Inspiration, Ideation, and Implementation:
Library Integration with Design Thinking Courses

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Introduction

Employers seek college graduates with soft skills (e.g., communication, critical thinking, initiative, cooperative teamwork) and desire students that are better prepared to apply such skills along with disciplinary expertise.[1] Recent pedagogical trends strive to support industry preferences, pushing for classroom models that foster creativity, promote collaboration, and encourage innovation.[2] At Brigham Young University (BYU), this trend is manifest in faculty developing courses using design thinking as a means to solve problems with social impact. Students from multiple majors take these courses and combine areas of expertise (e.g., computer programming, graphic design) through group projects. As evidence of a growing interest in this type of problem-based learning process, BYU began offering a design thinking minor in Fall 2018.[3] This specific curricular trend parallels a broader BYU initiative to increase experiential learning opportunities for students.[4]

Noting this learning trend back in early 2014, BYU Library administrators began conversations with other campus administrators and faculty who were developing interdisciplinary courses that utilized design thinking as a pedagogical tool. Coming out of these conversations, a space was set aside in the BYU Library where faculty could teach these types of courses. Our aims in this paper are threefold:

1. We will provide a basic review of the design thinking process and its use in academic libraries.
2. We will identify existing library services that support the design thinking process.
3. We will describe the processes, benefits, and challenges of developing a new library space and services for interdisciplinary courses.

Our overall goal is to describe our experience and help other librarians determine whether a similar space and accompanying services would benefit their library's and university's mission and strategic initiatives.

Background on Design Thinking

Design thinking is a framework and set of principles that emphasizes empathy-inspired solutions refined through iteration and testing.[5] The term originated decades ago in engineering and architecture and has been adopted in a wide variety of fields since.[6] Design thinking today consists of procedures that vary by name, but one of the more commonly used set of terms is (1) empathize, (2) define, (3) ideate, (4) prototype, and (5) test.[7] While the steps have a general order, practitioners emphasize the recursive and flexible nature of the steps, applied according to the needs of and insights gained from the product and development process.

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FIGURE 1
Steps of Design Thinking

EMPATHIZE
DEFINE
IDEATE
PROTOTYPE
TEST
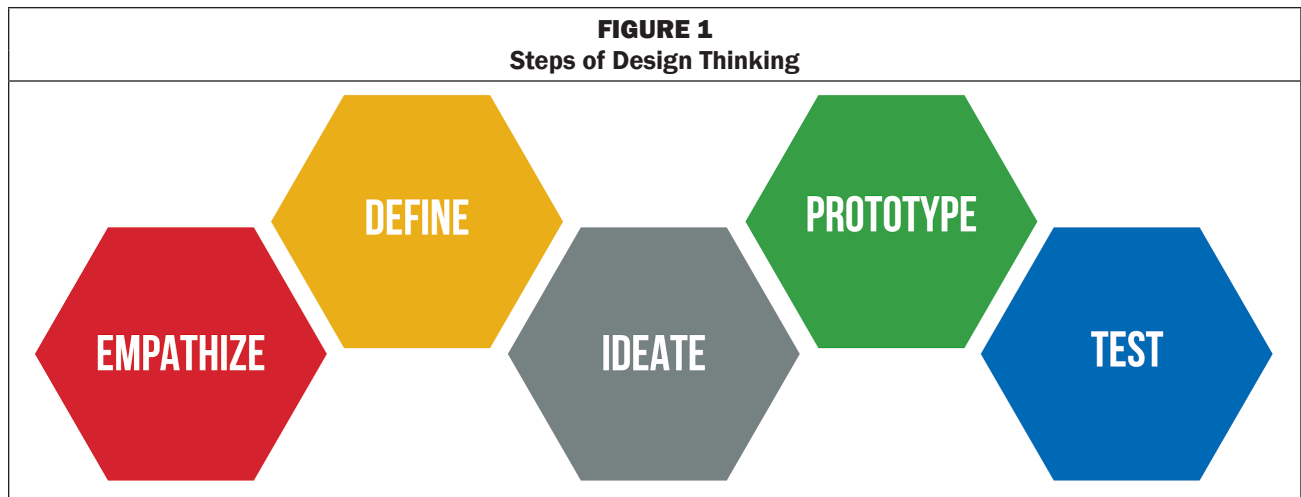
Design-oriented businesses have been some of the strongest adopters and proponents of design thinking, in particular companies like the successful product-design firm IDEO, which partnered with Apple to create its first computer mouse.[8] The popularity of these innovative companies inspired a new wave of businesses to step away from their traditional approach of pushing product to customers and replace it with empathetic practices that provided deeper insights of customer needs.[9]

