

# Collaborations Across Campus: Examining Pre-Service Teachers' Experiences with a Library STEAM Camp

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## Abstract

As both place and service, academic libraries serve a vital role at the center of the university—as a point of connection and possibility. In this article, we describe the UTA Libraries STEAM Camp, a collaborative project in which pre-service teachers designed hands-on STEAM workshops for campers ages 8-13 held across various spaces in an academic library. In addition, we share lessons learned and adaptations made across multiple iterations of the workshops and how we evaluated the impact of the experience on multiple stakeholders.

**Article Type:** Case study

## Introduction

Over the past decade, many academic libraries have designed makerspaces, sometimes called “FabLabs,” which are spaces that combine technology, craft materials, and tools that spark makers’ creativity as they create both physical and digital artifacts (Dougherty, 2013). There are myriad reasons for bringing makerspaces into the academic library: encouraging creativity, developing critical 21<sup>st</sup> century skills, and building community (Mersand, 2021). As makers explore, discover, and create, academic makerspaces can serve as points of connection and possibility, bringing together people, activities, and new ways of learning.

Established in 2015, the UTA Libraries FabLab offers training, support, and resources to support innovation and entrepreneurship for students,

faculty, and staff. Previous studies have documented the role of the UTA Libraries FabLab in building students’ maker literacies and competencies, such as problem-solving, communication, design thinking, and knowledge sharing (Peery & Chivers, 2021). The FabLab has also presented new opportunities for creating connections with multiple audiences, including community partners and K-12 students.

The UTA Libraries STEAM Camp is a collaborative project in which undergraduate students enrolled in a teacher education program designed and implemented hands-on STEAM workshops for campers ages 8-13. This program has offered the chance to extend the FabLab’s reach to a broader audience. Across two iterations -- held in spring 2023 and spring 2024 -- pre-service teachers worked collaboratively with library staff to learn about the university library’s spaces and resources, including the

FabLab, studios, and archives, and how to utilize these resources in designing experiential learning experiences for children.

In this article, the authors outline how different stakeholders came together to build an innovative experiential learning opportunity for both university and K-12 students. In addition to describing the background and structure of the camp, we detail how pre-service teachers utilized library resources to design experiential workshops and the impact that this experience had on their views of teaching and learning across informal and formal learning spaces. We also share how we made adaptations across multiple camp iterations, evaluated the impact of the experience on K-12 students, and created a sustainable model for connecting our campus and community.

### Literature Review

As interest in academic libraries' implementation of experiential learning opportunities has grown (Kolb, 1984), there is a need for more models of practices and programs to encourage scalability and the development of new activities. Our study is grounded in the idea that experiential learning provides learners of all ages with invaluable opportunities to wonder, explore, and move between abstract and concrete knowledge. Kolb's (1984) model of experiential learning defines learning as "the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experience" (p. 41).

Research has begun to explore how academic libraries can utilize makerspaces and maker services to bring more experiential learning opportunities to their campuses. Nagle argues that there is a "chronological trend towards more student-centered, hands-on, and inclusive spaces" (2021, p. 185) that encourage users to find new and innovative approaches to solving problems that build agency and self-efficacy. These efforts have often included developing spaces for students to make, create, and explore.

In addition to offering new experiential learning offerings, these spaces also create outreach opportunities for a variety of audiences, including K-12 students and the public. For example, Coleman and McGraw (2009) describe the need for academic libraries to develop comprehensive K-12 outreach programs to prepare students for higher education. In reports of other camps held in academic libraries (Baker, 2018; Smith & Marquez, 2021), faculty and librarians have worked to integrate making and maker technology into curriculum as a way of academic libraries to serve as a place of exploration, collaboration, and experimentation with research for youth. For example, Baker (2018) details how providing day camps at the Abilene Christian University makerspace offered unique opportunities for homeschooled students to engage in hands-on, personalized learning. Through the Maker Academy, youth and families were introduced to free and open-access educational resources that supported their learning goals.

While there has been growing interest in how academic libraries can engage with various stakeholders, including academic departments, staff, and the public (Harland et al., 2017; Wynne et al. 2016), there is a need for more specific models for how academic libraries can serve as a nexus for experimentation and learning across the campus and community. This is particularly important in the post-Covid landscape, when there has been some re-centering of the library on campuses. During the Covid-19 pandemic, most instructors and learners took their environments online, and this shift has extended past 2020. Libraries have an enviable opportunity to re-imagine their services and align with campus strategic values and goals. As library administrators conduct space surveys and make plans for remodels, they have been planning for more social engagement events, workshops, and promoting a sense of belonging with the library at its center. These efforts can also include creating or redesigning spaces to be more friendly towards outreach and welcoming to K-12 groups to academic library spaces.

