Libraries and Coding for Children and Teens: Key Conclusions

Introduction

The ALA Office for Information Technology Policy's Program on Youth and Technology has spent several weeks collecting anecdotal data on library coding instruction programs and activities for children and teens. The proceeding analysis distills several key takeaways from the data program staff has collected thus far. Data comes from a basic web search for library coding activities, a scan of the official blogs of the ALA youth divisions, and a SurveyMonkey survey soliciting information about libraries and coding, which was pushed out to several ALA listservs.

Librarians should be confident in their preparedness to teach coding

Despite the acceleration of coding programs and activities in libraries in recent years, many librarians are still intimidated by the thought of integrating coding into a program of library. These individuals cite their own lack of experience with coding and the programs that facilitate its instruction as the principal source of their intimidation. However, the fact is that librarians are well suited to coding instruction, whether or not they are proficient in coding languages themselves.

Reference is a bedrock skill of the library profession. Thus, if a librarian is stumped by a patron's question while leading a coding program or activity, that librarian should be confident in his or her skills to find the answer. By finding the answer, he or she not only boosts patron understanding of the concept at hand, but also the library's capacity to teach it. Jami Schwarzwalder of the Pierce County Library System in Tacoma, Washington speaks to this directly in an article on YALSABlog – one of the Young Adult Library Services Association's (YALSA) two official blogs – when she explains, "I was worried at the beginning that I wouldn't have the knowledge or skills the students would need, but I've been learning along with them and having so much fun that when we don't know the answer I just help them learn how to find it, just as if it was any other reference question."[i] Thus, librarians should approach coding programs and activities as learning opportunities not just for their patrons, but also for themselves.

Furthermore, new tools have emerged in recent years that facilitate basic coding instruction. At Tufts University, a research group called DevTech has developed a hands-on programming language called CHERP. CHERP allows users to create programs by arranging simple icons on a digital screen or by manipulating wooden blocks and using a scanner to convert the arrangement of the blocks into a program. Similarly, the Media Lab at the Massachusetts Institute of Technology (MIT) has developed Scratch – another "drag-and-drop" program. Designed for children ages 8-16, Scratch allows users to create programs by joining digital blocks together to create strings of code. Scratch is already being integrated into library programming with success. In Michigan, the Flint Public Library offers a coding club twice-per-month, through which teens use Scratch to build basic coding skills; in Minnesota, the St. Paul Public Library holds weekly 2-hour Scratch animation workshops for children led by teen interns from the local science museum; and in the nation's Capital, the Southeast branch of the D.C. Public

Library held a contest last November challenging children to make a game, music video or animation using the Scratch program.

Additionally, from Montclair, New Jersey to Homer, Alaska, libraries are integrating Scratch into broader coding instruction programs by combining it with other coding tools available through free online platforms like code.org – which offers the "Hour of Code" program – and CS First. A broad range of libraries also now utilize equipment that demystifies the coding process by "blending the digital and physical worlds."[ii] For example, the Highland Public Library in Michigan has offered a coding program this year that uses Circuit Scribe, a roller ball pen that allows people to draw circuits instantly. Similarly, the Chestnutwold Elementary School Library in Pennsylvania offers a course on coding with Ozobots: robots that follow patterns on the digital or physical surfaces they roll over. Other such equipment now in use in libraries includes Sphero – a robotic ball gaming device that you control with a tilt, touch, or swing from your smartphone or tablet; the Finch Robot – a robot designed by Carnegie Mellon University that supports over a dozen programming languages and environments.

Some in the STEM and education communities feel that the use of simple "drag-and-drop" languages and tactile programming equipment in formal and informal education environments oversimplifies coding and thus detracts from the ability of learners to grasp complex programming concepts. However, these tools are gateways into –not substitutes for – the suite of tools that facilitate more advanced programming instruction. By embracing them, librarians can quell their own unease about teaching coding, as well as inculcate their students with a basic appreciation for computational thought.

Library coding activities/programs should focus on building skills for the future

In advocating for making computer science education universal, Weili Dai – President and co-founder of the Marvell Technology Group – recently called computer code "smart English," and "the language that facilitates our lives."[iii] Dai understands that the drive of coding instruction in early education needs to be greater than teaching children and teens a new skill; it must be to prepare children and teens to take the reins of leadership over a world that is continually growing "smarter" as a result of the ever expanding frontier of digital technology. In devising programming and activities involving coding, librarians need to understand this as well.

