Susan M. Ryan and W. Tandy Grubbs

Library self-disruption: The key to surviving and thriving

A library dean and professor dialogue on learning technologies and mutual dependence

Disruption and change, especially in the area of technology, continue to have a major impact on society. The higher education community is certainly not immune to these trends. In this article, the authors, the library dean and a professor of chemistry at Stetson University, engage in a dialogue on learning technologies and mutual dependence.

Susan Ryan, library dean: *Fortune* magazine regularly asks CEOs to identify their biggest challenge. For the past two years, one of the top answers has been the "rapid pace of technological change."[1] The media discusses innovation/technological disruption and its effect on businesses on a daily basis. The impact of rapid technological change would also surely make it into most library administrator's top five challenges. Libraries, like corporations, have experienced the effects of disruptive technologies for years and have responded with varying degrees of success. Gutenberg's printing press is one of the first disruptive technologies, but others have followed—the Internet, e-books, open access, and self-publishing have all wreaked havoc on commercial publishers and the way libraries acquire and distribute information.[2]

At Stetson University, a primarily undergraduate institution with 3,000 students, our library has grappled with the fast-paced changes in higher education that affect how students learn, most driven in some way by technology.

What is the solution to navigating the barrage of technological disruption? Perhaps libraries should practice self-disruption to stay ahead of the curve.

Many libraries tend to ignore disruption until they feel forced into change. Inadequate budgets, administrative priorities, and lack of staff expertise may all contribute to our reluctance to embrace technological innovations. A dramatic change in Stetson University's overall administration a number of years ago, however, offered our library a window to become bolder. We used our window of opportunity to make *disruption* a strategic priority. We chose three broad areas for our strategic direction: teaching and learning, collaboration, and innovation.[3]

Our first major technology-related disruption, however, involved a tough mental transition for some of our librarians. In 2013, the library received a large "innovation" endowment for innovative services of the library's choosing. We decided to offer subsidized

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3-D printing, although 3-D printers were far from ubiquitous in libraries at that time. Some of our librarians failed to see the relevance in offering such nontraditional library services. Others, however, believed that 3-D printing would be a healthy direction for our library, if we could align the service with our mission and goals. We also knew that successfully implementing 3-D printing in a way that aligned with our goal to promote teaching and learning required classroom collaborators as well as innovation.

W. Tandy Grubbs, chemistry professor: For most of the modern era, chemical educators have practiced as solo artists, relying upon a chalkboard, a well-equipped stockroom, and the occasional classroom demonstration to teach effectively. In the lab, students hand-recorded empirical data on paper. Advances in technology over the last three decades ensure that students now have a variety of software/web-based tools and mobile apps that can be used to analyze data, mathematically model complex physical systems, and visualize the molecular world. To keep pace with modern, high-impact practices, educators must be willing to self-disrupt traditional instructional approaches and embrace new learning technologies. Successful disruption requires that the educator surrender a measure of solo artist status and become dependent upon externally administered resources and expertise.

As an example, Stetson undertook an initiative that challenged chemistry students to use computational chemistry software in tandem with 3-D printing technology to create molecular models. To the chemist, 3-D printing represents a powerful tool to create more realistic tangible models of molecular structures (Figure 1).

Such an initiative would require a sizable investment in multiple printers, which would have been unaffordable at the department level.

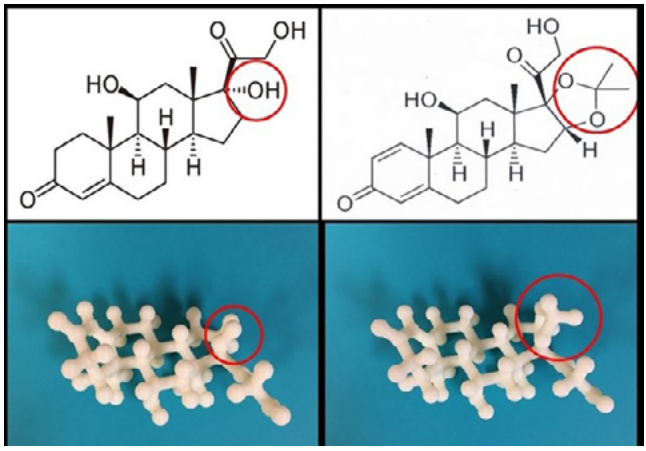

Figure 1. Two common topical pharmacological agents (Hydrocortisone, left; Desonide, right) that possess similar molecular structures. 3-D printed models of each drug allow students to better grasp the similarities and differences (circled in red) in these structures.