Design thinking may be more recognizable in the business and entrepreneurial sector as a way of creating consumer products, but it is becoming more common to see it applied to solving complex, real-world problems.[10] Bell has been a key figure in bringing design thinking into library practices, arguing this process for innovation and problem solving can help librarians adapt services and spaces to establish relevance for evolving patron needs.[11] Bell particularly emphasized the need for librarians to fully understand their users before developing solutions and implementing changes.[12] Meier and Miller suggest design thinking is more than a process, but also a toolkit with multiple strategies (e.g., interviewing, brainstorming) that can be applied to situations where they best fit.[13] Meier and Miller especially value the idea of using rapid prototyping as a way to test possible solutions to "[fail] early to succeed sooner."[14]

Through a funded project, and working alongside librarians worldwide, IDEO helped create an online design thinking toolkit for libraries.[15] The toolkit teaches the steps of design thinking, provides activities and worksheets to practice using the steps, offers examples (e.g., video narratives), and overall provides easy-to-use resources for any librarian wanting to learn more about design thinking and how it can be implemented to benefit libraries. Many public libraries have reported using design thinking processes to implement changes in areas such as patron services.[16] Specifically looking at published research connecting design thinking and academic libraries, research shows this method being used to improve student orientations,[17] develop better workflows[18] and create or remodel spaces,[19] to name a few applications.

As these highlighted cases illustrate, research in this area has largely focused on how librarians can utilize design thinking to implement changes in services or spaces. Mirroring the trend in undergraduate education, some librarians argue that design thinking should be taught as a core skill in library graduate programs.[20] Fewer studies illustrated cases where academic libraries created services or spaces directly dedicated to supporting faculty and students who were using design thinking, although the makerspace movement[21] and implementation of various collaborative spaces[22] is certainly connected. Rarely, if ever, were these spaces described as places where a semester-long courses using design thinking were taught. At BYU, where design thinking courses and their

popularity led to a formalized minor, it became important to determine how we were or could support this kind of learning process with our services and spaces. With evidence that other universities see prioritizing interdisciplinary, collaborative learning environments as a priority,[23] articulating our discoveries will provide valuable insights to other libraries considering this trend.

Supporting Design Thinking Curriculum

In libraries, we value providing services that support the needs of our patrons. From our experience, design thinking is implemented in various ways. Some faculty using design thinking pedagogy to ask students to engage in the steps of design thinking as a method to solve a problem related to the discipline of the course (e.g., working with a community center to develop interventions to improve literacy). Other faculty literally teach what the design thinking process is and how to implement it (e.g., innovation bootcamp). Still other classes use pieces of design thinking to facilitate their specific area of research (e.g., using empathy to understand and improve aspects of international development). Libraries can support each step of this process in a number of ways, many of which may already exist and just require a bit of marketing for faculty and students to see the connections to this course framework.

Although research showing that academic libraries directly support design thinking is sparse, academic libraries certainly provide services and spaces that foster skills involved in design thinking such as teamwork, iteration, and innovation. See Figure 2, which we created to visualize the many ways that common academic library spaces, services, and people map to and intersect with the design thinking.

