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STEAM at the Library:
Supporting Youth and Lifelong Learning

American public libraries promote equality and opportunity by fostering literacy and skill acquisition throughout an individual's entire lifespan. Libraries have traditionally provided free, confidential assistance as patrons develop reading, writing, language, information and computer literacy. Libraries also foster the acquisition of skills necessary for a lifetime of satisfying employment. In 2018, a critical component of literacy is digital and STEM-related.

The Cambridge Public Libraries (CPL) offers some STEAM learning programs. We plan to expand our offerings to build a robust **STEAM at the Library** program. Past programs for youth include building with robotic Legos, programming with Raspberry Pis, and in a recent collaboration with Akamai, students took part in a dramatic game, enacting network components to viscerally understand how the internet works. The Library partnered with Innovators*for*rPurpose last summer to teach 3D modeling technology and modeling concepts to middle schoolers. Students scanned physical models with the 3D scanner, printed these models with the 3D printer and examined them in virtual reality. Additionally, Book Shop is an ongoing hybrid book group and makerspace workshop for youth.

In an innovation economy where the very nature of work is shifting, and a significant percentage of job sector growth is in STEAM related fields, guided experimentation with emerging technologies has become an essential bridge across opportunity chasms in our society. The role of the Library to create learning opportunities for all residents from birth to end of life in a rapidly evolving creative, scientific, and technological landscape aligns naturally with the Cambridge Public School Department's (CPSD) and the City's strategic plan and STEAM initiative.

For example, the Library partners with Girls Who Code, but a recent library survey and feedback revealed that all ages (and genders) are interested in learning to code. The CPL, which is open to the public 65+ hours per week across seven locations, is well-suited to meet that need. Similarly, the CPL plans to expand the scope of its 3D modeling classes and introduce robotics classes. It's important for public libraries to support innovators of all ages as they do their work. The Library can provide staff with the professional expertise to make these creative services available in a free and accessible manner.

To fulfill our mission of being a doorway to opportunity and learning, the Cambridge Public Library is committed to devoting resources in the form of space, expertise, networking and learning opportunities for patrons of all ages to acquire and expand their digital and STEM literacy skills. We therefore propose transforming space at the Main Library to augment existing public service areas, build staff capacity by hiring and training, and build upon current STEAM programs at all library branches to create new opportunities for Cambridge youth and adults. The addition of these creative services, with staff expertise to help all residents take advantage of them, positions the Cambridge Public Library to support the City's and CPSD's commitment to STEAM for youth and lifelong learners.

STEAM at the Library Goals:

1. To introduce, expose, build awareness, and deepen* an understanding of what scientists, mathematicians, engineers, technologists, designers, writers and artists do and how they work especially STEAM professionals from diverse backgrounds (*following the City's STEAM introduction to immersion model)
2. To connect youth, emerging adults and career changers to mentors, role models and STEAM professionals
3. To provide seamless access to STEAM tools and curriculum for children and teens during out of school time
4. To teach coding, 3-D modeling, robotics, and audio/video production to any resident who wants to learn regardless of socio-economic barriers
5. To focus outreach efforts to segments of the population who are under-represented in STEAM careers including African-Americans, Hispanics/Latinos as well as low-income families
6. To collaborate with community partners including building on existing relationships with schools and universities, City departments, businesses and nonprofits.

To address the above goals, **STEAM at the Library** will include four components:

1) Improvements to support STEAM learning and access to technology and equipment,
2) Staffing to provide expertise and coverage of points of service,
3) Curriculum and program design to ensure we are meeting patron learning goals and supporting City STEAM goals; and
4) Outreach to make sure we are providing access to underrepresented populations.

IMPROVEMENTS to Support STEAM

Innovation Lab ("The Garage")
A large, open space for collaborative and multimedia working and learning, and for tinkering and training (imagine a 'Silicon Valley garage' for individuals who don't necessarily even have a car). There will also be separate, sound proof glass rooms providing flexible space for:

- Audio, film and animation studios
- Mixing and editing work
- Virtual Reality (VR) and Augmented Reality (AR) modeling
- 3D printing and other technologies for the public

Collaborative Work Spaces
The two collaborative work spaces on the second floor of Main are in near constant use. We plan to create two new glass rooms on the lower level featuring large computer screens and writing walls for group work and videoconferencing.

Technology Bar
The Information Commons (IC) was conceived more than ten years ago to meet basic public computing needs at fixed stations. Today, equitable access means offering mobile devices so patrons are free to sit anywhere in the Library, like their neighbors who own their own laptops. We will bring a new level of support and activity to this area at the Main Library by replacing a small service

desk with a genius bar that will feature seating on one side for the public and staff to assist patrons with questions on the other.

- Large screens will provide real-time inventory of an array of devices to check out from mobile hotspots to Chromebooks
- Some existing seating will be replaced with open tables or comfortable seats with a laptop tray
- New sight-lines will allow for an array of printers, scanners and accessibility equipment and an overall increase in seating capacity
- Seating overall will increase in the area devoted to assisting the public with computing

Specialized Creative Workstations at Main and Branches
Creation of moderated, flexible workstations in support of homework and out-of-school learning

- Specialized computers supporting advanced software such as CAD, Final Cut Pro, Illustrator, Photoshop and the Adobe Creative Cloud linked to graphic and poster printers

Info Commons Lab
Reducing the number of fixed computer stations while adding seating in the IC at the Main, and increasing the number of laptops that can be used anywhere in the Library, frees the Info Commons Lab from the queue for personal computing. With the new lab space, we will significantly increase the amount and type of learning experiences we provide.

