Expect More: Why Libraries Cannot Become STEM Educators

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ABSTRACT

America's public libraries can play an important role in furthering STEM education. However, this will be true only if STEM learning efforts focus on librarians and librarians acting as facilitators. Any effort to transform librarians into STEM experts will have limited success given the increasing number of roles librarians are being asked to take on. At the same time, the current belief among many librarians that they can only offer programming in which they feel comfortable or have expertise will strongly constrain STEM programming in libraries. Librarians must instead create platforms within a community to unleash STEM expertise within the communities they serve. This will involve changing the concept of libraries in the minds of librarians and community members alike. Librarians must facilitate the use and sharing of STEM expertise already existent in the community by the community. Librarians ultimately must see their communities as their collections, not simply materials in the building.

A Counter-Intuitive Argument

Libraries should not become STEM educators. It may seem counter-intuitive to start a white paper on the role of public libraries in STEM by proclaiming they should have no role. It is even more counter-intuitive to discover that this paper will strongly endorse a role for Public Libraries in STEM education. However, I stand by the statement for two reasons:

1. Public libraries, and indeed libraries of any type, are either physical places or abstract organizations and can do nothing. It is the people within the libraries, particularly librarians, that can make things happen; and
2. Public librarians are often unequipped to be STEM educators and preparing them to be STEM teachers is actually counter to the interests of both the librarian and the community served.

So how do I reconcile these reasons with advocating a strong role for public libraries in STEM education? The short answer is that librarians can be key facilitators in STEM programs as they should be in other areas of community learning.

Let us take these ideas in turn: librarians make things happen; it is not in the interest of communities to prepare librarians as STEM educators; and yet librarians can be key to successful STEM programs in public libraries.

Librarians Make things Happen

The core of librarianship is knowledge and learning. This has been true throughout the over four millennia history of libraries. The ancient Library of Alexandria was key to accumulating and building the understanding of physics, philosophy, and mathematics (Casson, 2001). The libraries of Islamic Spain were instrumental to the advancement of western culture into the Renaissance (Burke, 1985). Monastic and early university libraries were founded on scholarship. In the United States the public library movement of the 19th century was coupled with the public education movement (Garrison, 1979) with Melvil Dewey once proclaiming that public libraries were co-equal education institutions with the public school (Idaho, 1903).

Yet through most of modern history we have increasingly seen libraries as places and collections. Knowledge was seen as a recorded commodity that could be shipped and shelved as books, journals, and documents. Libraries referred to documents as "knowledge objects," and the belief was that, in a world of scarcity, accumulating these objects in a library would produce a better educated citizenry. For most of the 20th century the library was a book palace where librarians and the public alike focused on collections.

We also see with the advent of the industrial revolution a move to fixate agency on institutions. That is to say, we believed that institutions like schools taught, libraries informed, government set policy, and so on. This was the age of the production lines and guilds. The people within the institution were often seen as replaceable and

exchangeable. Simultaneously we saw the rise of a consumer culture. The means of production and the means of consumption were separated.

Today we see the shift of agency back to the individual. So schools don't teach, students learn. Government doesn't set policy, politicians make law and civil servants deliver services. Likewise, libraries do not inform, librarians empower community members.

How does this apply to STEM learning? First, it is not a choice of libraries as places or abstract organizations to implement STEM programs. It is the choice of librarians. Public library directors must chose to make STEM a priority, and librarians must feel comfortable implementing these services and programs. A single approach to "public libraries" and STEM ignores the reality of individual action in making this happen.

The other consequence of a shift in agency from institutions to individuals and the rise of a consumer society is the role of community in public libraries. For too long communities were seen as users, consumers, or customers of the library. Library users went to the library to consume media (books, DVDs, ebooks) and services (story time, author talks, classes, etc.). This put the focus squarely on the collection of materials that could be circulated.

This focus on the library as separate from a community led to an increasing view of communities as problems to be solved. Libraries provided literacy services because the community had a reading problem. Librarians provided employment services because the community had an unemployment problem. Librarians built collections and provided access to the Internet because the community had insufficient access to materials and information. Communities and community members get tired of being told what they are not good at. This deficit model does not build motivated and engaged partners in any endeavor. If public librarians are to be any part of increased STEM literacy in their communities they must show how engagement in STEM activities leads to greater opportunity, economic development, and/or power within society.

Librarians Should Not Be STEM Educators: The Greedy Librarian Problem

If librarians can be convinced to engage their communities in STEM education, why do I argue that they should not be prepared as STEM educators? The short answer is that librarians cannot be all things to all people. However, the longer answer is that doing so stretches librarians too thin, and there are much better educators in the communities served by public libraries and librarians should partner with them. To demonstrate these two ideas let me tell a story.

A public library was having a STEM robotics program geared towards 8-10 year olds. One Saturday three librarians worked with the children to build "bristle bots," toothbrush heads with a vibrating pager motor attached. When you power up the pager motor, it vibrates the bristles on the toothbrush head and you can race them and such. The librarians helped the kids cut off the heads of the toothbrushes and helped tape the motors on. However, when the kids connected the small batteries the bristle bots vibrated for

about 2 seconds and then stopped. It turns out the librarians had purchased the wrong batteries, and they were drained very quickly.

The librarians quickly huddled in a corner frantically discussing the situation, and whether they could go get new batteries, who would do this, etc. Meanwhile the kids got a hold of AA batteries. While the librarians were conferring, the kids were taping together whole toothbrushes and connecting them to AA batteries. In a moment of insight the librarians looked at the kids building "bristle tanks" and "bristle battleships" and came to a realization. The librarians realized that they were simultaneously no longer in control of the program and the kids were learning a lot more than the librarians could have planned. What the librarians realized in that moment, was that people learn, and that the librarians' role didn't have to be as teacher, but could be about facilitating learning. They had discovered the "Greedy Librarian" problem, and the solution simultaneously.