FIGURE 2
How Libraries can Support Design Thinking Curricula
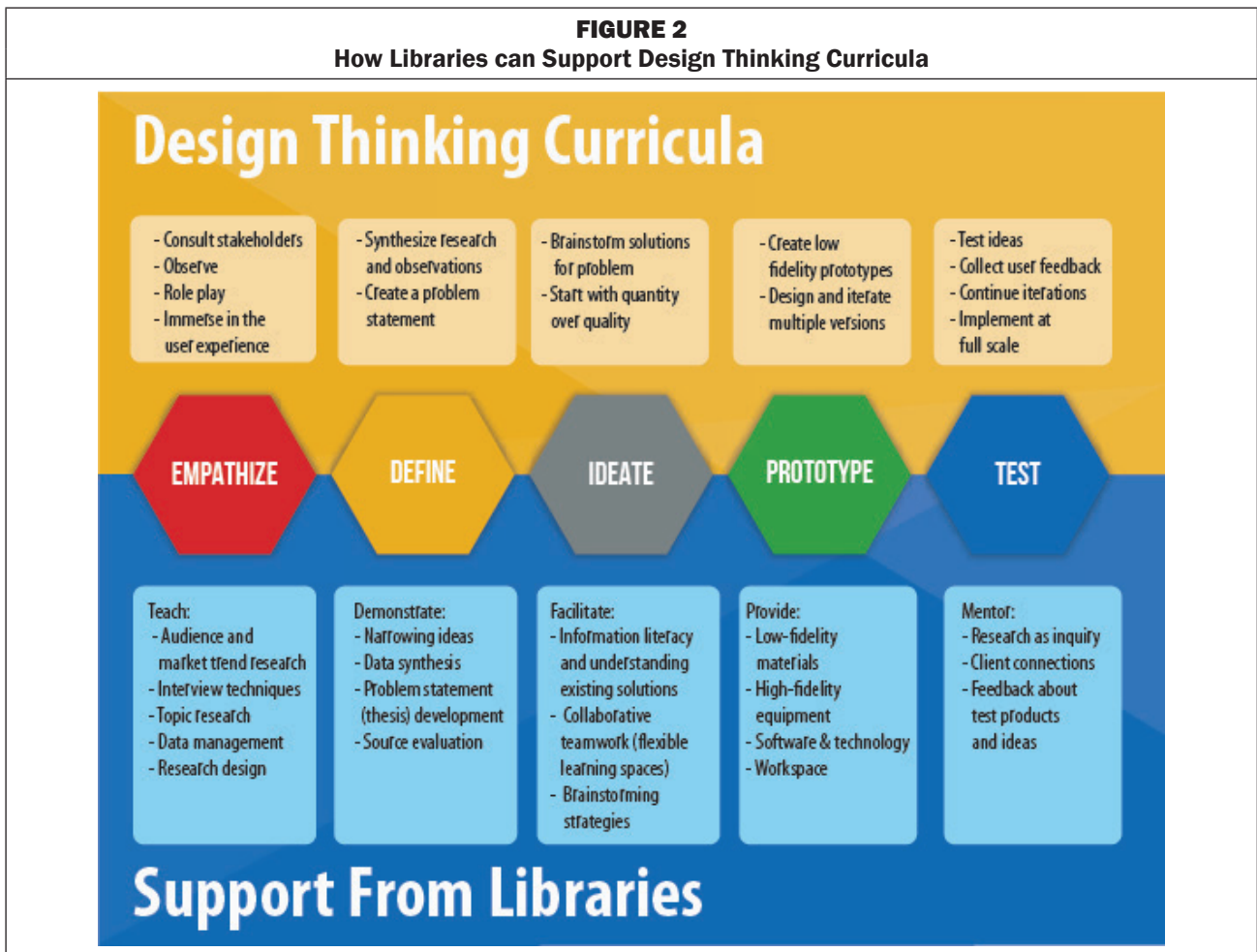
One prominent example of this is makerspaces. Makerspaces can provide a variety of services and tools, ranging from high fidelity (e.g., 3D printing) to low fidelity (e.g., basic craft supplies). Makerspaces map to the prototyping phase of design thinking, allowing patrons to create elements of solutions in sophisticated or quick ways depending on where they are in the iteration process.

Media centers are another common service in academic libraries. These too support parts of the design thinking process. Specialized software, video production studios, and sound booths can help in prototyping (e.g., building apps). Equipment checkouts can be used in the empathy phase (e.g, using GoPros to understand user experiences). Staff and student employees who provide training in any media-related tools or equipment can help students develop skills to apply in their design thinking course and later in job settings.

Subject librarians are an important asset for students engaging in any kind of research or project-based learning. They provide information literacy training, helping students recognize that innovation and iteration should be built on prior knowledge and research. Librarians can also act as mentors, guiding students through design thinking phases (e.g., as a sounding board for a product pitch), and as consultants, making sure faculty and students know what library resources are available that will meet specific course needs.

Students engaging in design thinking are usually deeply collaborating through teamwork. Students can utilize group study rooms or existing flexible meeting spaces in the library to work on projects outside of class time. These spaces may be used for ideation discussions, presentation practice, video conferencing, client meetings, and so forth.

