ASEE 2022 ANNUAL CONFERENCE
Excellence Through Diversity
MINNEAPOLIS, MINNESOTA, JUNE 26TH-29TH, 2022 ASEE
Paper ID #36891

Introducing Arduino Library Kits for Checkout

James Thomas Mcallister (Engineering and Honors College Librarian)

Engineering and Honors College Librarian at the University of Arkansas.

Introducing Arduino Library Kits for Checkout

Introduction

The availability of technology kits of various kinds in academic libraries is becoming more prevalent. During the summer and fall of 2021, the engineering librarian at the University of Arkansas – Fayetteville Mullins library conducted a process to implement the availability of Arduino Tech Kits for checkout. The Arduino Tech Kits allow all users a pathway for hosting numerous projects and activities. Some science and computer labs are dropping their traditional aesthetic and are evolving into more of a fab lab or makerspace type environment built on supporting STEM learning [1]. This adoption of new technologies is great, and libraries are taking on the role of supporting it via workshops and events, but also making the tech itself available for checkout.

At the present, users in K-12 schools tend to be the leaders in hosting technologies like Arduino, which could be considered entryways into further development and interest in areas such as electronics, robotics, and coding. To support secondary education, institutions and libraries need to embrace this public interest in STEM technology and help make its transition into higher education for users and for those that serve in educational roles by making it accessible in academic libraries. This paper explains the process from proposal to making Arduino UNO library kits available at a large research university to users and members of the community. This work is not interested in what institutions are using Arduino kits in their library, but more so explaining how the kits became part of the collection and what steps were taken to promote and sustain the kits for future use. This project is also about supporting the campus and community in introducing and educating users about the future of technology and Arduino is one such example of that.

Background

Although Arduinos were made available in libraries over the previous decade, literature on the how-to for adopting technology for checkout into the library proved difficult to find. Much of the literature focuses on studies made with Arduino as part of a lending program along with other technologies offered for checkout [2]. Many libraries, both academic and public, have provided Arduino kits via checkout and through makerspaces, innovation labs, or other similar type labs. Checkout policies differ depending on the library as there are too many to list, however, most allow the lending out electronics kits like Arduino. As with the availability of new technologies in the library, much of the support and users naturally come from the STEM fields, as they have benefited greatly. Additionally, Arduino library kits have had success in public libraries. The Hillsboro Public Library in Hillsboro, Oregon first introduced Arduinos as part of their unique collection [3]. The difficult part was to come together on a checkout process. Each of the fifty-piece kits was stored in a fishing tackle box.

There is a noticeable collaboration between the library and other partners on campuses for lending out kits for checkout. In 2015, the Ryerson University Student Learning Centre launched

a technology lending program hosted by the library's Digital Media Experience Lab [4]. A previous workflow of using laptops helped in the development of crafting the circulation policy for electronic kits like Arduino. The process included members of circulation services in the training of knowledge with the kits as well as having the kits cataloged for discoverability on their library's search platform. In 2017, the MIT libraries partnered with the MIT MakerWorkshop to check out tools and various kinds of equipment from the MIT library [5]. Before implementation, they addressed financial responsibilities, and ownership expectations and created metrics to measure success. The kits were designed to be user-friendly with a guide and how to contact for support issues.

Technology lending of Arduino kits can coincide with the launches of makerspaces. In 2013, North Carolina State University Libraries introduced Arduino workshops for users to help them learn how kits work [6]. Usage data were obtained and analyzed to determine department, user status, and kits checked out.

Steps for Arduino

Beginning Phase

Starting a tech lending program does not happen instantly, but rather through a process of steps. Gathering information from other libraries and librarians, while learning about the technology itself was a crucial step in setting the foundation for the lending of Arduino Library Kits. Also, this was the first time that the University of Arkansas – Fayetteville Libraries had taken on this kind of task, which meant this would be the pilot for considering future library tech kits for checkout. The beginning phase of the program involved an intense and methodical approach to understanding the needs of patrons who would be using the Arduino Library Kit. The primary audience would most likely come from the STEM fields; however, Arduino kits do provide the capability for flexible projects that apply to other disciplines not related to STEM.

One approach included searching the web for libraries (public and academic) to see what kind of technology kits are offered at those libraries. All information was documented with regards to the type of Arduino kit offered as well as noting the current checkout policy rules for the kit. Additionally, several librarians from other institutions were interviewed about the Arduino kits provided by their libraries. The information gathered proved invaluable as parts of the steps were not at first considered like submitting a proposal for funding and storage of the Arduino Library Kits. Discovering the availability of Arduino Kits from other libraries was essential in crafting a lending policy.

