Library and Student Innovation Center: Makerspace!

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Tonia A. Dousay is an Assistant Professor of Learning Sciences at the University of Idaho and a Google Certified Innovator. She has more than 15 years of instructional design and eLearning project management experience. Tonia's teaching and research focus on design-based learning activities and the knowledge and skills acquired and reinforced through these opportunities. Makerspaces currently serve as the hub of her research, creating an engaging environment to play with robotics, 3D printing, 3D modeling, and mobileography for K20 learners. Where some areas of education focus on STEM-learning, Tonia emphasizes STEAM-learning, giving attention to art and how we empower learners to be interdisciplinary.

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Abstract
The College of Engineering and Applied Science together with the College of Arts and Sciences, the College of Education, and the University of Wyoming Libraries have developed a Library/Student Innovation Center (CSIC/SIC) makerspace, in order to spark student innovation, creativity, and design skills. In May 2012, Governor Mead, the State legislature, and the Wyoming Governor's Energy, Engineering, and STEM Integration Taskforce articulated a vision to propel the College of Engineering and Applied Science (CEAS) and the University of Wyoming to the realms of "excellence in instruction, research, and service." Part of this initiative included an active learning "makerspace" in the new Engineering Education and Research Building (EERB). Makerspaces employ technology along with hands-on education to spark student innovation, creativity, design, and entrepreneurship.

The UW Libraries have graciously provided 2500 square feet of space to develop a prototype Library Innovation Center (LIC) during the Fall 2016 semester. Lessons learned and equipment purchased will form the basis of the Student Innovation Center (SIC) planned for the EERB. Groundbreaking for the EERB was October 7, 2016 with a scheduled completion of Spring 2019.

The purpose of the LIC/SIC is to provide experiential learning space for STEAM (science, technology, engineering, arts, and math) students. The LIC/SIC provides a location for students to explore ideas, complete class projects, or pursue an entrepreneurial innovation. Also, the space is available to conduct classes and workshops. The space is coordinated and managed by an onsite specialist.

The LIC/SIC planning team consists of an interdisciplinary group of faculty members and students with a common interest: hands-on, innovative learning. In this paper, we provide detailed information about developing a makerspace, including equipment selection, staffing, funding, day-to-day operations, and lessons learned. This paper serves as a useful guide for other institutions that are considering setting up a makerspace.

Overview
Over the last several years, an interdisciplinary team has stood up a makerspace within the UW Library. The team has gathered considerable information and lessons learned about developing a makerspace – information that the team believes will be valuable to other institutions pursuing this same goal. In this paper, we answer the following questions: what did we do? Why did we do it? What was our motivation? What are our goals? What is the current status of the project? Where are we heading?

Background
In May 2012, Governor Mead, the State legislature, and the Wyoming Governor's Energy, Engineering, and STEM Integration Taskforce articulated a vision to propel the College of Engineering and Applied Science (CEAS) and the University of Wyoming to the realms of "excellence in instruction, research, and service." Part of this initiative included an active learning "makerspace" in the new Engineering Education and Research Building (EERB).

One of the primary objectives of the initiative was to develop a location for exploration of creative ideas within the EERB. A makerspace provides a location for students to explore ideas, complete class projects, or pursue an entrepreneurial innovation. As a general concept, university makerspaces present both formal and informal learning opportunities to students. From an educational perspective, makerspaces espouse constructivism and constructionism as learning philosophies, incorporating collaborative and problem-based activities. Essentially, the expertise and tools provided in makerspace facilities foster a hands-on approach to learning based upon individual interests, building upon intrinsic motivation (Kurti, Kurti, & Fleming, 2014) [1]. Whether a student wants to learn a new skill to improve classroom performance or participate just because it seems interesting, they can work within a makerspace to identify these opportunities. In some cases, a facility might offer regular workshops on a topic. In others, there might be a one-time event that showcases a particular expertise. The open access, drop-in approach to facility operation encourages visitors to visit at any time to tinker or explore.

There's also the notion of university-based makerspaces serving curricular needs by providing tools and resources necessary for completing class projects. An example here might be a seminar on problem-solving and design that challenges student teams to identify a problem, research existing solutions, and propose a new solution through designing, prototyping, and testing. In some cases, these experiences create entrepreneurial opportunities. In one case, a student-team used a makerspace to design a lighted-seat prototype of a child's toilet with a Bluetooth-enabled application to help parents potty-train their toddlers. These types of projects can be entered into innovation competitions or used as the foundations for other business opportunities.