## **UTA Libraries Experiential Learning Initiatives**

UTA Libraries has a demonstrated history of supporting and pioneering experiential learning. The UTA Libraries Fabrication Lab (hereafter referred to as the “Fab Lab”), was created in 2015 and grew from a cluster of 3D printers in the corner of the Central Library into a dynamic, bustling space with a fully outfitted shop room, glass and pottery kilns, sewing and embroidery area, vinyl printers, multiple 3D printers, laser cutters and a screen printing dark room is being built out currently. The FabLab’s strategic placement on the library’s ground floor ensures that all students, faculty, and staff have access to creative technologies, regardless of academic major.

During the COVID-19 pandemic, the Central Library underwent an extensive first floor renovation, intentionally earmarking space and designing for experiential learning initiatives, including a dedicated classroom and studio space with recording studio booths, a soldering/robotics room, and a print design area, collectively known as the Creative Spaces and Studios. This area is divided into three spaces: The FabLab, Studios, and Basement. The FabLab houses machines such as 3D Printers, Laser cutters, embroidery machines, glass kilns, and a shop room. This 8,000 square foot space proved to be an ideal space to host workshops during the day camp. The Studios space holds a robotics room with soldering stations, a motion capture room, and sound studios. Additionally, the library debuted a dedicated gaming basement in spring 2020 that received little use prior to the COVID-19 pandemic but is now a bustling space where many students gather to play and learn. The Basement includes gaming consoles, video games for circulation, group gaming tables, PC gaming, tournaments, workshops, and virtual reality technology.

These updates coincided with the formation of a dedicated Experiential Learning Department. UTA Library’s Experiential Learning Librarians have demonstrated interest and expertise in curriculum development. Additionally, they are

well versed in the creative technologies in the Studios and FabLab spaces and work alongside faculty to integrate the use of these technologies into curriculum. The librarians learn how to use creative technology, spaces, and resources and communicate these opportunities to faculty so faculty can dedicate their efforts to instruction.

## **Experiential Learning Faculty Fellowship Program**

The Experiential Learning Faculty Fellowship (ELFF) was created and funded during the COVID-19 pandemic and the program was implemented when students and faculty began returning to campus in fall 2021. This fellowship opportunity offered faculty a stipend for reconceptualizing and partnering with library staff to fully integrate the library’s experiential learning resources with academic course content. The ELFF program was advertised via various outlets on campus and interested faculty submitted a course syllabus, ideas they may have, and a statement of interest in the program. Use of library technology (FabLab, Gaming Basement and/or Studio Space) was mandatory. This program continues and is unique in its scope and intention.

## **UTA Library STEAM Camp**

The initial STEAM Camp was a result of successful ELFF application; a UTA College of Education faculty member applied to build more experiential learning opportunities into a course taken by pre-service middle school teachers in their junior year. Our collaboration began in October 2022 with a series of meetings to go over the syllabus and the needs of the pre-service teachers. The aim of the course redesign was to provide a comprehensive introduction to the library’s experiential learning resources and to help students engage in experiential learning throughout the semester. As we discussed potential avenues for collaboration, we thought through multiple possibilities, including having the pre-service teachers design artifacts for their future classroom, build conceptual lessons for use in K-12 schools, and conduct research projects on the FabLab.

As library staff discussed our previous experiences with hosting camps and activities for K-12 students, we realized that we had an opportunity to provide pre-service teachers with an authentic learning experience in which they would work with small groups of K-12 learners during an all-day STEAM Camp. One challenge for many of our faculty and staff with young children is the availability of childcare on dates when the university is open but public schools are closed. We decided that hosting a STEAM camp on one of these dates would not only offer a unique opportunity for students to work with youth in an interactive, hands-on environment, but it could also provide a valuable service to the university.

The UTA Libraries STEAM Camp has now been through two iterations that took place in spring 2023 and spring 2024. The 2023 STEAM Camp was the first camp to take place at the UTA Central Library and, in addition to collaboration between the UTA College of Education and the Library, this initiative required cooperation and coordination with the UTA Libraries FabLab, the Library Systems and Technology department, UTA's Compliance Office, and the UTA College of Education's Marketing Department.