The type of Arduino was worth thinking about when creating the library kit. Based on feedback from a librarian whose library lends Arduino kits, not many users would be interested in just a basic Arduino kit with few parts for lessons. Students want the versatility of an Arduino kit with the parts that allow for a plethora of lessons. One great caveat about Arduino is that any level of user can start with it, hence it was important to consider a kit that will meet the same level of service, from beginner to the advanced Arduino user. It was also necessary to consider an

Arduino package that provided plenty of lessons that vary in difficulty, as well as include some support or instruction such as a manual or website link.

The cost was another factor to consider. Arduino UNO kits are relatively inexpensive when compared to other tech and even traditional collection materials like monographs. Each kit cost $40.00 for the Arduino kit and $10.00 for the storage box. When it came to a decision, the ELEGOO UNO Project Super Starter Kit was chosen for the high number of lessons, great reviews, and affordable cost. Storage is important since some of the essential parts of the kit must be accounted for but also be protected. The storage box that the kit came with was not user-friendly due to the parts not being arranged and tightly packed in [7, Fig. 1]. To remedy the issue of storage, the Plano 3780 ProLatch Deep Stowaway Box was selected because it had enough slots to separate the different parts, great affordability, and the ease of creating a visible library cover on the front of the kit as shown in [Fig. 2]. The Plano 3414 Stowaway Micro Organizer Box was ideal for the tiniest Arduino pieces and could fit inside the larger box. To prevent damage to the Arduino Uno board, a 3D printed case was fitted around it for protection from wear.

Figure 1: ELEGOO UNO Project Super Starter Kit.

Figure 2: Plano 3780 ProLatch Deep Stowaway Box with more slots for Arduino parts.

The next step was to create a proposal for review by the dean of libraries and library administrators for approval to purchase. The proposal was broken down into several parts where the first piece included objectives that stressed the importance of the need of students and faculty. The first part also explained the importance to align with the current strategic plan, access to new technologies on campus, and training interested library personnel. This piece also included goals and solutions that helped with creating timelines and aligning with the objectives. The second portion of the proposal provided general facts and statistics such as collection numbers of monographs and serials of the Mullins library along with the number of library personnel employed. Such statistics and descriptions were added to the proposal for the formality of illustrating the scope and size of the Mullins library. Another part of the proposal described the importance that libraries must embrace and hold technologies for checkout along with mentioning the benefits and risks of such an endeavor. This part also listed some libraries that offer technology kits like Arduino for checkout as well as described their technology checkout policy. The next section of the proposal included the cost, budget, storage, and potential checkout policy. This checkout policy, though not finalized, explained the prominent roles and service areas that would handle the kits such as the library staff who are lending the kits, how to troubleshoot, and where the kits would be held. The final part of the proposal included on and off-campus outreach collaborations such as faculty and student groups that would support the program. Lastly, supportive literature on Arduino kits had been included for reference.

Transition Phase

Determining what checkout policy would best serve the Arduino Library Kits required meetings with the Director of User Services and the Circulation Systems Manager. Fortunately, both were supporters of the project and assisted greatly in the development of the checkout policy. Most notably was input provided on what electronic location in the library's circulation system would best fit based on cataloging and system rules. For example, an item placed in reserve would have different checkout requirements than an item placed in a different location like main stacks. It was decided that the kits would be placed on reserve and the physical location be at the main help desk. The checkout time would be seven days along with a two-day grace period for weekends, and the ability for one renewal. In the case of special circumstances, such as checking kits out for a class, would require special permission from the engineering librarian.

The managing and upkeep of the Arduino Library Kits would fall to the engineering librarian. This included weekly inspections of the condition of the kits, checking for missing parts, and keeping parts and pieces in order. It would be up to the user services staff to notify the engineering librarian of any damages or missing items. There was informal training for user services staff and supervisors that included a review of checkout procedures, support services, and basic Q & A on the kits.

Since the Arduino Library Kits contain many parts and pieces, it would be futile to maintain the entirety of the kit, so the circulation systems manager suggested that only essential or high-cost replacement parts of the kit be counted. Without those essential parts, the Arduino kit would be incomplete, and therefore unusable. A total of 3 parts: breadboard, Arduino board, and LCD were to be counted by user services staff members whenever a kit is returned to the library. If a returned kit had a missing or damaged essential part, the user would have to pay to replace the missing or damaged part.

The circulation systems manager recommended that a loan device agreement not be included since the cost of replacing the kit is minimal. Usually, per the current policy, the loan device agreement is for items priced over one hundred dollars. However, a term of use was placed on the cover of the kit as well as on the institution's Arduino Libguide [8]. The Arduino libguide, created by the engineering librarian, assists users who want information and support. The libguide contains an FAQ, example workshop lessons, suggested Arduino books, and instructional videos.