With construction plans underway for the new EERB, attention quickly focused on establishing a student innovation center (SIC) for student use that would occupy much of the second floor. The groundbreaking for this building, however, was still more than a year out, with an anticipated opening in Fall 2019. The maker movement had already come to campus with the opening of the COE Makers facility, established within the College of Education in Fall 2014, and the UW 3-D ArtScience and STEM Maker Laboratory, established in the Department of Art and Art History in Fall 2015.

To help maintain this momentum, the SIC planning committee agreed that an intermediate and more centrally located facility might assist with broader campus goals, build anticipation for the new facility, and launch a network of makerspaces on campus to maximize impact and use. Committee meeting discussions took into consideration guidance and advice learned from opening the other spaces, including an absolute need for a facility to be easily accessible and visible to students.

When innovation and maker labs are not directly in the flow of typical student traffic, they become destinations that require forethought and planning rather than open-access, inviting spaces. Additionally, windows looking into a facility provide valuable free marketing to advertise the kinds of activities and projects that happen in the space, generating curiosity and conversation. These considerations led the committee to look toward buildings on campus that featured fewer administrative offices and more spaces oriented toward student services. Early conversations with University Libraries revealed a desire to collaborate and opened up potential for available space. This collaboration presented an opportunity to begin scouting for optimal locations within the main library. Ultimately, a large mixed-use study area emerged as the most suitable space to convert into an innovation center. With representatives from the library now on the committee, plans commenced with the purchase of modular walls to enclose the area and the design of a layout for new equipment and furniture [2].

During the preliminary planning stages, faculty within the CEAS were surveyed to find out how an innovation facility could fit with their current practices and future curricular plans. This survey helped inform later data-gathering efforts as the committee prepared proposals to seek internal and external funding for both the SIC and the intermediate library innovation center (LIC). In terms of existing practices that could benefit from or be expanded by a makerspace, CEAS faculty highlighted activities including fabrication, prototyping, machining, programming, and design related to software, interfaces, virtual reality, and production. Responses about fabrication focused on circuit boards and related assemblies, fluid dynamics, concrete beam construction, concrete batching and testing, and structural member testing. Future curricular goals indicated a desire to expand more into 3D printing models, parts, and entire assemblies with particular emphasis on a variety of materials. Other plans selected include robotics experiments, micron-scale fabrication, and rapid prototyping. When asked about how such a facility might be used outside of formal curricula, CEAS faculty noted that the innovation centers could assist during recruiting tours, attracting students, parents, and partners. Additionally, the spaces should accommodate projects and competitions such as the Chemical Car Competition, DOE wind energy, ASCE Concrete Canoe, ASCE Steel Bridge, robotics competitions, design competitions, NASA design competition(s), NAE Engineering 3U, AIChE vaccine design competition, DUI Grand Interaction Challenge, and hack-a-thons.

As construction on the LIC began, the decision to locate the facility in a central, visible location helped to generate interest in the facility. Some students were already familiar with these kinds of centers because of two existing makerspaces on campus, and their word-of-mouth exchanges helped to generate excitement. Students began contacting planning committee members with questions regarding new student organizations such as a blacksmithing club and a 3D design and prototyping club. Additionally, faculty members began to inquire about how to teach an entire course or schedule individual classes in the library space.

Hundreds of university-based makerspaces exist around the United States, offering a variety of facility experiences. In 2015, a review of top-ranked universities found that 40 had at least one makerspace, with the vast majority indicating that the facility was housed in a department other than Engineering and/or was open to the broader campus [3]. It is interesting to note that three of the universities hosting makerspaces listed more than one facility, indicating different emphases or contextual applications for the facility equipment. Also the review noted that the most common equipment provided in these facilities were 3D printers and textile work; e.g., sewing machines, followed by computers for design and research/collaboration. Unfortunately, the review did not explore the kinds of activities conducted in these facilities or how the institutions with multiple makerspaces viewed their individual or collective roles.

A recent special issue of the International Designs for Learning showcased the learning designed for makerspaces in cooperation with how they are designed [4]. The profiles of university makerspaces describe using the facilities to introduce students to newer technologies such as microcontrollers, circuitry equipment, 3D printing, augmented reality, videography, and 3D design. One of the universities also provided unique and specific guidance related to extracurricular design challenges rooted in realistic problems and helping students showcase their productions through visible displays and scout-style badges.