All pre-service teachers enrolled in the course visited the library by January 2023. During this first meeting, we introduced the project, provided a tour of library spaces, and engaged in initial brainstorming regarding lesson topics and ideas. In a subsequent class session, the pre-service teachers came to the library to meet with subject matter experts, including FabLab and Studios staff, and present their project ideas. Library staff provided feedback regarding materials, feasibility of timeline, and creative technology recommendations. Additionally, a member of the UTA Libraries Open Projects and Partnerships team met with the class and explained Open Access publishing, copyright dos and don'ts, and how their group lesson plans would be available on the UTA Libraries institutional repository for others to reference and implement (UTA Libraries, 2024).

Once camp dates were planned and organized, the University Compliance Services Department was notified to ensure that the camp would align with the university's Youth Program Policy regarding the care of children. The initial meeting offered a debriefing standard operating procedures and training on how to use CircuiTree, which is a camp management tool required by compliance and is used across campus for any UTA sponsored youth programs where minors are in the "care, custody, and control" of an employee. The "Request to Host" is submitted and sent to the department's administration via the online platform. Allergies and medications are listed by the parents, and the hosts can make decisions on what is served for lunch and snacks. During the registration process, photography agreements were collected to allow us to photograph all camp participants on the day of the camp.

Since these camps involve minors in which the parents leave the children on campus, all the pre-service teachers, staff, and student employees who were scheduled to be around the campers were required to have a background check and complete the UT System Child Protective Training. To keep compliance with UTA policies and procedures, the pre-service teachers were required to go through a volunteer approval.

### **Collecting and Analyzing Data to Evaluate Stakeholders' Experiences**

To measure the success of any library initiative or program, it's essential to collect and reflect upon data from stakeholders' experiences. For this project, we were especially interested in learning how the pre-service teacher candidates utilized library resources to design interdisciplinary experiential learning activities for K-12 learners aged 8-13, as well as how the library STEAM project impacted their long-term perceptions of teaching and learning. After obtaining Institutional Review Board approval, the researchers collected several sources of data created by pre-service teachers, including initial planning documents, lesson plans, instructional artifacts, reflections, and roundtable

presentations after the Library STEAM project concluded. All artifacts were collected in the academic course in which pre-service teachers were enrolled and were submitted through the university's learning management system.

Data was analyzed using grounded theory (Charmaz, 2006), which is an inductive approach to research that focuses on building theories to understand new phenomena. It is most appropriate for researchers who seek to understand how or why a particular event occurred, as is the case in this study. We also collected feedback from the K-12 students who participated in the camp and spoke informally with families about their experiences, which helped to provide valuable information that informed future iterations of the camp experience.

After each camp iteration, we met as a team to discuss ways to improve the experience for all stakeholders. For example, during the 2023 iteration of the camp, when the age range was 8 to 13, some pre-service teachers experienced behavioral issues with some of the oldest and younger campers. The following year, the age range was adjusted to 9 to 12 and campers were arranged into small groups based upon their age, which helped to resolve the behavioral issues. To accommodate the needs of K-12 learners with disabilities, we also had additional staff on hand to provide one-on-one assistance as needed.

### **Leveraging Library Resources**

We found that the expertise of the library staff, and particularly their experience in working with learners of all ages, was crucial to supporting pre-service teachers as they grappled with both ideas for their lessons and ways to make those ideas into a reality. All nine groups reported leveraging the expertise of library staff members in various areas, including the Experiential Learning staff, FabLab staff, Archives support, and the Open Access team. Staff members served in various roles, including advising students on the most effective and efficient ways to use resources, helping to conceptualize

experiential learning experiences, and providing instruction in the use of different library technologies and tools. Pre-service teachers were also asked to design extensions and adaptations for K-12 learners with various needs and those with disabilities; library staff offered invaluable suggestions for making learning experiences engaging and accessible for all camp attendees.

Four of the nine groups chose to utilize FabLab tools and resources, including the expertise of FabLab staff members. For example, one group aimed to help their campers understand wind energy and wind turbines. Initially, the group wanted to have campers design and print a large wind turbine during the STEAM Camp. The FabLab staff helped the group to map out the time needed for printing large-scale models, which helped the group realize that not only would such a task not be possible in the time provided, but it would also mean that the K-12 students would spend most of their time watching the 3D printing without active engagement.

With the support of the FabLab staff, the group of pre-service teachers reimaged their project by printing pieces of smaller turbine models ahead of time to have students construct, build, and interact during the workshop. The staff also helped the group set up a 3D printer for students to visit so that they could see how the parts were constructed in real time. Ultimately, the lesson was successful in helping K-12 students learn about alternative forms of energy, and wind turbines more specifically.