Youth and Teen Spaces
STEAM programming, demos, classes and workshops for children through age 13 will take place on the third floor of the Main Library where there is ample space and during scheduled times in the Garage and InfoCommons Lab, as well as in the youth space or program space at branch libraries. Teen programming will take place in the Teen Room, during scheduled times in the Garage and InfoCommons Lab, and in youth and program space at the branch libraries. Mobile hotspots will be available to borrow for families and publicized in both the teen spaces and children's areas. Additionally, all STEAM spaces will be available to youth at various times and for specific programs through coordination between managers.

Branches
Mobile STEAM equipment such as 3D technologies, robotics and learning kits will be transported to the branches to support branch programming. Laptops and hotspots for lending will also be made available at the branches. Providing circulating laptops at the branches with less restrictive time limits will help to meet demand (desktop workstations have a two-hour time limit) and provide freedom for patrons without computers at home to sit anywhere in the library.

If desktops were replaced by circulating laptops, it would also free up valuable space at the branches:

- Central Square: The Tech Center could be repurposed as flexible space to host activities such as STEAM programming, classes or workshops.
- Central Square: One or two robust workstations featuring creative software and/or a 3D printer could replace basic desktops in the Children's Room.
- O'Neill: Laptops, specialized software and technology, and a large screen could be added to the Conference Room.
- O'Connell: One or two robust creative workstations could be added.

STAFFING

In order to design the curriculum, oversee programs, form partnerships, and fulfill outreach goals, contingent upon available funding through the City's budget process, we anticipate adding STEAM staff at the Library.

CURRICULUM/STEAM PROGRAMMING

A manager will develop the library's curriculum and outreach and work closely with the City's STEAM coordinator, to ensure that the library's curriculum and programs help the City to achieve its STEAM related strategic goals. With outreach strategies working with CET and community partners we can do even more to ensure free and equitable access to STEAM learning opportunities to underrepresented and underserved populations across Cambridge. We are committed to offering an array of STEAM programs, from introductory to immersive, for Cambridge's families and youth as well as individual learners.

We know that families, children and teens spend a lot of out of school time in the City's public libraries. In support of the CPSD's curriculum, high-powered multimedia stations and engineering workstations and software that is compatible with school technology will be available. The coordinator will also work closely with the Cambridge Public Schools, to support school related curricular and strategic goals.

Here are some examples of envisioned **STEAM at the Library** programs and initiatives:

STEAM Professionals in Residence

We will offer residency programs with talented writers, artists, designers, and scientists who will share and workshop their creative and scientific process with youth, families and the public. Perhaps we will inspire the next Lynn Nottage, Lin-Manuel Miranda, Elon Musk or Rainer Weiss to go forth and create.

Leadership Mentorship Program

We may recruit a diverse group of STEAM professionals to help to create and pilot a mentoring program for teens and emerging adults. This program will introduce mentees to various STEAM careers, skills-building workshops and learning opportunities, and include personalized one-on-one demonstration, discussion and learning time. The mentoring program will tie in with the Library's commitment to equity, diversity and inclusion, as well as the City's guiding STEAM principle of access and equity. This program will also create a community of practice for both the mentors and mentees.

Building Musical Instruments and Robots

CPL will continue to partner with Innovators*for*rPurpose and to host and teach middle school and high school students design and computational thinking through wayfinding projects and development of musical instruments.

Understanding Satellites

We will partner with Wolbach Library at Harvard-Smithsonian Center for Astrophysics and MIT Media Lab's Public Innovation Exchange for Cambridge on a project geared toward youth and public development and awareness of CubeSats (small satellites) development. These partners are dedicated to bringing science education and maker culture to public libraries by creating a program where high school students build a small satellite that will be launched by NASA and developing a digital architecture for preserving research data collected from these types of small satellites.

Branches

In addition to supporting STEAM at the Main Library, the six neighborhood branch libraries will play an important part of introduction and exposure of STEAM learning for youth and families living nearby. This will include collaborations and strategies developed in partnership with local assistance programs, schools and services including Cambridge Housing Authority (CHA), DHSP's afterschool program, Agenda for Children, Center for Families, Baby University, and neighborhood schools and churches.

This may comprise of creating exposure programs at CHA sites or other locations, as CPL did this past summer around a more general introduction to the library system with library parties. STEAM at the Library branches will also include mobile kits to go to the various branches, for example a 3-D modeling kit, a robotics kit, a programming kit for teaching, demonstrations and learning. Pop-up STEAM demos are also envisioned, such as cloud chambers at the Central Square Branch and at O'Neill Branch in North Cambridge, as well as take-home kits.

OUTREACH

Outreach is a critical element in the library's successful promotion of literacy in the community and STEM literacy will be no different. In addition to designing and publicizing STEAM learning opportunities across our seven locations, we also plan to take programmatic elements out to other locations. For example, every summer librarians bring story time to the parks; we can build on those connections to bring STEAM experiences such as programming with Raspberry Pi's. Our Senior Services Librarian visits assisted living facilities every month, we would love to take our 3D printer on a road trip to provide a demonstration.

We are working closely with the Community Engagement Team (CET) to build stronger connections with new communities and diverse families in Cambridge. We are planning tours and an overview of services and programs (including STEAM) available at the Library for the CET and their clients. We are launching a Conversation Café for Spanish speakers. Each gathering will start with brief presentation about the opportunities at the Library and we plan to incorporate STEAM learning. The Library already partners with many community organizations and city departments to bring services and an awareness of opportunities out into the community. It's a natural part of our work which we believe can be highly effective at raising awareness of and interest in STEAM learning and careers.