The existing makerspaces on campus, along with the profiles and reviews of other university facilities, helped guide decisions related to differentiating the LIC. While emerging literature and popular media continued to cover the booming maker movement, most of the universities profiled operated a single large facility. By launching a third facility with the fourth under construction, the University of Wyoming inherently established a commitment to supporting student innovation through a variety of channels. The strategic approach to include the existing facility coordinators ensured a holistic plan that considered the needs of other disciplines as integrated and interdisciplinary with the CEAS. Once the initial planning and equipment ordering were completed, the committee's attention turned toward how to maximize use of the facility for both in- and out-of-class opportunities. For example, various courses within the education and engineering colleges were identified as possible candidates for scheduling in the innovation center to expose students and integrate the tools as a learning strategy. Similarly, discussion included what kinds of special events to host. One early example included a rave-like dance party in the evening, featuring collaborative demonstrations from theater, music, and electrical engineering faculty and students on set-up, sound production, and music mixing. As student interest expanded, committee members also worked to identify possible faculty sponsors for specialized student organizations to ensure regular use of and scheduled programming in the facility. In essence, the interdisciplinary and multi-faceted approach to use blended together concepts represented in other institutions.

Methods

In this section we provide a step-by-step, chronological listing of activities accomplished to establish the makerspace in the UW Library.

Formed interdisciplinary team. Starting in the summer of 2015, the CEAS and the Dean of the University of Wyoming Libraries (Libraries) first openly discussed the idea for a makerspace, or SIC, within the UW COE Library. The Dean of Engineering was interested in laying the groundwork for jump-starting a student innovation and entrepreneurship space that would be in the new CEAS EERB. By using space, the library could be modified to work as the interim makerspace. Equipment could be purchased and the facility could be used ahead of the actual opening of the new facility. In the fall of 2015, a Memorandum of Understanding between the CEAS and Libraries was agreed to with the understanding that the Libraries would provide and modify the space while equipment and staffing needs would be provided by the CEAS. With the completion of the new EERB building, the furniture and equipment would be assessed and anything that was still appropriate for the new space would be transferred. The Libraries plans to reassess the space, equipment, furniture and staffing needs to determine if their continued use, constituting and supporting a makerspace, is appropriate.

The Deans approached the Associate Dean of Libraries and two librarians to start the discussions. After that initial meeting, a group was created to start the planning for the LIC. The early planning team consisted of two librarians (heads of the Brinkerhoff Geology Library and of the Learning Resource Center) and one engineer from the Chemical Engineering Department. Members of the team were already familiar with the concept of a makerspace and were excited about helping facilitate this idea. The purpose of this team was to explore the arrangement for creating the space in the library and identifying equipment and costs appropriate for a facility within the library.

Investigated other makerspaces on campus. We also learned about other spaces on campus with makerspace equipment. There is a small space devoted to making in the College of Education; the Learning Resource Center has tinkering equipment, and the Art Department has some 3D printers and a vinyl cutter. With the goal of the new COE Student Innovation Center (CSIC) to be a space for anyone to use, the team decided to bring in the individuals working on these spaces. The UW COE Library is of course a very busy space, so foot traffic could not hurt as we looked for exposure for the space and also to advertise the future home of the SIC in the new EERB. With this in mind the team grew with the addition of representatives from the College of Education, Department of Art, CEAS Shop Manager, and a member from the University of Wyoming Information Technology Department.

Detailed planning efforts. In the fall of 2016, the group started to move ahead with the planning for the CSIC and were invited to take part to help plan for the SIC space in the new EERB. The planning team started meeting every other week as the floor plan for the UW COE Library was finalized and equipment for the space was ready to be ordered. We started our efforts to hire a manager for the space in the spring of 2017, intending to hire the part-time position starting that summer.

Developed concept of network of makerspaces. The existing makerspaces on campus and collaboration with these personnel demonstrated the potential to leverage local, contextualized facilities within disciplines with an open access model. The makerspace housed in Education targeted preservice teachers specifically and showed how these students might use the technologies as future teachers. The makerspace in Art targeted design students learning how to create in 3D with various media for artistic expression. The planned SIC would target Engineering disciplines but also provide the greatest variety of tools and feature the largest space. In designing the CSIC, it became clear that a network of facilities might help coordinate access and focus contextualized activities and expertise. In concept, this idea welcomes students to whichever facility is easiest to access and/or most comfortable for them. While discussing project goals or expectations, the visitor might be referred to one of the other makerspaces based on necessary tools, upcoming programming, and/or in-house expertise. For example, a student team in an Education seminar conceptualized a concept for easily moving bales of hay manually. The students used tinkercad.com to sketch the initial handle idea and brought it to the in-college makerspace. After consulting with the work-study students on staff, the team was referred to the Art makerspace to work with one of the interns to modify the design and produce it on one of their 3D printers. This networked approach helps mitigate potential overloading issues that are sometimes experienced in single facilities and helps reinforce the interdisciplinary approach embedded in the maker movement.