Design Classroom: Rationale, Processes, and Management
Rationale for a Design Classroom

Despite our ability to identify many existing services, spaces, and people within the BYU Library that already supported design thinking, in 2014 campus faculty and library administrators suggested that the library might be an ideal place to actually teach these kinds of courses. Among these advocates was an informal group of campus faculty—the Collaboration, Innovation, and Design (CID) Faculty Group—who had been meeting a few times each semester since 2012 to consider how to integrate design thinking and creativity with campus curricula. They argued that by attending class in the library setting, students could connect with these many other services and resources within a class period, not just afterward on their own time. Additionally, the argument of the library as a neutral space was put forth, suggesting that because design thinking courses often draw students from many majors, attending class in territory unclaimed by a specific major might better foster a collaborative environment.

This idea applies to one of BYU Library's strategic initiatives to provide spaces "that facilitate collaboration, experimentation, creation, and discovery."[24] However, when creating new spaces or services, we try to identify things that are not globally available to campus. For example, some colleges on campus have their own 3-D printers, but only give access to certain majors. Thus, the library felt justified investing in 3-D printers that would be accessible to all students. Several collaborative learning spaces exist across campus,[25] but these are typically housed within a specific department or college and use is prioritized for specific types of projects and/or groups. Given the growing interest in design thinking on campus and the interdisciplinary nature of these courses, BYU Library administrators decided to pilot a space in the library that could be used for these courses.

Ultimately called the Creativity, Innovation, and Design (CID) Studio, this 1,300+ square foot collaborative classroom provides a non-exclusive space that can fill gaps for faculty and students who need a place for project-based, collaborative learning that does not fit within other exclusive spaces elsewhere on campus (e.g., the Computer Science Collaboration Lab).[26] It also acts as an incubator space where faculty can explore new ways of teaching they might not otherwise try in traditional classrooms. Although the space itself does not house specialized equipment, it sits in close proximity to other places in the library that do have specialized tools. It

provides a flexible learning space that can be used in creative ways with accessible technology and low fidelity prototyping supplies.

The main classroom seats 25-30 students and is walled off from neighboring collections by temporary dividers. Whiteboards line the interior walls, which also have space for posting prototypes or design boards. The Studio includes three breakout rooms that allow for groups of up to eight students.

Library administration and the CID Faculty Group, serving as an ad hoc advisory committee, developed initial guidelines for courses taught in the CID Studio:

1. Courses and projects in the Studio needed to be interdisciplinary, preferably with faculty from separate departments and colleges co-teaching and with students from multiple departments participating.
2. The courses needed to be design focused, teaching a process for engaging in creative thinking and problem solving.
3. These courses needed to be taught differently than traditional university courses by emphasizing messy, project-oriented mentoring instead of presentation lecturing.
4. The courses needed to engage the library as a full partner, utilizing library resources and personnel, even possibly as co-teachers and course designers.[27]
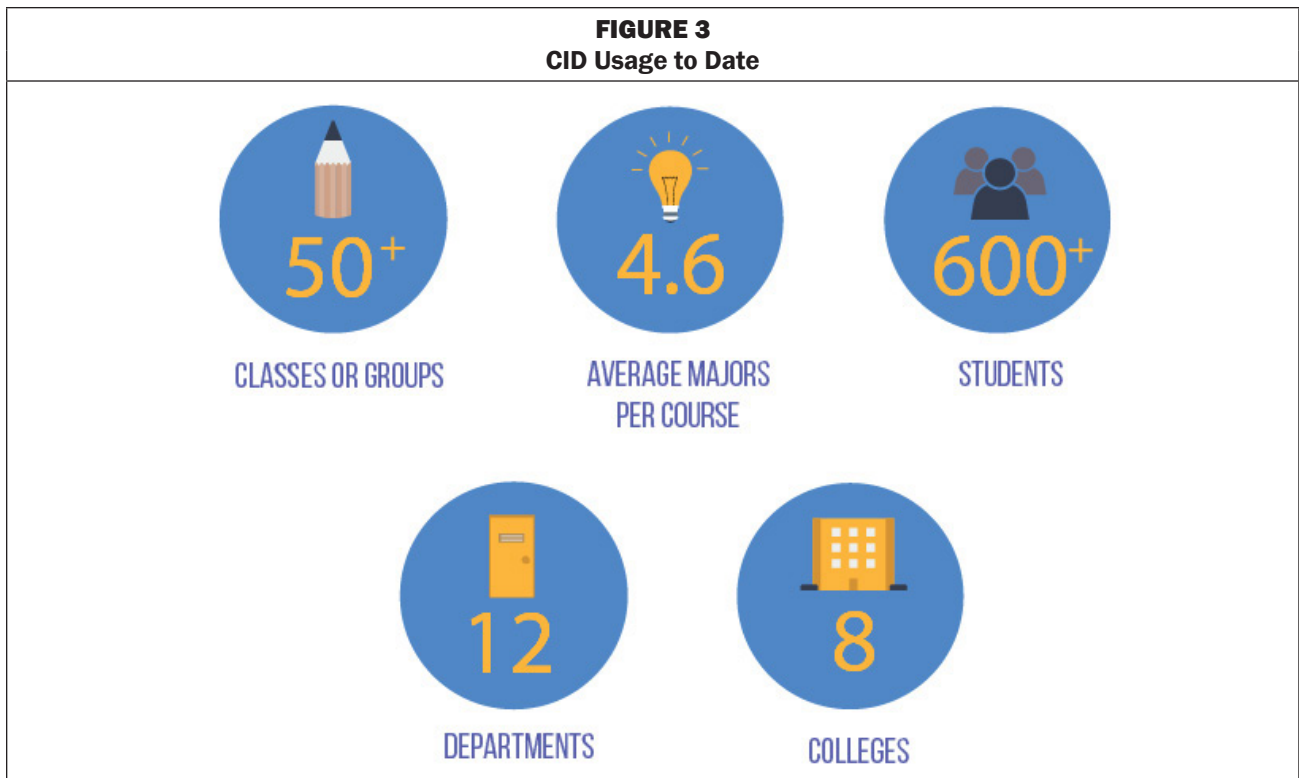
Courses that focused exclusively on design thinking and projects with social impact were primarily scheduled in the classroom. More recently, the steering committee has moved toward bringing in courses with additional innovative teaching approaches, with or without social impact as the main focus.

