype (RP) machines.

3D printing and Grand Valley State University's Libraries

The library has the following introductory statement for students wishing to use their MakerBots:

The University Libraries Makerspace is a lab for you to create, tinker, and explore. Housed in the Technology Showcase in the Mary Idema Pew Library Atrium, the Makerspace has two 3-D printers and specialized modeling software for use by current Grand Valley State University students, faculty, and staff.²

This statement makes it clear to all audiences but especially students that this resource is not reserved for labs or individual courses but rather as a means to enable them to develop ideas and methods on their own.

The library has a student employee present in the Technology Showcase/Makerspace to help students load the files into the printer and troubleshoot printing problems. If students need help with design or using modeling software there are workshops offered in addition to many on-line resources.

Details: The makerspace is open Mondays thru Thursdays, 10 a.m. until 5 p.m. and Fridays, 10 a.m. until 3 p.m. These are the times that the space is staffed, though for bigger jobs the

machines are allowed to run overnight. Students using the MakerBots are only charged for the materials they consume. They are charged \$0.35 per gram of material with a \$6.00 minimum. The fees are added to their library account which is typically used for late fees and other library services.

3D printing and Grand Valley State University's Department of Art & Design

Students in GVSU's Art & Design programs have been provided with access to some new digital tools for doing 3D design work in the last few years. In several lower- and upper-division A&D courses 3D design and problem solving are explored in detail; in many others, there may be a need for a 3D component of some kind. Presently the department has assembled a small fabrication lab, or "FabLab", comprising a MakerBot, a CNC milling machine, a laser cutting machine, and a Stratasys uPrint SE Plus 3D printer. They employ one student manager, first hired in 2013, to oversee the small, roughly 10 ft. x 15 ft., facility ensconced deep in the A&D building.

Art & Design fabrication lab manager Ross T. explains that the Art students in the 3D classes learn the software applications for making and manipulating the 3D files, and for running the equipment. Others may need parts fabricated, and rely on a consultation with him to execute the job. He troubleshoots the equipment and helps solve design problems from the technical side.

Details: For a course project the students are given a set amount of material after which they pay \$5 per cubic inch of material.

Factors for practical management

Both departments have several key components in common:

- Support staff – students who take on responsibility for becoming sufficiently knowledgeable about the operation and "care and feeding" of the equipment to assist their peers.
- Fee for usage – students are required to pay for use of the machines in the form of paying for consumables.
- Education resources – available to students to allow them to educate themselves on the use and limitations of the RP machines.
- Limited access time – access may be limited by the requirement for a manager/overseer to assist users and ensure safety.

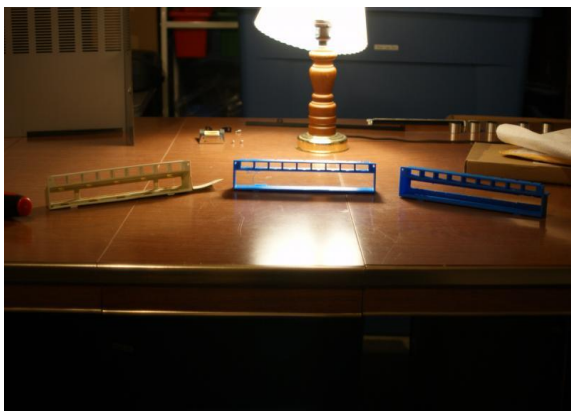
Poised for growth

The volume of 3D printing in the library's Makerspace has been modest in its first year of operation. During Fall 2013 through December 2014, 110 people were logged in to use library MakerBot equipment to print 3D objects, for total charges of \$996.56. Printed objects reflected some variety, such as "fix-it parts," phone cases, knick-knacks, Go-pro accessories, and art projects. One of the very first uses of the library's first MakerBot was notable: a student

encountered promotional information about access to 3D printing, and started thinking about a way he could put that technology to personal use. Kyle Niewiada says,

In the fall semester 2013, right after the library began offering services of their 3-D printer, I went in to produce a working model of a 1970s lamp housing for my amp. ... I wrote up a blog post about the process in-depth, things that went wrong, things that I learned, and a little bit about 3D printing technology (there's also lots of pics!) (personal communication, Feb. 25, 2015).

Kyle's blog post documents in words and pictures what is possible with a little patience and persistence, and an idea³:



“...a perfectly built lamp housing to go in as a replacement for my old one” (Photo by K. Niewiada, used with permission)



“An overview of my Marantz with the bright blue part placed inside” (Photo by K. Niewiada, used with permission)

The A&D fabrication lab is largely known only to Art & Design majors and other students in Art classes. Dr. Norwood Viviano, Sculpture Program Coordinator and Assistant Department Chair, says that planning is underway to revise the department's 100-level '3-D Design and Creative Problem Solving' course and open it up as a General Education course. He anticipates that in time, that course will have a significant impact on the awareness of 3D design and modeling as a powerful and attainable skill among students in a widening assortment of majors. In turn a growing demand can be expected for more centrally and generally accessible fabrication facilities at Grand Valley.

Notes

1. Devaney, L. “MakerBot center brings 3D printing to UMass Amherst Du Bois Library; connects students, community with 3D printing.” (Mar. 24, 2015). Blog. <http://www.ecampusnews.com/business-news/innovation-center-3d-389/>. Accessed Mar. 24, 2015.
2. “Makerspace – University Libraries – Grand Valley State University”. [n.d.] <http://gvsu.edu/library/maker-space-228.htm>. Accessed Mar. 18, 2015.
3. Niewiada, K. “Restoring Vintage with 3D Printing.” (Sept. 22, 2013). Blog. <http://www.kyleniewiada.org/blog/2013/09/22/restoring-vintage-3d-printing>. Accessed Mar. 18, 2015.