Visited other spaces to adopt best practices and lessons learned. The Pikes Peak Library District (PPLD) in Colorado Springs, Colorado has an outstanding makerspace at Library 21c. The Creative Computer Commons (C^3) portion of PPLD has two makerspaces available for public use. These makerspaces are well established and well run. The development team took a fieldtrip to PPLD to learn more about the day-to-day operations of a makerspace [5].

Developed extensive equipment list for LIC and SIC. The development team constructed a list of equipment for both the CSIC and the EERB SIC based on the expertise of team members, recommendations from the PPLD C^3 visit, and CEAS shop expertise. The list of desired equipment for the CSIC is provided in Appendix 1.

Established fund-raising goals. To fund the equipment for the CSIC, approximately $180,000 was required (reference Appendix 1). The Dean of CEAS pledged the first $60,000 of equipment money. To raise the remaining funds, the development team approached two other groups on campus:

- The College of Engineering and Applied Science University of Wyoming Engineering Fund for Enrichment (UWEFE), and
- The University of Wyoming University Central Student Technology Committee.

Both groups graciously agreed to fund the remaining equipment startup costs for the CSIC.

On a related note, a private donor family contributed $250,000 which was matched by the state for a total of $500,000 as an endowment for technology upgrades for the SIC efforts.

Hired director. In July 2017, the CSIC planning committee hired Tyler Kerr, a University of Wyoming graduate program alumnus, to oversee and direct the day-to-day operations of the makerspace. In his role as director of the makerspace, Mr. Kerr is responsible for managing employees, maintaining equipment, hardware, and software, and planning and implementing community and educational outreach.

Established day-to-day operations. The CSIC makerspace is open to students from Monday to Friday and is staffed by one part-time staff member (the makerspace director) and five students (makerspace educators). Typical day-to-day activities include short tours and demonstrations for curious students, printing objects for visitors, and brief tutorials on 3D printing. Presently, the CSIC caters predominantly to individuals and small groups interested in 3D printing. The makerspace staff also receive requests to 3D-scan objects using the CSIC's Artec Eva structured light scanner. At the same time, there are requests for tours – usually lasting one hour -- from educators interested in demonstrating the capabilities of emergent technologies that can benefit a wide range of STEAM disciplines.

Staffing. The CSIC is staffed by five student employees. Students hired were those who expressed a passion for emergent technologies, innovation, discovery, and creative design, and who had an interest in DIY projects. Experience with emergent technologies was not a job requirement. Mr. Kerr developed rigorous in-house training programs during the first semester to fill any gaps in the student educators' knowledge of makerspace trends and to ensure that they were well-versed in the makerspace's equipment, hardware, and software. All CSIC staff members, including Mr. Kerr, are expected to 1) monitor and maintain the center's hardware and software for optimal performance; 2) interact, assist, and engage effectively with a diverse population of K-12 educators, UW students, faculty, staff, and members of the local community; 3) develop and deliver brief onsite lessons, modules, or workshops for K-12, college and general audiences; and 4) respond to evolving community requests for new technologies or equipment.

Hours. Initially, the CSIC was open Monday through Thursday from 12pm to 8pm MT and Friday from 12pm to 7pm MT in order to accommodate visitors after work and school. The hours of operation were adjusted for the Spring 2018 semester to better suit morning visitors, since the CSIC received few visitors in the evening. Currently, the CSIC operates from 10am to 6pm MT.

Grand opening and ribbon cutting. The facility opened in the fall semester of 2017 with the grand opening during homecoming weekend October of 2017. The facility has been running for the semester and this spring we started ramping up our advertising for the space.

Results

Even without large-scale advertising campaigns, the CSIC has attracted plenty of attention thanks to word-of-mouth mentions. The center has welcomed 888 unique visitors since it started counting use statistics in September, and has likely seen closer to 1,000 total visitors since its inception after hiring Mr. Kerr in late July. There have been approximately 200 visitors a month, of whom approximately 75% are drops-ins with printing requests and 25% are tour groups. On a given day, the CSIC sees 5 to 10 unique visitors a day. These visitor numbers are predicted to increase following a series of campus and community advertisements and workshops planned for the Spring 2018 semester.