The first course taught in the Studio, starting in February 2014, was Fine Arts 301, Creativity and Collaboration in the Arts and Communications. This course had a track record of successfully applying design thinking principles to solve a social problem. The remainder of the first year, ten classes and five additional workshops or projects were taught in the Studio. These classes were sponsored by Business Management, Information Technology, Instructional Psychology and Technology, Fine Arts, Physiology and Developmental Biology, and Recreation Management (now Experience Design).

Surveys of students taking classes in the Studio the first year of the pilot revealed a mix of experiences. Participants "felt responsibility for [their] portion of [the project] and for making it as good as possible" (with a mean score of 4.45 out of 5, with 5 being "strongly agree") and that they "learned new things unrelated to [their] previous areas of expertise and interest (4.2 out of 5).[28] Lower ratings were given to the statements: "I felt like everyone in the group was on equal footing and authority" (3.37), "In this experience, I learned in part by critiquing the work of others" (3.73), and "Prototyping helped us make the project more creative and of higher quality" (3.88).[29] Lower scores might be attributed to how instructors approached their classes—not all classes relied on prototyping or might not have included peer review. As assessments continue, it will be important to ask these questions again to gauge improvement.

After the pilot year, the library and the CID Faculty Group sought support from university administration to improve and possibly expand the CID Studio. But before committing to expanded spaces, university administration suggested focusing first on curriculum development and cross-listing creativity and design thinking courses. The CID Faculty Group began to formalize interdisciplinary courses on campus through new, cross-listed classes, eventually leading to the minor in design thinking available to students as of Fall 2018. During this phase of curriculum development, the library focused on improving management of the space and collaboration between campus faculty and library faculty.

In the five years since the pilot courses were taught in the CID Studio, more than 600 students have participated in fifty classes or group projects. Courses have been sponsored by twelve departments from eight colleges. Two years after initially requesting an expansion, the steering committee successfully gained university approval in April 2017 to expand the Studio from 1,300 square feet to 2,300 square feet if funding could be identified.