Implementation

A kit is only as good if users know about it. The library marketing and relations team assisted in creating news wire releases for campus and in the development of library-specific covers that go over the kits. The outside cover of the kit shows the University of Arkansas Libraries logo and Arduino logo with another link to the Arduino libguide seen in [Fig. 3]. The inside cover includes the terms of use, a visual parts list, circulation policy, Arduino libguide link, and a feedback survey in a QR code format as seen in [Fig. 4]. A feedback survey was placed on the kit so that user needs were met and to capture any suggestions for future Arduino or other kit requests.

Even though many library personnel at the Mullins Library had heard of Arduino, they were not aware of its capabilities. In turn, the engineering librarian hosted two workshops for only library personnel where they had the opportunity to learn about the history of Arduino and the contents of the kit as well as actively participate in several Arduino lessons and ask questions. The last stage before making the Arduino Library Kits available to users was to get them cataloged in the library's system. The cataloging process did not take long since another institution had the same kit available in their library, so it was just a matter of duplicating the record from WorldCat and placing it in the library's system.

Figure 3: Arduino Library Kit outside cover with the University of Arkansas Libraries' logo and Arduino libguide link.

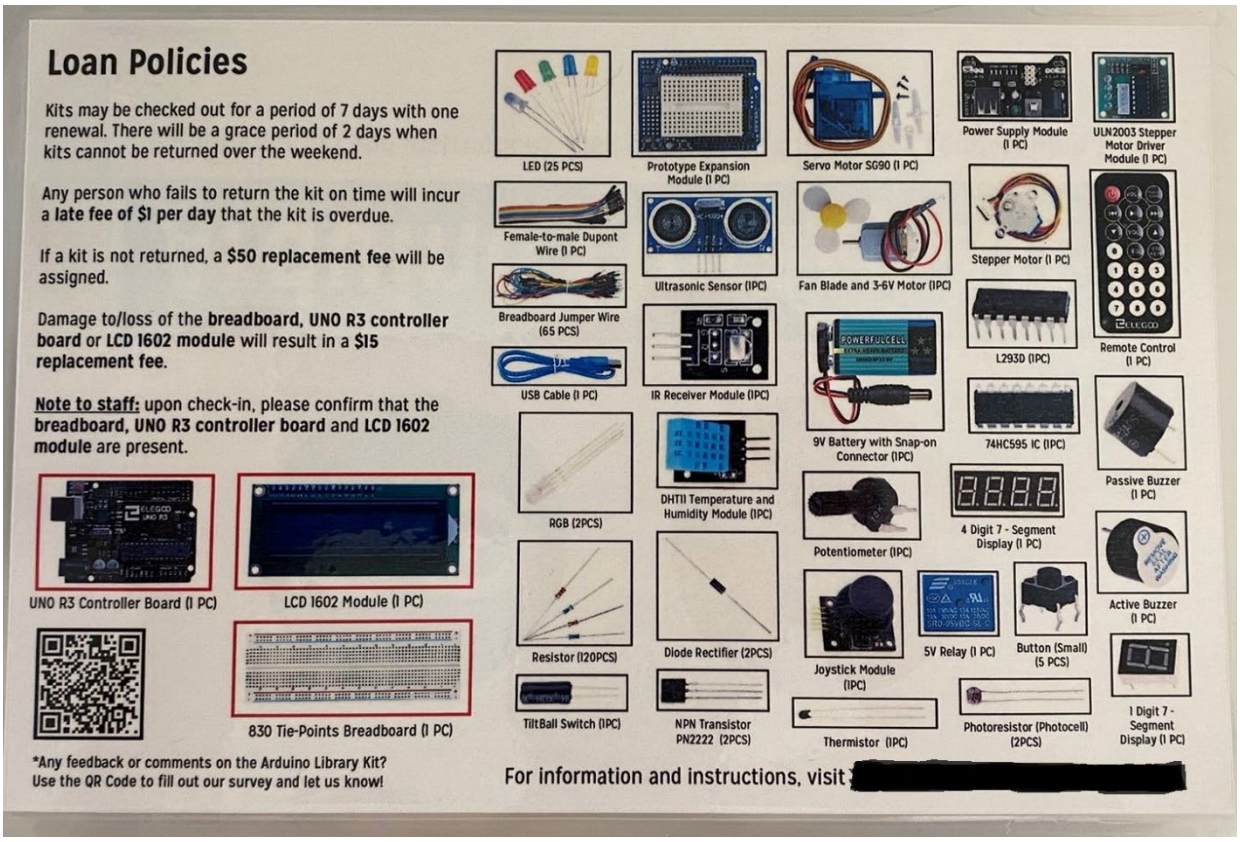

Figure 4: Arduino Library Kit inside cover showing the loan policies.

