MAKERSPACES IN PRACTICE

SUCCESSFUL MODELS FOR IMPLEMENTATION

EDITED BY ELLYSSA KROSKI

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PREFACE

Makerspaces and maker activities have evolved from a shiny new trend in libraries to an acknowledged and valued conduit for partnering with library patrons in the production process and a potent means to provide STEM and critical thinking skills to people of all ages. In a 2017 *Library Journal* survey of 7,000 public libraries, it was determined that the vast majority of them—89 percent—currently offer maker programming for their patrons.

Makerspaces in Practice: Successful Models for Implementation is an advanced guidebook to library makerspaces written from a perspective derived from years of practical experience. Written nearly half a decade after *The Makerspace Librarian's Sourcebook* was published, this book strives to be of use not only to librarians who are strategizing how to get started but also to those who are actively running makerspaces and maker programming in their libraries. This handbook offers advice from seasoned practitioners based on what has worked for them as well as which programs and tools don't resonate with library patrons. This essential handbook will answer these questions and more:

- What do we know about library makerspaces now, and what are some of the lessons we've learned?
- What tools and programs have been popular with patrons, and which weren't worth the cost?
- How do we assess makerspace programs and technology?

- How do we keep the makerspaces active with staff?
- Who are the current vendors/suppliers that librarians prefer?

Each chapter is authored by knowledgeable professionals from the library field, all of whom offer real-world advice and experience on these timely topics for librarians in public, academic, school, and special libraries that utilize maker activities and makerspaces.

I would like to express my gratitude to all the knowledgeable information professionals who dedicated their time to share their expertise and experience in this book. It was truly a pleasure working with everyone.

CHAPTER 1

The Current State of Library Makerspaces

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Where We Are and How We Got Here

As the maker movement continues to grow, new ideas and applications are being applied in public, academic, and K–12 libraries. Looking at where we started and where we are headed is essential to applying new knowledge and creating spaces that meet the needs of our users.

The maker movement got its first push in 2006. Maker Media launched the maker movement as we know it today and brought it to the public with Maker Faires. The maker movement really got a boost when MakerBot came out with 3D printers that could be purchased by novice users for an affordable price.

3D printing became the driving force behind makerspaces; it caused a commotion and drew the attention of the simply curious to the budding inventor. People tended to gather around 3D printers, share ideas, and bring them to life. This printing method provided a catalyst, enabling the maker movement to evolve and grow.

The first makerspaces began to pop up in libraries around 2010. Their addition was controversial. Some librarians did not see how they fit into the traditional library. Indeed, makerspaces didn't fit the old mold. The traditional library was changing and continues to change with the maker movement. In many cases makerspaces have revitalized libraries by taking the concept

of knowledge to a new level and transforming them from disseminators of information to creators of knowledge—a role that had always existed but not necessarily in a form based in technology.[1]

Public Libraries

The maker movement seemed to start with makerspaces in our public libraries, followed by their placement in K–12s and academic libraries. Naturally, public libraries were some of the first institutions to create makerspaces. The public library has been using patron-driven initiatives for a while. Public libraries were the first to offer e-books and have historically been a preferred location to test new technology and how well library users embrace it. Public libraries have created new positions and departments to manage the challenges generated by a technology-driven public. To their benefit, they were among the first to address how these changes would affect the way the public viewed their libraries and what their expectations would mean to their services and structure.

School Libraries

K–12 libraries may have had different reasons to reinvent their libraries with the addition of the makerspace. There has been a steep decline in the number of school media librarians within each district; often the position can only be found at high school libraries. Education administrators are fickle with their libraries. Budgets are tight, and we've seen many cuts to the funds available for school libraries. Unlike public libraries, many schools have viewed technology in a separate box, apart from their library. Schools were looking for experienced educational technologists and often didn't see the potential for that to be part of their library. Enter the makerspace, which started to change the way we looked at the role of our school media specialists. Who better than our school media specialists, with their knowledge of curriculum and technology, to create an environment where students can expand their imaginations and faculty can incorporate new ways of teaching? The busy schedules of the faculty often hinder their willingness to incorporate these new ways of applying knowledge, but the makerspace, along with instruction by school media specialists, has made the work much easier.

Academic Libraries

The academic library may have been last to the table, but the strides they have made have been astounding. When you blend makerspaces with research and education at this level, you can't help but be exposed to students and faculty whose productions are groundbreaking. Of course, the idea of incorporating the makerspace into academia was not an easy sell. Convincing faculty and administrators that the library could take a larger role in their courses and change the way we teach took time and required academic libraries to provide an assessment of how it would align with school curriculums. In many cases it added costs to the library and required additional staff, neither of which is an easy sell in academia. As with the K–12 libraries, academic libraries had to prove how makerspaces would improve student learning and support curriculum without putting a burden on an already fully loaded faculty. Selling librarians as technology trainers with a knowledge of curriculum and research was a positive move toward the acceptance of the makerspace.