The FabLab and Studios staff also assisted another group that wanted to design a large-scale board game in which K-12 learners assumed the roles of historical figures to answer trivia questions. The Studios team helped the group learn how to print the game board as a large-scale 36" x 48" poster, while the FabLab staff helped the group learn how to use the wood laser cutter to create game pieces designed to look like famous people in history (e.g., Amelia Earhart, Frida Kahlo) (see Figure 1).

The Library Special Collections on the sixth floor also served as critical support for three of the nine groups. For example, one group had a goal

of helping K-12 students grasp the importance of understanding history from multiple perspectives. To develop a fully integrated lesson, they worked with the Archives staff to identify multimodal resources, including diary entries, maps, and charts, that would allow students to analyze an event, synthesize information, and work across disciplines, including history, mathematics, and science.

*Figure 1: Board game and mini-figures designed in UTA Libraries' FabLab*



### Changing Perceptions of Teaching and Learning

In their written reflections, pre-service teachers identified four primary ways that the project changed their understanding of teaching and learning: hands-on experiences with K-12 learners, impact on their views of K-12 teaching and learning, and knowledge of open access publishing initiatives. One of the most common topics was the need to be flexible and adjust teaching as needed.

For example, one of the groups had initially planned a workshop that utilized FabLab resources to help K-12 learners learn about propulsion and energy. As the group tested their workshop, which involved building and racing Lego cars propelled by balloons, they soon discovered that there were several challenges related to the attachment of the balloons and the propulsion. Library staff members helped the

group utilize a ramp to aid the propulsion. As Dee, a group member and future middle school math and science teacher, said, “Something I learned throughout the semester is that lessons do not always work out the way that you expect them to.” No matter how well we plan and prepare, there are a variety of factors that can impact student learning and engagement, such as student behavior, outside distractions, and unexpected events.

Pre-service teachers also identified key elements of informal learning environments that they planned to use in their future classrooms. As Dave, one of the candidates who worked on the wind turbine project, said, “student choice and a dynamic environment” are two pieces that he planned to incorporate into his future math and science teaching. Similarly, Elise, another pre-service teacher, said that the “Library STEAM Project helped her learn “to increase movement, flexibility, and usability” in lessons.

Similarly, K-12 students who participated in the workshops said that their perceptions of the library had changed because of the experience. Many had not anticipated that they would be making, creating, and composing with new tools, or visiting areas such as the Archives. The STEAM camp provided them with the opportunity to reimagine the library as a space for learning, doing, and thinking alongside their peers. Families also reported that the workshops offered an invaluable opportunity for their children to engage with STEAM concepts and topics in an exciting and engaging atmosphere. For children and families, the workshop offered a new opportunity to envision the university library as an accessible, community-focused space.

### Building Synergistic Collaborations

Over the course of project implementation, we’ve found that the Library STEAM Project has had lasting and important impacts on university unit collaborations, pre-service teacher candidate participants, university staff members, and middle grades students. Working on this project has engendered several collaborative efforts, including FabLab training for College of

Education faculty, grant initiatives to provide K-12 teachers with experience in using the FabLab, and ongoing efforts to design interdisciplinary and co-curricular programming for students. The STEAM Camp will continue to be an annual event, and we hope to scale the project to involve more pre-service teachers and K-12 students.

For pre-service teacher candidates, the project offered a critical opportunity to understand the types of powerful learning that happen in informal spaces. Through designing learning opportunities that maximize use of library resources and spaces, they also learned valuable lessons about the importance of play, engagement, and experiential learning that impacted their views about K-12 teaching. They also learned about the role of open-access curriculum and gained expertise in creating and publishing lessons for a distributed audience.

We found that a key component of the experience was offering reflection opportunities at numerous points in the process, including prior to, during, and after workshop implementation. When the pre-service teachers had the opportunity to share lesson ideas and roadblocks with experienced staff members, they got critical feedback that helped them to adjust their plans to create more successful and engaging lessons that used library technologies and resources. Specifically, we encouraged pre-service teachers to maximize the opportunities afforded by the spaces and technologies to create meaningful experiences for the K-12 students that they worked with. Focusing on Kolb's Learning Cycle (Kolb et al., 2014) and intentionally making room for reflection in the experience is a huge step towards more thorough and complete learning.