Continuous Development

As if with any technology or material that is added to a collection, there is a level of maintenance or development that continues. The hardware and software of Arduino, Raspberry Pi, and other lending kits change over time so upcoming changes to the kit would need to be made. This could come in the form of replenishing missing parts and upgrading components. Naturally, any feedback received from the survey on the Arduino Library Kits will be recorded. At some point, the need for storage will have to be addressed if the possibility of adding more Arduino Library Kits or even other technology kits for checkout like Raspberry Pi. This, in turn, will also mean more storage for extra parts and pieces that make up the kits. Some possible storage items being considered are a storage cabinet or tool chest. Switching from physical to electronic space, the Arduino libguide would need the occasional updates if any changes are made that fall under the supportive tabs of the guide. This would include marketing future Arduino workshops or related events for users.

Challenges

There are a couple of challenges that involve the lending of Arduino and other electronic kits. The high number and fragility of parts that are in each Arduino kit, increases the likelihood of a possible missing or damaged part when it is returned. To avoid this, users and library personnel can refer to the visual parts diagram found inside each kit. If an Arduino kit is returned with

damaged parts, a library staff person or the engineering librarian will assess whether the part is a critical or non-critical component. Non-critical components are easily replaceable while the critical components have a higher replacement cost. A fine is handed down to the user who damaged or returned a kit with missing part(s). A replacement fee will be assessed for any kit that is not returned. Those notes are listed under the loan policies on the inside cover of the kit. Another challenge is introducing new library staff to Arduino due to common turnover in the user services (circulation) department. To resolve this, the engineering librarian hosts quarterly workshops for training new and interested library staff on Arduino kits. This workshop touches on the checkout policy for the Arduino kits, when to replenish them, and navigating through the Arduino libguide.

Conclusion

The process of introducing Arduino Library Kits for checkout appears to be off to a great start with faculty, students, and other users in the community. Hopefully, the Arduino Library Kits are the first step in bringing more tech for checkout into the Mullins library at the University of Arkansas – Fayetteville. Although the whole process had rolled out as a success, it wasn't without its long process. It is important to understand all the steps that go into developing these types of programs as they do not happen overnight.

References

[1] J. Stryker, "Makerspaces: The next Iteration for Educational Technology in K-12 Schools," *Educational Technology*, vol. 55, no. 3, 2015, http://www.jstor.org/stable/44430369.

[2] K.A. Kozak, "Creating Ideas into Reality: Spaces and programs that open up the imagination," In 2017 ASEE Annual Conference & Exposition, pp. 10.18260/1-2—28083. https://peer.asee.org/28083.

[3] K. Muller, E. Buss, and B. Lax, "Arduino kits, bakeware, and LEGOs…Oh my!" *OLA Quarterly*, vol. 20, no. 4, 2014, https://doi.org/10.7710/1093-7374.1779.

[4] W. Wang, K. Kimberly, and F. Wang, "Meeting the needs of post-millennials: Lending hot devices enables innovative library. *Computers in Libraries,* vol. 37, no. 3, pp. 4-9, 2017. https://www.proquest.com/trade-journals/meeting-needs-post-millennials-lending-hot/docview/1891749560/se-2?accountid=8361.

[5] M.R. Buchman and D.M. Dorsch, "Building strategic partnerships with non-maker entities to foster a maker culture," *Proceedings of the 2nd International Symposium on Academic Makerspaces*, Cleveland. 2017. https://assets.pubpub.org/23eiwydy/51585584963628.pdf.

[6] A. Rogers, B. Leduc-Mills, B.C. O'Connell, and B. Huang, "Lending a hand: Supporting the maker movement in academic libraries," In 2015 ASEE Annual Conference & Exposition, pp. 26.1081.1-26.1081.11, 2015. https://peer.asee.org/24418

[7] Flinn Scientific. *Arduino Super Starter Kit*, April 29, 2022 [Online] Available: https://www.flinnsci.com/arduino-super-starter-kit/ap9875/?gclid=CjwKCAjwgr6TBhAGEiwA3aVuIZ1xKxmsxrXHOX6mvCc-bSOYRj3uRp0Y0DVIrTpubPXE88dZLqiFIxoCWrEQAvD_BwE

[8] J. McAllister, *Getting Started with Arduino*, The University of Arkansas, April 29, 2022 [Online] Available: https://uark.libguides.com/Arduino