ISTL Issues in Science and Technology Librarianship

Tips from the Experts

Engineering the Future of Outreach

Emily Dommermuth
Science & Engineering Librarian
University of Colorado Boulder
Emily.Dommermuth@colorado.edu

Megan E. Welsh
Interdisciplinary Arts & Humanities Librarian
University of Colorado Boulder
Megan.Welsh@colorado.edu

Introduction

While academic libraries strive to meaningfully engage their campus communities, it can be hard to imagine new and creative outreach strategies. InfoMotion, a customized tricycle, is the University of Colorado Boulder Libraries' "vehicle" to meet patrons where they are and embed ourselves in the campus community (Figure 1). InfoMotion was mobile and eye-catching, but it was cumbersome as we navigated campus pathways. The authors discuss their institutional context and describe an impactful partnership with engineering students to design an electric-assist system for InfoMotion. This collaboration resulted in a more user-friendly way for Libraries personnel to engage with the campus community, and helped the authors learn about student information needs while building relationships with engineering faculty and students.

Figure 1: InfoMotion posed in front of Norlin Library at the University of Colorado Boulder. Photo by Casey A. Cass/University of Colorado

Institutional Setting

The University of Colorado Boulder (CU Boulder) is a public, research university with just over 35,000 undergraduate and graduate students (CU Boulder fall enrollment 2020). CU Boulder is also geographically large, with a main campus of approximately 313 acres (Campus setting [date unknown]). When CU Boulder outgrew Main Campus, the 201-acre East Campus was developed a mile east (Campus setting [date unknown]).

CU Boulder is in the city of Boulder, Colorado, located in the foothills of the Rocky Mountains. Boulder is a hilly city, but the hills do not stop residents and students from biking, so much so that Boulder was named a "Best Place for Bikes" (2019 City ratings 2019). CU Boulder further encourages biking as an environmentally-friendly mode of transportation, noting that over 7,000 students and staff bike to campus on nice weather days (Bike [date unknown]). Biking on campus is supported with repair stations, plentiful bike storage, affordable bike rentals, a bike sharing program, and bike lanes and pathways around campus (Bicycle program and updates [date unknown]). The use of a bike for library outreach fits well with the bike culture in Boulder and on campus.

There are 150 fields of study at CU Boulder, with engineering being a strong focus, as the College of Engineering and Applied Sciences (CEAS) is ranked 17 of public universities for engineering (CU Engineering continues rise 2019). CEAS has over 15 majors and a student enrollment of just over 7,000 students (CU Boulder spring enrollment 2020), making engineering students approximately 20% of the student body at CU Boulder. The college has a strong focus on entrepreneurship, industry partnerships, and solving real world problems, with 91% of engineering students employed, serving in the military, or attending graduate school within six months of graduation (CU Engineering [date unknown]).

CU Boulder University Libraries facilitates access to vast electronic collections, and provides access to physical collections and study spaces across one main and four branch libraries. All Libraries branches are located on Main Campus; however, librarians have relationships with employees and students on East Campus, including a space to allow for delivery and return of Libraries' materials on East Campus. University Libraries uses a liaison model, where librarians work closely with their assigned departments to understand and support the library and research needs related to specific subjects.

Project Context

In 2017, drawing on the campus and city bike culture, the University Libraries worked with fabrication company, Pedal Positive, to create a custom library tricycle. Libraries faculty and staff used the tricycle, named InfoMotion, to meet patrons where they are: by connecting with the CU community around Main Campus, and with plans to engage patrons on East Campus and in the city of Boulder. Interdisciplinary Arts & Humanities Librarian Megan Welsh, who originally conceived of and obtained funding for InfoMotion, currently oversees its use for outreach programming.

The custom-built tricycle successfully traveled around Main Campus for a number of outreach events from summer 2017 through spring 2019. These included distributing government information prior to the election in November 2018, and handing out popsicles and information about the Libraries during New Student Welcome. Soon after its deployment, those riding InfoMotion discovered that it was difficult to ride for long distances, especially up the slightest incline. Riders realized it was impossible to go to East Campus or downtown Boulder. The

difficulty in riding InfoMotion was attributed to the fact it is a tricycle rather than a bicycle, and to its weight. Given the robust engineering programs on campus, Welsh wondered if it would be possible to partner with engineering students who could install electric-assist to make it easier to ride InfoMotion. Science & Engineering Librarian Emily Dommermuth identified the Design for Community Class as the perfect avenue for engineering students to plan and install electric-assist for InfoMotion.

Design for Community (D4C) is a CEAS class that gathers project ideas from the CU Boulder and surrounding community. Engineering students then turn the problem, project, or proposal into a solution or product through an in-depth process that includes designing, testing, refining, and developing. The class supports students in applying their engineering education to real-world problems, and helps them move from education to industry. Welsh and Dommermuth submitted electric-assist for InfoMotion as a potential project to the class, and the Libraries were accepted as a client. Through an internal grant process, the University Libraries awarded $3,000 for materials to fund the electric-assist solutions that the students designed.