Equipment use leans overwhelmingly toward the 3D printers, followed by a few monthly requests for 3D scans of objects. Open houses and tours are requested most often by middle school educators and youth organizations (e.g., Boy Scouts, Girl Scouts). Efforts to engage extracurricular collegiate groups, college classes, and campus student-led academic organizations will be addressed through more frequent advertising campaigns and informational hands-on open houses.

Crucial to the tracking of usage statistics is a recent initiative to digitize attendance and equipment use. The CSIC team is developing a sign-in kiosk and online visitor surveys. Not only will these efforts enable the team to get accurate counts of visitors, but they will generate valuable data about usage and requests for new equipment, workshops, or open houses in the space.

At present, one recognized student organization (RSO) meets weekly in the makerspace. The Collegiate Entrepreneurs' Organization (CEO) is a 20-member group that uses the resources of the CSIC to help students prototype designs and cultivate the skills required to successfully start and run their own businesses. Establishment of a makerspace-specific RSO is under way by makerspace staff. A primary and ongoing goal of the CSIC is to promote use of the space to as many additional student organizations as possible.

Two or three open houses or equipment demonstrations are typical each month. These events serve several purposes, such as: 1) fostering youth interest in the wide-ranging academic and hobbyist applications that a makerspace provides; 2) encouraging faculty and staff to consider how the space might be used in their curricula or in academic research projects; and 3) motivating community members to consider how the space might be used for personal, research, or hobbyist projects.

It is common for the CSIC to host one or two tours per month, largely for middle school or young adult organizations. Middle school tours often include a 30-minute tour of all the available technologies followed by interaction with specific equipment (from littleBits to Lego to the modeling software) at the request of the organizer for the remainder of the period. Due to time constraints, the hour-long tours do not often include a 3D printing component. Most popular among young adults is a 30-minute introductory 3D modeling lesson using the user-friendly Sculptris program.

Several special events have been hosted at the CSIC. During the UW Impact Weekend (an event for high-performing high school students), the center held technology demonstrations for 125 visitors. The CSIC also hosted an activity for the UW Latina Youth Conference, at which 119 young women were encouraged to use the engineering design process and equipment at the CSIC to imagine, plan, construct, and test catapults for distance, accuracy, and precision using household materials. Furthermore, during the Wyoming State Science Fair, the CSIC hosted an activity for 91 middle school students who had been challenged to think through the engineering design process and come up with creative solutions for buoyant, wind-powered, weight-bearing “cargo ships” made of Lego.

As yet, no college courses have been hosted in the makerspace. However, several STEAM instructors have utilized the space to develop hands-on components for their coursework, including haptic feedback devices for hearing or sight-impaired individuals, chemical engineering petri dish supports, brain slice teaching reproductions, and 3D-printed woodwind reeds. The CSIC team is optimistic that the center will become an active hub for hosting courses.

Discussion

Challenges. Although the CSIC is not the first makerspace on the University of Wyoming campus, it is the first large-scale, multidisciplinary facility at the University to provide substantial, accessible, dedicated space for students to create, collaborate, and innovate. As such, the first semester of operation at the CSIC was met with many new challenges, such as: 1) finding ways to actively engage visitors 2) ensuring print quality and overall quality control; and 3) promoting underutilized equipment in the space. Each challenge merits a closer look:

- Finding ways to actively engage visitors. Bearing in mind that the overarching goal of the makerspace is to provide a location for students to explore ideas, complete class projects, or pursue an entrepreneurial innovation, the CSIC team focused on meeting those first-semester challenges to the best of their ability. The early operational focus was primarily on space development, staff training, and visitor feedback in order to determine what resources, instruction, or workshops visitors would wish to see in upcoming semesters. Less focus was spent on campus-wide advertising, and any publicity was largely through word-of-mouth. During the second semester of operation, with staff trained and equipment operating well, the focus turned to the hosting monthly instructional workshops for faculty, staff, and students as well as to awareness campaigns such increased campus advertising (both print and online). Although the CSIC team is detecting greater interest from the center's target users overall, it is still too early in the center's operation to make causal connections between the awareness campaigns and greater usage of the space and its available resources by students and community members. Similarly, it is premature to gauge the center's success in attracting another target user group: University faculty and staff who might wish to host classes and conduct research using the space's facilities. The main issue is one of timing: when the makerspace officially opened its doors in October 2017, faculty, educators, and researchers had already developed their curricula or research plans for the semester. Therefore, during the second semester, the CSIC team spent more time and resources raising awareness among faculty and staff, using large-scale campus poster advertisements, email campaigns, and hosting faculty and staff open houses. The team expects positive results from these efforts to be reflected in faculty and staff participation in the academic year ahead.