FIGURE 3
CID Usage to Date

50+ CLASSES OR GROUPS

4.6 AVERAGE MAJORS PER COURSE

600+ STUDENTS

12 DEPARTMENTS

8 COLLEGES

Processes & Management
Steering Committee

While the CID Faculty Group served as the principal advisory group to library administration in developing the CID Studio, in September 2015, a steering committee with specific oversight of the Studio was formed. The committee included representatives from the CID Faculty Group and two subject librarians new to the Studio initiative. Adding subject librarians expanded the group's view of library collaboration to include research instruction, media and makerspace technology, and information literacy. The committee also began regularly identifying goals to support the continued growth of the Studio: holding consistent application deadlines, evaluating applications against a rubric, centralizing data collection, and encouraging contact between campus faculty and the library earlier. Developing an organizational infrastructure that was tied more closely to library Public Services benefitted the Studio through more consistent communication within the steering committee about library resources and processes.

In 2018, the steering committee began discussions about a committee charge that would formalize the objectives for the Studio and establish guidelines for future rotation of committee membership and leadership. Initially, discussion about the committee charge centered on the CID Studio as a space specifically for design thinking courses. However, to reflect emerging university goals to provide substantial experiential learning opportunities for all students, the charge was expanded to note this campus imperative:

> The Creativity, Innovation, and Design (CID) Studio is [a collaborative space designed] to support experiential learning within the library. The goal of the CID Studio is to provide an environment for students across all majors and backgrounds to collaborate with each other, as well as with faculty, while fostering creative thinking to gain and share knowledge and to solve problems. This goal is fulfilled as the space is used by the library, academic courses, workshops, and student groups in

ways that encourage interdisciplinary collaboration, design thinking, experimentation, and other pedagogies that reflect creativity and innovation.[30]

Managing Space

Since 2014, classroom furniture has improved as adjustable, movable tables and chairs have been surplussed from other areas of the library. Tables and chairs have variable heights to allow for different kinds of project work. Previously, when soliciting feedback from faculty and students, the furniture was often the main area identified as needing improvement. On the technology front, the steering committee partnered with the campus Office of Information Technology to add larger displays and better technology for screen sharing.

The Studio has two main storage areas for prototyping supplies: (1) a repurposed, 60-drawer card catalog with small supplies in each drawer (e.g., pencils, pens, rulers, pipe cleaners, googly eyes); and (2) an adjacent storage closet for larger supplies (e.g., hot glue guns, cutting tools, cardboard). The use of the supplies varies significantly between classes, with some utilizing an extensive amount and others using none. Ground rules have been established to keep the classroom usable for all groups that use it: e.g., furniture should be returned to a defined configuration at the end of each period, white boards that are not dedicated to specific classes can be erased at any time, and library books used in the space need to be checked out to patrons.

A significant improvement in managing the Studio came when the steering committee, the associate university librarian for public services, and the instructional design librarian worked together to modify a permanent part-time library position to add a few responsibilities in support of the CID Studio. This position, which is primarily responsible for designing and creating online tutorials, now includes additional responsibilities to manage Studio logistics, scheduling, and the application process to teach in the Studio (up to 35% of 28 hours each week). A new incumbent for this position, the Innovation and Online Learning Assistant, was hired in September 2017.

Managing Classes and Library Integration

Each semester, between three and six classes are scheduled in the Studio, in addition to club meetings and other group projects. Initially, class proposals were evaluated based on their interdisciplinary nature, integration of design thinking teaching methodologies, social innovation, and integration of library instruction and resources. In early 2016, the steering committee developed an evaluation rubric, with each member scoring proposals on interdisciplinarity, design thinking, social impact, and library integration. Over time, the specific focus on social innovation has become less important, while working with individual applicants to improve library integration has continued.

Originally, when applying to teach in the space, faculty tended to estimate rather than seek direct input on how they would integrate librarians. This often translated to minimal contact even after applications were approved. To encourage more collaboration, the steering committee started alerting subject librarians about upcoming classes scheduled for the space. We also hosted lunches in small and large groups of faculty and librarians to initiate brainstorming about how library integration could occur and why it would support student success.

Examples of librarian integration include the education librarian coming into a course multiple times to help students writing and illustrating children's storybooks, the assessment librarian partnering with multiple courses to team teach or consult students as they conducted assessments of library services, and the psychology librarian working with an innovation bootcamp, first as a participant in the course, and then as one of the judges of group projects.

Library Assessment

The assessment librarian conducted an evaluation of student experiences in the CID Studio for one academic year in 2014-2015. The evaluation used interviews, observations, and surveys. Results were shared with library administration and managers in June 2015, and published in 2018 by Zaugg and Warr. Additional informal assessments have been conducted intermittently. Students like working with classmates from other disciplines, working together to solve a problem (in some cases with real clients), hands-on educational experience, and dedicated space to display and work on their projects. Students sometimes missed the structure of traditional classes, and learning how to make group decisions was challenging.[31] Faculty who teach regularly in the Studio appreciate the flexible furniture, break-out rooms, and a space where students can return throughout the week to work together. Because the Studio can only accommodate 30 students, some faculty have sought other classrooms on campus with larger capacity.