So where are we today? Currently, we have a wealth of information to pull from; however, the data collection is extremely lacking. The data that has been collected regarding makerspaces show that they are thriving. Later in the chapter we'll take a look at the changes in data gathering required at a national level to adequately address what we do and how we are funded.

Headed for Growth

So where are we headed? I would summarize that in a couple ways. We are making great strides inside the library community in sharing the value of the makerspace and maker communities. Our numbers and support are growing, and the value can be assessed and documented. We see more and more the inclusion of makerspaces in our professional development opportunities, our library school curriculum, and our library journals, and they have been a hot topic at conferences both here and abroad—all because we've proven that the maker movement is not a trend that's hot one day and gone the next. It's stood the test of time. In a world that is technology-driven, trends come and go, but the maker movement is more than just one technology. It changes with our users' needs, evolves with new technology, and brings with it a revitalization to libraries and the creation of knowledge.

Luckily, those of us with makerspaces want to share information with everyone. Fellow makers are quick to tell of their success and even provide helpful information to colleagues so they can avoid pitfalls.

We've gained a great deal of information from our colleagues that can help us grow our makerspaces. Surveys have provided a wealth of information regarding what we are doing right and what we need to adjust to fit our patrons' needs and interests.

Survey Results

I recently conducted a survey of public, K–12, and academic libraries with makerspaces. Our respondents came from many different types of libraries. One of the great things about librarians is their enthusiasm for what they do and their willingness to share. The survey was distributed via public, academic, and K–12 social media and electronic discussion lists, resulting in under fifty responses. While not a large enough response rate to draw clear conclusions, it does provide some information that can be applied to how we view our users.

Library Journal (LJ) conducted a detailed survey of public libraries in March 2017. Four hundred and four public libraries responded to the survey. The two surveys together can help answer questions about makers on a broader spectrum. I wanted to share information that covered all types of libraries—public, academic, and school libraries—as we move forward with maker initiatives.[2]

The LJ survey results will be intertwined with my own survey to provide a greater depth to the information we can use to evaluate our makerspaces and determine the best ways to enhance our spaces. Results from my survey will be referred to as "my survey," and *Library Journal*'s *Maker Programs in Libraries, 2017* survey will be referred to as the LJ survey in the next sections.

Where Are Our Makers?

In figure 1.1 we have a compilation of my survey respondents. For this sample group we show public libraries as still having the majority lead. Because this was not an all-encompassing survey it would be difficult to draw from its

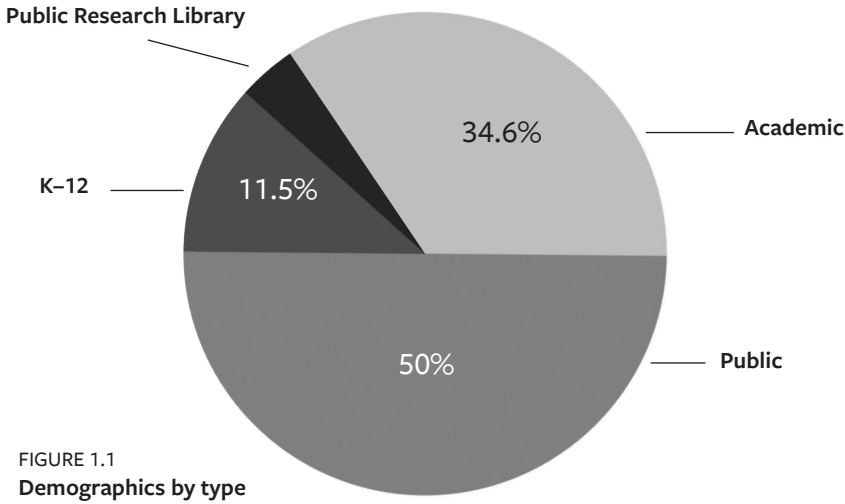

FIGURE 1.1
Demographics by type

results the actual numbers of makerspaces; however, it does give us a window into where we are in terms of locations of makerspaces.

LJ results showed that over 90 percent of the libraries that offered some kind of maker programming were in urban and suburban areas; small town and rural libraries followed closely with percentages in the 80 percent range. Results from the LJ survey indicated that all types of public libraries are including makerspace offerings in their regular programming, with a minimal percentage of libraries not offering makerspace programming.