"Greedy Librarians" were first identified in research around virtual reference, when librarians answer questions via the Internet. It was observed that when a librarian got a question, they would work extremely hard to provide an answer, even if there was another librarian or expert better able to provide an answer. Librarians, it was observed, feel it is a failure if they personally cannot provide the solution.

This can be seen in programming where many librarians feel they must master any topic that they present to the public. So if they are going to teach robotics to children, the librarian must know robotics (or at least more than the kids know). If the library is going to offer access to a 3D printer, the librarians must be experts in 3D printing to do so. The consequence of this is that librarians naturally limit the programming they will offer. If a library is staffed with librarians with little expertise in STEM, then they will offer less STEM activities.

The answer might seem obvious: provide librarians with a deeper background in the STEM disciplines. They will become more comfortable, and more STEM learning opportunities will emerge. However, if you take this same solution and apply it to the other things we ask of public libraries, the problem becomes apparent. Public libraries offer programming in reading, local history, genealogy, technology, employment, college readiness, early literacy, knitting, and much, much more. Is a librarian expected to be an expert in all of these? At best, this might work in larger library settings with large library staff. Yet even here, how does a public library pick these topics and provide continuous staff development in these areas?

The problem of librarians being stretched thin is compounded by the shrinking of civic government services. Many local, state, and federal agencies are seeking to reduce costs by shrinking or eliminating public services. Where a citizen could once talk to a tax specialist at the IRS, now they are only offered access to frequently asked questions and forms online. This year the IRS didn't even budget enough funds to provide printed forms through libraries to citizens with no access to the Internet or no Internet skills. To be clear, the way the IRS currently seeks to support citizens with no access to the Internet is to provide forms on the Internet! This has resulted in librarians increasingly be called upon to provide support of citizen tax filings. So now we want librarians to be STEM

educators, tax experts, employment councilors, pre-literacy instructors, and manage core library services. The result of all of this is that if we seek to increase public library STEM support, preparing librarians for the task will have mixed support at best.

The Community is the Collection

In order to provide increased STEM activity and support in public libraries we must realize that public libraries, and the librarians that make them work, need to radically change their view of the communities they reside within. Rather than look at the community as a group to be served (supplied access to a collection, taught to read, etc.), librarians must see their communities as their true collection. Communities have in their numbers tax experts, scientists, writers, historians, and much more. Once again, an example can make this clear.

Last summer, in response to the alarming statistics about girls' lack of interest in STEM education, the Fayetteville Free Library in New York offered a Geek Girls camp. Where a more traditional approach to public libraries might have centered on reading STEM materials, or activities taught by librarians, this camp took advantage of the community around them. A female fighter pilot from the Air Force Reserves came and talked about being a pilot, a soldier, and a mom. A local hobbyist brought over her trebuchet to talk about engineering. The girls built their own catapults using parts that they 3D printed, all with the help of their neighbors. Rather than exposing girls to STEM, the librarians helped build a network for the girls with professors, pilots, and others. Rather than the librarians feeling that they had to master all of the exercises (thus limiting the learning to what the librarians knew), the librarians did what they do best: collection development.

When we talk about collection development we think about selecting, acquiring, organizing and circulating books and materials. These same "meta" skills (locating, organizing, preparing, providing access) can be applied to the community itself. The librarians of Fayetteville, and across the country, are seeking out expertise in their own communities. Once they identify experts, they work to provide that expertise to the rest of the community. Here is a professor of physics, maybe she can do a discussion on a popular book or movie. Here is the local afterschool program provider, who has the expertise and knowledge of existing resources to create kits with an oscilloscope, a book on energy, and a lesson plan a parent can use with his or her child.

This kind of facilitating and community-centered approach can be seen in the rise of citizen science. Scientists pose questions, establish methods, build tools, and then seek the help of the community. So scientists studying wildlife in Africa set up a camera to automatically capture pictures at a watering hole. The pictures are too numerous for any scientist to sort, so they use the Web to invite people interested in science to help catalog the wildlife in the pictures. Scientists get data and citizens are empowered to be part of the scientific process.

The result of using the community as the collection puts the librarians in a position of comfort, builds on resident expertise, and ultimately results in a greater culture of STEM throughout the community. The expert receives recognition and the reward of a public

good. The community member gains access to expertise (from an expert that normally has a passion for the topic) and the library builds a stronger connection to the community.

Action Plan

Public libraries as places and institutions can play an important role in furthering STEM education. Public libraries can provide a space for STEM exhibits and community laboratories. Libraries can build and circulate collections of STEM resources (oscilloscopes, telescopes, and voltage meters). For many, that's where their thinking of a public library role stops. However, to have true and lasting impact, public *librarians* need to be engaged.

Librarians can act as facilitators in this work: linking STEM experts with learning communities. To make this happen librarians need to be prepared in the role of facilitation and collaboration. Librarians and community members alike must be shown that libraries are places of continuous learning, not simply book palaces, or physical places for events. The key to increasing STEM literacy across all public libraries – small and large, urban and rural – is to change the perception that librarians have to know everything, or master a topic before they promote it.

Librarians need to understand that the true collection of any library is the community served. Rather than accumulating materials or programs for a community to consume, librarians must transform libraries into places of learning that leverage local expertise. Further, the libraries that librarians build must be platforms not for consumption of learning, but places to amplify and share local expertise to the world.

The heart of successful STEM education is the heart of all good education: people must continuously learn and be curious about the world around them. Libraries and librarians must become engines of local innovation, whether citizens engage in learning for market advantage, personal empowerment, or to shape their society.

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