In 2018, a graduate course conducted focus groups and interviews with librarians to learn more about their experiences working with students and faculty in the Studio. This was the first assessment of librarian perceptions about the success of library integration. Ten librarians participated in focus groups and one librarian was interviewed. Two campus faculty were also interviewed about librarian integration. Generally, librarians who had worked directly with Studio classes had a positive view of the Studio's potential. Still, some noted that their skills were underutilized by campus faculty and that earlier communication with the class instructor would help. Librarians who had not worked with classes in the Studio had a more negative view of its potential overall.[32]

Challenges, Benefits, and Looking to the Future
Challenges

Common challenges in developing and organizing the Studio have come down to relationships and communication. Keeping faculty generally apprised of all of the library's established, new, and evolving services and resources is difficult.[33] In addition to information access and information literacy, libraries provide support for open access publishing, negotiating publication agreements, measuring scholarly impact, data management, open educational resources, and digital humanities. Add to these a new Studio that requires adjusting teaching methods, and it is understandable why faculty colleagues with substantially different roles in the academic community do not fully understand how to build in library integration. Similarly, librarians are not as attuned to the deadlines for course development. Sometimes, faculty preparation for a class occurs shortly before the semester begins, making it difficult to plan new or enhanced approaches to integrating library research activities, let alone team teaching. At one point, the steering committee discussed seeking funding for faculty grants to incentivize course planning for the Studio, with an emphasis on library integration, but has not taken action. The library has already taken this approach to improve the adoption of open educational resources and it could be a successful model to support course design for the Studio.

Other challenges stem from working with a variety of stakeholders with different views of success. For teaching faculty interested in piloting studio-based pedagogy, the CID Studio has been a success in terms of student engagement and faculty development.[34] For librarians seeking library integration beyond hosting classroom space or a one-shot instruction session, success is still in the making.

Record keeping and data collection has also impacted the steering committee. A formal steering committee was not established until Fall 2015, and staff support not available until Fall 2017. While the steering committee has always focused on how to improve and support the Studio, over the years, the responsibility of record-keeping has shifted between committee members, resulting in inconsistent data. Much of the committee communication became siloed in emails rather than codified in shared meeting minutes. Additionally, the committee

inadvertently fell outside lines of direct and consistent reporting to library leadership, which impacted the ability for the committee to push forward at various junctures. For example, a formal budget has yet to be established for the CID Studio, which has meant that supplies and various equipment have been purchased through committee member's department budgets.

Relating to budget, a final challenge has been a lack of resources to expand, staff, and remodel. Early in the pilot, we learned that faculty thought the space was too small. Five years later, we have secured funding for an expansion and other improvements. Before the Innovation and Online Learning Assistant was hired, no on-site support was available, making it difficult to respond to technology issues and maintain the classroom on a day-to-day basis. Additionally, although the space has valued breakout rooms, they are located at the back of the Studio and various students continue to use them even when other courses are in session, creating a distraction.

Benefits

Practical benefits of the CID Studio include evaluations conducted by resident classes that have evaluated library resources. One class focused on designing a new library carrel that was sturdier and more functional than existing carrels. The result was a carrel with lighting, a whiteboard, and footrest. These new carrels were put into production on campus and were installed starting in 2016. In fall 2018, a graduate course in Instructional Psychology and Technology evaluated librarian perceptions of the CID Studio, and an undergraduate class from the Design Thinking minor evaluated new seating and furniture configurations in three areas of the library.

Students benefit from new experiences in the library; the Studio has hosted a wide variety of courses that have given students real-world learning experiences. An international development course focused on documenting international truth commissions then used design thinking to recommend future restructuring of commissions to better support victims. Multiple students from the project have published articles and one student recently presented at an international conference in Ireland with the professor. An urban studies course partnered with local city officials to contribute to a new city plan as well as promotion of a new public transportation system. Another project brought together game design, education, and science majors to create an augmented reality game teaching middle schoolers basic science. These experience-driven, design-driven courses enhance students' relationships to the library beyond a place to study or find research materials. Students develop a comfort level with an innovation mindset and the "rise of new forms of interdisciplinary studies" recognized in the 2018 Higher Education Edition of the *Horizon Report* as a trend expected to impact universities over the next five years or more.[35]

Subject librarians and teaching faculty also benefit from "new forms of interdisciplinary study" by seizing opportunities for teaching, mentoring, and research collaboration. Additionally, librarians have a chance to work with disciplines that might not typically seek library help.