Goals & Requirements

The Libraries' requirements for implementing electric-assist included the ability for InfoMotion to travel to East Campus and downtown Boulder, the desire for a low-maintenance system, and the budget of $3,000. As clients to the D4C students, Welsh and Dommermuth hoped to gain a new perspective on the engineering design process, and learn more about engineering student information needs during design.

Project Implementation

A group of five fourth-year mechanical engineering students were assigned to this project, and began meeting with Welsh and Dommermuth in February of 2019. The group worked on the project for the remainder of the spring 2019 semester, and as they did not have time to implement their design, they produced a report of their work. The report detailed all the factors they considered, all the information they had gathered, and their recommendation for an electric-assist system that would meet Libraries' needs.

In fall 2019, the D4C instructor assigned the project to two new fourth-year mechanical engineering students who picked up where the first group left off. They worked to verify the solution identified by the first team and to install electric-assist for InfoMotion. Unfortunately, after ordering the system recommended by the original five students, they learned it would not fit on InfoMotion. They identified and then installed a new solution that met the design constraints. In December 2019, InfoMotion had a functioning electric-assist system that met the requirements and preferences of the Libraries.

InfoMotion Outcomes

The second group of students, who worked on the project in fall 2019, finished installing the second electric-assist solution they had identified. The system worked well, and was easy to use. Riding InfoMotion was comfortable and simple, and Welsh and Dommermuth felt that the students had delivered a system that met their criteria and needs (Figure 2). The students indicated that the project had been an excellent learning experience. Their most important takeaway had been to "trust, but verify everything". The students had double-checked the conclusions of the group that had started the project, but had not re-measured InfoMotion. They

ensured the motor would fit the measurements the first group reported, but the measurements were incorrect, so the first system did not fit.

Figure 2: Megan Welsh riding InfoMotion with the electric-assist system for the first time. Photo by Claire Woodcock/University of Colorado Boulder

Information Seeking & Sources

Pre-searching & Client Engagement

As the project began in spring 2019, Welsh and Dommermuth set up a meeting with the first group of students and shared pictures and information about InfoMotion, the budget, and the requirements with students. The students came to this meeting with information they had already retrieved and questions they had already considered. For example, they had researched local laws and standards related to speed and horsepower for a bike, and they also had questions about the experience of riding InfoMotion. Welsh and Dommermuth were impressed that they had already started seeking outside sources of information to inform their design process. One early project meeting included a chance for students to see and to ride InfoMotion. They asked questions about the Libraries' use of the vehicle and the experience riding it, and they brainstormed information they would need to seek out and calculate, such as InfoMotion's weight, and information about the shapes, sizes, and functions of different parts. They also gathered information about how InfoMotion works by observing it in motion, highlighting the importance of first-hand observation as an information source for engineers working on design.

Types of Sources

The students researched standards relevant to their project, including testing efficiency and health and safety. When asked how they identified the necessary standards, students were hesitant to answer, but indicated that they just Googled the needed information, and were successful. Other information sources helped the students benchmark their project with existing

products. They began “poking around websites” of companies that provide different electric-assist bike products and asked Welsh and Dommermuth about other library bikes and trikes.

Additionally, students explored numerical data to inform their design. One parameter for the project was the ideal temperature at which the battery powering the electric-assist mechanism could function. Students found climate data from government sources to provide an appropriate temperature range for effective battery function. The students also researched the grade of the routes on which Welsh and Dommermuth described wanting to travel. The road grade information was needed for calculations of how much torque would be required from the electric-assist system. Google Maps provided students with the grade of streets around the campus, and students identified the steepest grade to use in their calculation (Figure 3).