The advantages of a library-supported 3-D printing lab include extended-hours access to printers, the availability of technical support staff, and no worries at the departmental level about 3-D printer expenses and maintenance. Thanks in large part to the availability of the library-supported 3-D printing innovation lab at Stetson, the chemistry 3-D printing initiative was a success that has led to student and faculty publications and other scholarly outcomes. 3-D printing activities have provided a means of getting students to engage further in chemistry, while at the same time practicing skills of creativity/innovation, collaboration, and technological literacy deemed important for the 21- century workplace.

Ryan: The library's early 3-D printing partnership with the Chemistry Department provided multiple benefits. Integration of 3-D printing into chemistry lab assignments, senior research projects, and faculty research allowed us to meet our teaching and learning goals for the new technology.

Rather than just let students print out iPhone cases, we implemented the technology with academic collaborators who gave our operation instant academic legitimacy. The excitement of the chemistry faculty and students did not go unnoticed by professors and students in other disciplines. A faculty member teaching anatomy added a 3-D printing component to a project she had long-assigned, and enthusiasm for the project immediately multiplied (Figure 2). A business student created a prototype mold for a sandal strap that his family business manufactured, and an art professor discovered 3-D printing as a medium to create pieces that went into his professional shows (Figure 3).

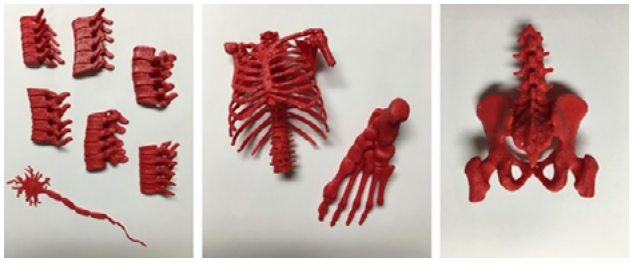

Figure 2. 3-D printed models significantly increased student interest in an Anatomy Laboratory exercise.

During this initial 3-D printing spree in 2013 and 2014, the library won two competitive innovation awards—not for offering 3-D printers, but for collaborating with teaching faculty to incorporate the technology in the classroom. We had discovered a way to hit the trifecta of our strategic objectives. The 3-D printing initiative not only met our desire to have the library be a place of teaching and learning, but it also incorporated collaboration and innovation. Within two years of establishing our Innovation Lab, librarians, faculty, and students generated six conference presentations, four national posters, two book chapters, two journal articles, three senior research projects, and various professional workshops and webinars.

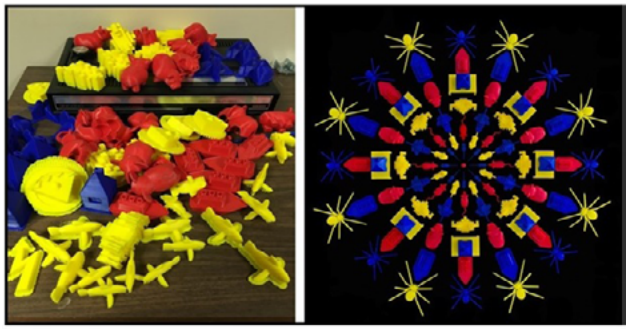

Figure 3. 3-D printed figurines used to create art pieces exhibited in professional art shows.

The university president, the provost, Board of Trustees members, and the university marketing staff took notice of the attention the library was receiving. Somewhat surprisingly, however, not all of the librarians embraced the library's role in hosting nontraditional learning technologies. While some did not see the relevance of providing the services, others resented the attention 3-D printing garnered. The same internal and external constituencies who praised the library's efforts to self-disrupt had largely ignored the traditional library services we provided just as well, if not better—such as research assistance, classroom instruction, and work on information literacy learning outcomes. Some librarians felt that the library's accolades for the "new" and "innovative" marginalized other important work going on in collection development, user experience, and special collections.

It was hard to argue, however, the benefits to the library. Traffic increased in the entire building and the library—in all areas—was busier than it had been in decades. Increased attention and use meant justification for maintaining and increasing library budgets, and, in general, made fund-

raising easier and more effective. Despite the reservations of some librarians, the benefits of self-disruption outweighed the concerns. Thanks in part to the collaborative nature of the Innovation Lab, librarians and library staff interacted in new ways with diverse groups of students and faculty. Conversations that took place in the Lab led to our most ambitious project yet: developing a for-credit course based on the library's Innovation Lab offerings.