Future

Up to this point, the CID Studio has continued as a pilot initiative. The space itself has been temporary in nature, as the exterior wall could easily be removed and the internal breakout rooms could return to group study rooms. However, funds have been secured to remodel the space in 2019, expanding the footprint from 1,300 square feet to 2,300 square feet. The remodel will fully enclose the space with windowed walls. This will help with noise containment, so that students studying outside the space will not be as affected by noise levels that naturally occur in a collaborative learning environment. A portion of the space will be dedicated to a low fidelity makerspace area and storage of projects and whiteboards. The main teaching area will include multiple screens and flexible tables configured to seat up to nine groups of six people. This means that courses up to fifty or fifty-five students will be able to apply to use the Studio, a recurring request from faculty. The plans also include three breakout rooms,

two that will seat up to six, and one that will seat up to twelve. These breakout rooms will have an entry point from inside and outside the Studio, making it possible for students to access these coveted spaces even when a course is in session in the main teaching area. Additionally, plans have been set in motion to move the high fidelity makerspace, currently located on another floor, to a nearby space on the same floor as the CID Studio.

As the remodel creates a more permanent area in the library, the steering committee should pursue additional goals to improve the administration and services of the space. Zaugg and Warr recently made recommendations as well, which we synthesize into our own.[36] Beyond improving the space, the future of the CID Studio will depend on formalizing and streamlining communication, decision-making, and administrative processes. More work is needed to establish consistent timelines, patterns of record keeping, and ongoing assessments. Increased marketing is needed to attract faculty teaching courses using other experiential or innovative teaching pedagogies, besides design thinking, per the newly expanded CID Studio Charge. This will increase usage of the Studio overall and show that the library is more fully aligned with the broader experiential learning initiative on BYU's campus. The success of the Studio will be more likely as its purpose is anchored to established library and campus strategic initiatives,[37] not just observed trends.

However, it is critical that librarians and teaching faculty work together to establish shared markers of success, so that all partners in this projects are working toward common goals. Teaching faculty may define success as having an amazing space to teach located in the heart of campus. Librarians may define success by utilization of other library resources (e.g., collocated makerspace and media center, databases, collections) and level of their integration into Studio courses (e.g., team teaching and mentoring valued above simple one-shot instruction). Library administration may be seeing another definition of success. Future work is needed to determine how different stakeholders define success and then create a synthesized understanding so that more specific goals can be set with clear benchmarks to be assessed over time. Creating a shared understanding will provide a foundation that teaching faculty and library faculty can build on to pursue innovative methods of library-course integration. Overall, we expect that by remodeling the space and improving processes and communication, we will see increased use of the space and will be able to observe measures of success that will communicate the value of the CID Studio to students, librarians, teachers, and administrators.

Conclusion

Although it is an important part of remaining relevant and meeting academic trends, developing new spaces and services in libraries is a challenging endeavor. People and systems that may not normally interface come together in complex ways. In the case of the CID Studio in the BYU Library, the people involved included library administration, subject librarians, library facilities staff, library and campus technology groups, teaching faculty, the ad hoc CID faculty group, and university administration. Systems involved included library instruction, marketing, scheduling, supplies, and circulation, to name a few. The process for creating and improving the CID Studio has been an organic process, but would have benefitted from a more solid groundwork. Greater shared understanding between stakeholders would have helped provide clearer goals and benchmarks throughout. When libraries are investing significant resources and money, the process needs to shift from informal, ad hoc actions to clear, formalized communication and decision-making structures. Despite the challenges faced, the CID Studio stands as a unique example of how libraries can support both specific needs (i.e., interdisciplinary teaching using design thinking) and broad initiatives (i.e., experiential learning). Students and faculty and librarians who have been deeply involved in using the CID Studio have been positively impacted. Students especially are more prepared to enter the workforce with a diverse set of skills that will allow them to engage creatively and collaboratively with colleagues as they solve the complex issues of our time.

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