- <u>Ensuring print quality and overall quality control.</u> 3D printers are the most popular technology housed in the space, and consequently are the machines used most often. As a result, regular maintenance is required to ensure acceptable print quality. In the first semester of operation few visitors knew how to use the software necessary to 3D print objects. Because of this, most 3D printing, including prints for visitors, was completed by staff members. This proved to be challenging for the six staff members for two reasons: 1) print preferences and personal settings varied considerably; and 2) the first printers were largely unreliable and inconsistent over time. Care was taken to ensure consistency in use among staff members so that print quality and cost would remain constant over time. The CSIC set out to keep almost all services free and accessible to encourage frequent student use. Any charges, such as the $1.50 per hour to use the 3D printers, was implemented only to recoup the costs of consumable materials, a practice which is consistent with other 3D printing price models on campus. The issue of cost, however, does play a role in the larger issue of quality control, since different settings influence the timing of a print. To combat this, individual use profiles (low resolution, high resolution, fast draft) were created around each machine and each machine's known printing issues. This was coupled with extensive logs for each print which included time, estimated cost, machine used, filament color used, and staff member. Thus in theory, a user could print the same object months apart at the same quality and cost.

- <u>Promoting underutilized equipment in the space.</u> In addition to the 3D printers, the CSIC houses littleBits circuitry kits, Lego, Lego Mindstorms robotics, Arduino kits, an electronic bench, a 3D scanner, and a suite of different modeling and CAD software. Because some of these kits and tools are less visible than the 3D printers, they are largely underutilized. For the future, the CSIC team plans to host lively and more detailed information campaigns (campus event booths, community advertisements, active community engagement during community events, free workshops) to further engage the center's target users and promote its underutilized equipment.

Conclusions

We are pleased by the early success of the CSIC. We will continue to look for ways to publicize and expand its use. The lessons learned in standing up the CSIC will directly be applied to the development of the EERB SIC. We hope this paper will be useful to others considering starting a makerspace.

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5. https://ppld.org/library-21c, Library 21c (LI)

Appendix 1. Coe Student Innovation Center (CSIC) equipment list.

Appendix 1: Library Innovation Center Equipment List

Equipment Item	Source	Qty	Cost
*Lego Wall	Reference Appendix 11		$8830
*Little Bits Pro Library with storage	Reference Appendix 11		$4955
*ProJet 1200 3D printer			$5000
*Vinyl Cutter	US Cutter MH 34in BUNDLE, Supplies + Tools - $320 on Amazon	1	$320
*Computers	Dell XPS 8900 Desktop - $1469 each Tower plus monitors, mouse and keyboard https://www.amazon.com/Dell-XPS-8900-Desktop-Generation/dp/B01E5WQ5XE/ref=sr_1_8?s=pc&ie=UTF8&qid=1475707552&sr=1-8&keywords=dell+computer	2	$2938
*Epson "Graphic Arts" Large Format Scanner	http://www.epson.com/cgibin/Store/jsp/Product.do?UeCookie=yes sku=E11000XL-GA Note: Large documents can be digitized. Typical applications include: • Engineering drawings • Maps • Newspapers • Scrapbooks • Photographs	1	$3000
*Electrical/Electronics Module	Reference detailed list at Attachment 3		$11,000
*3D scanner	ARTEC Eva https://www.artec3d.com/ Note: "You can use the 3D scanners to quickly capture just about any industrial object, from a small mechanical part to a turbine, with astonishing accuracy. The resulting 3D model can then be exported to a variety of CAD & CAM programs and from there gauged and modified to improve the product's design and performance or integrate it into a new production system."	1	**$19,800**
*Furniture - 24 roll about tables - 48 chairs	- Table - Chair – Steelcase, cachet 5 Star Chair	$300 $490	$7200 $23520
LIC consumables	the paper towels, cleaning supplies, filament, toner/ink, etc. (estimated to be $5,000 per year)		$5,000
Robot module	Reference Appendix 2		76,648.35
Arduino startup package	Reference Appendix 13		$2,869.86
Total LIC			**$171,081**