Grubbs: What do a political scientist, a chemist, and a librarian have in common? Ordinarily, one might answer this question "Not much." In this particular instance, however, this odd combination of faculty at Stetson played a pivotal role in designing a first-of-its-kind, semester-long, introductory 3-D Printing and Rapid Prototyping course. The course brought together 15 students from a variety of majors and minors, including accounting, business, computer science, digital arts, English, journalism, management, marketing, music, physics, sports business, and theater arts. Critical was the library Innovation Lab's role in both catalyzing the development of this course and, once it was launched, providing the facilities and equipment to make it successful. The initial conversation that inspired and led to the design of this course would never have taken place if the political scientist, chemist, and librarian in question had not had an opportunity to work alongside each other in the library's Innovation Lab.

Figure 4. Students in the 3D Printing/Rapid Prototyping class design a prototype theatre stage set – one of 15 student prototype projects completed during the semester-long course.

Exactly how did that conversation come about? And, more importantly, how might other academic libraries play a larger role in fostering similar types of collaborative interactions on campus? By chance, the political scientist who helped create and eventually co-taught the 3-D Printing and Rapid Prototyping course was also Stetson's local DIY guru who had helped found a Makerspace for the Stetson community that eventually moved into the library's Innovation Lab. My physical chemistry students and I were also spending a lot of time in the library's Innovation Lab during the spring and fall of 2015 creating and 3-D printing molecular models. While there, we had an opportunity to rub elbows with the political scientist and library dean and have larger conversations about how to promote innovation at Stetson. Some of our students who were working in the Innovation Lab asked the question, "Why can't we take a course in that?"

We recognized that an innovation course, whatever that might be, would likely appeal to a diverse range of students, and would certainly promote technological literacy on campus. We decided that the innovation course should not be linked to any specific discipline and should not have prerequisites from any particular discipline. We looked to see how other institutions were teaching innovation and what curriculum might be involved. Surprisingly, we could not find any examples of a semester-long introductory undergraduate course focused on 3-D printing and its use as an innovation tool.

We agreed upfront that the class would be about designing prototypes and would be offered under the umbrella of the university's Entrepreneurship Program. The course

would be project-based—each student would develop an original idea to fruition through a series of prototypes of increasing sophistication (Figure 4). The political scientist would focus on those workshop-building skills traditionally associated with the Maker movement, and would include a strong emphasis on rudimentary circuit design for electronic, robotic, and remote control.

I, the chemist, handled the primary 3-D printing portion of the curriculum, with a large part of the class time devoted to learning about 3-D graphical file formats, related computer design elements, and how to use computer-aided design software. Library staff played a key role, as well—the library dean met with the class on day one to familiarize the students with the Innovation Lab, library hours, and the availability of library staff assistance. Much of the student work was done outside of class time, and the Innovation Lab staff assisted with 3-D printing and the use of other equipment throughout the semester. Committing to this new initiative required a sizable measure of self-disruption on the part of the two coinstructors. We both taught outside our traditional disciplines, and we both had to surrender our solo artist status on a much larger scale than we had ever done before and depend heavily upon resources and expertise outside our departments. In this case, self-disruption worked well.

Ryan: The successful 3-D Printing and Rapid Prototyping course is the most ambitious undertaking to come out of the Innovation Lab so far, but we continue to move forward. We have developed a concept for a 24/7 Innovation Center in the library that will not only be more than three times as large in size, but will also be more ambitious in scope. Without the self-disruption, the library would have struggled to prove relevancy in today's learning environment. Stetson is certainly not alone in taking this direction. Many librarians believe that dynamic disruption positively transforms library spaces and services. One technology editor cautions, however, that the "trick [to self-disruption] is to recognize where to focus our attention to ensure a vibrant future."[4]

Despite the reservations of some, our self-disruption, with our focus on innovation and collaboration, likely secured our prominence on campus for some time to come.

Notes

1. Alan Murray, "The Biggest Challenge Facing Fortune 500 Companies," Fortune.com (June 3, 2016), http://fortune.com/2016/06/03/challenges-facing-fortune-500/; "The Results of the 2015 Fortune 500 CEO Survey are In," Fortune.com (June 4, 2015), http://fortune.com/2015/06/04/fortune-500-ceo-survey/.

2. Marydee Ojala, "Dynamic Disruption," *Online Searcher* 39, no. 4 (2015): 4.

3. For the complete duPont-Ball Library Strategic Plan, see https://www2.stetson.edu/library/green/wp-content/uploads/2016/08/Strategic-Plan-MASTER-FINAL.pdf.

4. Ojala, "Dynamic Disruption," 4.