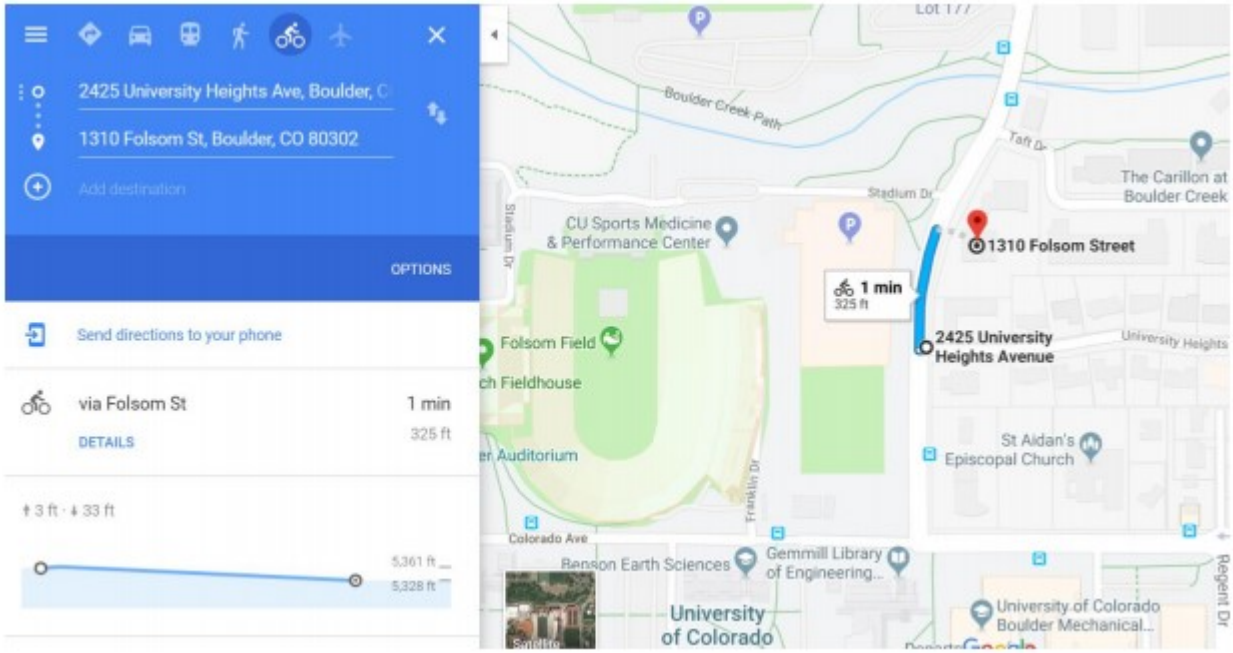

Figure 3: Route and road grade information from the student report

Students recognized that expert people are an important source of information. Acknowledging the expertise of an individual aligns with research findings about information use patterns of professional engineers, which rank people as a top source of information sought out and used by practicing engineers (Tenopir & King 2004; Allard et al. 2009). Students in fall 2019, tasked with installing the electric-assist technology, sought the support of experts as a source of information when the first electric-assist system did not fit. They met with their teaching assistant and professor to show these experts the problem to ensure their finding that the motor could not be made to fit was correct, to brainstorm possible solutions, and to consider new constraints such as a reduced timeline and reduced budget that needed to be factored into a new solution.

Instruction & Outreach Takeaways

Enhanced Understanding of Engineering Information Needs

Engagement with student learning through the library-as-client model was an important outcome of this project. Welsh and Dommermuth learned a lot about how engineering students searched

for and evaluated information, in addition to learning about the various kinds of information they needed.

To complete this project, students needed standards and legal information, and while they successfully found them, they were uncertain of their search strategy. Noticing this lack of confidence, Welsh and Dommermuth believe information literacy instruction with future engineering classes could help students understand how standards are created, and the strategies they can use to find them. Such instruction will help students be more certain of their search for and use of appropriate standards. Similarly, instruction can help students learn about finding legal information relevant to engineers.

To find information about existing electric-assist products, an important part of the design process, the students looked at websites of existing products. These websites represented companies offering information which is biased positively toward the product. Information literacy instruction could encourage students to seek out a greater variety of sources - including patents, reviews, trade publications, and standards or research articles about testing products and solutions - which could help students critically evaluate existing solutions.

Students' existing information ecosystems include valuable information sources and research strategies that information literacy instruction can incorporate and strengthen. For example, Welsh and Dommermuth learned of the road grade feature in Google Maps from the students. Information literacy instruction experts have a lot to share with students, but students have experience to share with instructors as well. Instruction should encourage students to transfer their existing information literacy skills to new sources, disciplines, and contexts. One such pre-existing information literacy skill that students demonstrated was turning to expert professionals as a source of information, and so information literacy instruction should continue to build on this skill.

Collaborating on Project-Based Learning

Working with the D4C class as a client resulted in a positive outcome for the Libraries in the form of a more user-friendly InfoMotion, while providing a problem-based learning experience to students. The Libraries participated in similar problem-based learning experiences in other classes outside of engineering, where they were the client for students conducting user experience research. In these classes, students gathered feedback from their peers on areas where the Libraries wanted to improve services, and provided written reports with findings and recommendations to the Libraries. These past projects as well as this partnership with D4C reinforce the benefits of students engaging in problem-based learning and learning about the Libraries, while also improving Libraries services with a high level of student input. Being a client for student projects is a valuable way for the Libraries to engage with students and contribute to learning on campus.

Engaging with the Campus Community

Installing electric-assist for InfoMotion increased the range of InfoMotion, allowing librarians to take the vehicle to their desired outreach locations. Future InfoMotion outreach activities will include extending the reach of past successful programs, such as providing popsicles during New Student Welcome and distributing election information from the Government Information Library, as well as developing new programming, such as representing the Libraries in a homecoming parade in downtown Boulder. The authors are especially interested in developing

plans to ride InfoMotion up and down the steep grade to and from East Campus, in order to more fully engage with STEM programs there.

Conclusion

Partnerships with students, especially centered on problem-based learning, provide an opportunity for librarians to learn about student research processes and information needs firsthand. Focused on InfoMotion, Welsh and Dommermuth engaged with upper division engineering students as they prepared for their professional lives outside of CU Boulder. Both students and the University Libraries benefited from the experience of working towards the goal of installing electric-assist technology, which will have a lasting impact on the presence of Libraries personnel among students outside of the Libraries' walls.

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