In a recent post for YALSABlog, Linda Braun of Libraries and Educators Online (LEO) suggests that one of the keys to making coding instruction for children and teens in libraries about building skills and competencies for the 21st century is focusing such instruction on design thinking. She exhorts librarians: "Instead of focusing on learning to code as the end all and be all of the experience, work with teens on a project that embraces the ideas of design thinking. [Participants] can then go through the design thinking process of researching the problem, talking with others about the problem, brainstorming solutions, prototyping solutions, testing solutions, and so on."[iv] ALA's program on youth and technology echoes this exhortation. At the 2016 ALA Midwinter Meeting in Boston, program staff held a workshop to develop a library-centric definition of computational thinking. ALA believes that by coming to a

working understanding of computational thinking, librarians can build programming that primes children for lifelong engagement with STEM topics.

To date, coding programs that have taken this sort of design/computational thinking approach have been successful. In Tennessee, the Clarksville-Montgomery County Public Library offers a Game Design Club and a Junior Coding Club. These two groups – the game design club (for ages 10-18, and the Junior coders club (for ages 5-9) – meet every Saturday at the library for workshops that instill game design skills. Bridget Cloud, the founder of these groups, explains that these groups build practical skills, as well as self-assurance: "By learning to create games, children learn to think logically. They learn communication skills by working in teams, as this is how games are developed. And they learn confidence by creating something they can be proud of."[v] In Illinois, the Zion-Benton Public Library holds Story Time for Teens, a recurring program that uses Scratch programming to teach computer game creation to tweens and teens. Instructors teach the basics of Scratch software, as well as how to how to design a game. Participants plan out their game and then use Scratch to bring their designs to life. This grounds them in the logical and sequential thinking skills that are in-demand in the modern economy. Librarians still considering establishing coding programs and activities should follow the lead of Clarksville-Montgomery and Zion-Benton and encourage the systematic design and creation of outputs creators can take pride in. These sorts of programs build critical skills and encourage continued cultivation of those skills.

Library coding programs/activities should reach out to communities underrepresented in STEM

Currently, the proportion of women in the STEM fields is well below that of men at all degree levels. Furthermore, since 2000, the proportion of underrepresented minorities in engineering and the physical sciences has remained flat, and the proportion of these cohorts in mathematics and statistics has diminished. Coding skills are a building block for a career in STEM. Thus, a concerted effort must be made to bring more women and underrepresented minorities into the STEM fields, and coding instruction must be at the heart of this effort. Libraries are well positioned to lead the effort to build interest in STEM among women and minorities through coding instruction. A number of libraries are already engaged in this effort. Washington, D.C.'s Martin Luther King, Jr. library recently hosted Black Girls Code D.C. – a half-day event that included talks by African American women in the STEM fields across the public and private sectors; various branches of the Public Library of Cincinnati held coding workshops for girls between the ages of 11 and 14 as part of its summer "Maker and Technology" programs; and recently, the Willingboro Public Library invited the non-profit organization Techgirlz – a non-profit organization dedicated to closing the gender gap in technology – to host coding workshops middle school-aged girls.

Libraries everywhere should follow the example of these institutions and build similar coding activities and programs. Additionally, libraries should leverage their existing coding instruction for girls and minorities to create initiatives with a broader footprint. For example, ALA or some other national library entity might consider drawing upon existing library relationships with Girls Who Code, Black Girls Code, TechGirlz and similar organizations to create a national-level initiative.

Conclusion

The analysis offered in this document is intended to be a jumping off point for an ALA-led, robust exploration, taxonomy and assessment of library coding activities and programs for young people. In the coming months, the ALA Program on Youth and Technology will conduct research, consult with technology and education experts and speak directly to children's and teen librarians and library administrators. ALA hopes that that this work will enhance the quality of library services to children and teens across the American library community.

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[i] Jamie Schwarzwalder. "Coding in Your Library." *YALSABlog*. 2 Oct. 2014. http://yalsa.ala.org/blog/2014/10/02/coding-in-your-library/

[ii] Dean Takahashi. "The tiny Ozobot robot can teach young kids programming." *VentureBeat*. 10 Jan. 2015. http://venturebeat.com/2015/01/10/the-tiny-ozobot-robot-can-teach-young-kids-programming/

[iii] "Charlie Wapner. How Libraries are Expanding the Frontier of Digital Technology." District Dispatch. http://www.districtdispatch.org/2014/04/libraries-expanding-frontier-digital-technology/

[iv] Linda Braun. "My Problem with the Hour of Code." *YALSABlog*. 28 Jan. 2016. http://yalsa.ala.org/blog/2016/01/28/my-problem-with-hour-of-code/

[v] "Free Computer Coding Classes for Children, Teens at the Library." *Clarksville Now*. http://clarksvillenow.com/local/free-computer-coding-classes-for-children-teens-at-the-library/