### **Recommendations and Extensions**

We found that there's great value in thinking across academic and professional boundaries to share experiences, resources, and tools. While all of us have various experiences in creating and running programming for K-12 learners across informal and formal learning spaces, the

UTA Libraries STEAM Camp offered us the invaluable experience of rethinking an undergraduate program to center experiential and informal learning experiences. For any collaboration between an academic library and another unit, planning ahead is crucial. As we had built in several checkpoints for candidates to learn about library resources, engage in initial brainstorming, and then adjust and modify their ideas, we were able to engage the expertise of several library staff members, which enhanced the learning experiences. In the initial planning stages for any camp or workshop, we recommend developing a calendar and a series of scaffolded steps and responsibilities for planning, designing, refining, and rethinking workshop ideas.

We also found that reflection for both pre-service teachers and campers was critical for cementing learning goals and maximizing the learning experience. For pre-service teachers, the process of publishing their lesson plans in the open-access format provided an important avenue for them to think about the ways in which knowledge can be shared and accessed, something that they will be able to draw on throughout their careers as educators. Similarly, it's important to provide opportunities for reflection for campers as well. Suggested activities for incorporating reflection on the camper level can include a day journal, a pre and post survey, exit passes or an end of day decompression session. During the UTA Libraries summer camp, camper groups were provided with cameras that they used every day. On the last day, we created a slideshow with all the photos, and the slides were shown to campers and their parents.

We also recommend taking an active role in camp management and having additional staff available to provide individual assistance to campers who may struggle with the workshop content or behavioral issues. In future iterations, we plan to ask pre-service teachers to develop a series of "what-if" activities, or back-up learning opportunities that can be used on an as-needed basis. This work will help to offer a differentiated learning experience for campers and will also

help pre-service teachers learn how to prepare for classroom teaching, which required them to be equipped with tools, lessons, and resources to meet a variety of learning needs.

Another potential avenue that we are considering for future iterations is the expansion of the program to school sites and other locations. It's important to note that traveling to the academic library can be an impossible task for some K-12 groups. Barriers to access occur when there are not enough funds for school buses, or the academic library is already crowded during long semesters. For example, academic librarians from the University of Florida supported local diversity, equity, and inclusion (DEI) initiatives at a local school through STEAM-based learning workshops and recycling curriculum used for a Girls Tech Camp (Birch et al., 2020). They received an "A+" from the school and feedback was overwhelmingly positive. This outreach took place at the school's campus, demonstrating the need and possibility for in-house and outside-the-library programming. We firmly believe in the promise and potential of bringing the maker mindset and resources into K-12 schools and informal learning spaces, thus opening up even more opportunities for the academic library to serve as a tool for connecting stakeholders, academic units, and community partners.

### **Conclusion/Summary**

In the past year, UTA Libraries has shifted towards a research library focus and away from prioritizing K-12 field trips and engagement. However, the partnership between UTA Libraries and the UTA School of Education persists, and experiential learning opportunities will continue. Whether due to budget constraints, legislation or university-level directives, many academic libraries and universities are finding themselves reworking strategic plans and directives to be more student-ready. A Gallup study found that adults with "a great deal or quite a lot" of confidence in higher education (36%) were roughly the same number as adults with "little or no" confidence in higher education (32%) (Jones, 2024). Of course, there are a multitude of reasons for this sobering information, but the

role of higher education in producing students who are career-ready is crucial in this challenging environment. We must constantly collaborate between colleges and libraries to offer programs that give students the opportunity to experientially learn and grow.

As we have collaborated to build and sustain this program, we have come to recognize the value of the library as a space for connection—not just for university stakeholders, but for the broader community as well. Our work has demonstrated the promise of designing authentic experiences that allow students to think outside the boundaries of traditional teaching and learning environments, something that we hope will serve them well in their future careers as teachers. We've also found that, in addition to exposing K-12 students to new ways of thinking about the learning that happens on a university campus and within the academic library setting, projects like these have the potential to serve university faculty and staff by providing an essential childcare service.

We've learned many valuable lessons, including the importance of mapping out a scaffolded series of planning activities that allow pre-service teachers to draw upon the expertise of library staff, the inclusion of reflection for all stakeholders, and the value of developing a series of "what-if" activities to create differentiated learning experiences. Along with many other academic libraries, UTA Libraries has undergone restructuring since this paper was submitted due to staff realignment and hiring freezes. As such, librarians working in smaller teams do not currently have the capacity required to plan and execute the STEAM camp; however, there are newly embedded librarians in the Creative Spaces and Services team that will continue working with course integration at the university level. The FabLab remains a welcoming space for learners and teachers, including K-12 students who attend UTA-sponsored camps. While this particular program is currently paused, we are looking forward to implementing what we have learned in future programming for our students, faculty, and the wider university community.

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