The results in the LJ survey were more inclusive of all types of making, with crafting making up a large percentage.

Maker Demographics

Figure 1.2 helps us better understand our users and their average age groups. Obviously, from our figure 1.1 examples, we know that our users are more prevalent in public and academic libraries, making the age group in that figure reflect the same. What is interesting is that we see a similar number of adult and college student users and lower numbers as the age goes down. It could be because of the lower number of makerspaces in K–12 schools, or even that

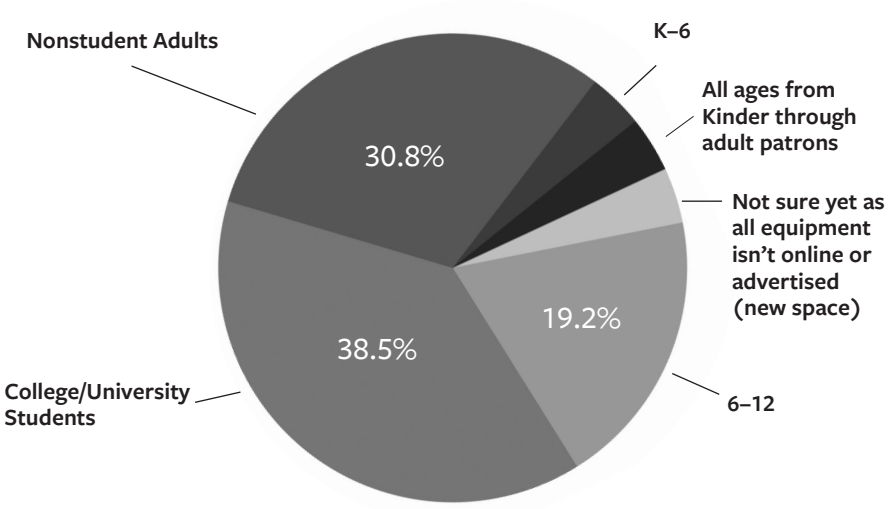

FIGURE 1.2
Demographics by age

there are not as many suitable and safe activities for younger age groups in a technology-based makerspace.

Age groups vary by institution, as do the communities they serve. Elementary schools and high schools are some examples of where we would find a consistent age group. The elementary school needs very specific activities that are deemed safe for younger age groups. High schools offer many of the same types of equipment we see in public and academic libraries but don't encounter the same types of issues experienced when serving small children.

My survey results show that the majority of users are adults. Knowing the age groups we serve allows us to build programs that reach our intended age group, but more importantly it allows us to gather data from specific age groups on the types of programs that best serve their needs.

Identifying our user age groups is just the first step in determining what fits an institution or community.

The LJ survey's demographic results varied from my survey in that children's programming was offered by 83 percent of the libraries, teen programming was offered by 73 percent, and adult maker programming by 51 percent.

Traditionally public libraries have put an emphasis on children's and teen programming in general, so the results of the LJ survey are not surprising.

My survey results differ slightly due to the mix of respondents. In addition, a greater amount of adult programming was shown in my survey demographics due to the inclusion of academic library results.

The most applicable information from the survey came from what respondents shared in the questionnaire portion.

Most Popular Makerspace Programs

Both surveys offered unique results from the most popular programs. Listed in table 1.1 are the top results from each respective survey.

TABLE 1.1
Most popular programs

My Survey	*Library Journal* Survey
3D Printing	Crafts
Robotics/Circuitry	Cooking
Graphic Design	3D Printing
3D Modeling	Sewing
Sewing	Painting/Drawing
Open Creative Space	Robotics
E-Sports	Coding
Crafts	

Not surprisingly in my survey, technology tops the list; however, I saw a rise in the variety of makerspace offerings and in the number of makerspaces partnering with other agencies. We all know how much our funders love partnerships; so, this is something to note. Partnerships can go a long way to help you fund activities and equipment for your makerspace.

Partnerships came up in several of our responses. One respondent listed a successful program on gardening that included a partnership with the Alabama Cooperative Extension Office and another offers the services with the Small Business Development Center. Partnerships have also showed up between university faculty, other libraries, and K–12 schools and their libraries.

The responses from my survey can shed some light on the impact of partnerships. Some examples are listed below:

"Thanks to our partnerships with the Education Foundation, we've also been able to provide Digital Technology Classes to children and teens using laptops that they provided us with, as well as 3D design classes for all ages, including adults. The Education Foundation was also able to provide us with the Lulzbot TAZ 5 3-D Printer in August. Without their partnership, we would be unable to provide many of the STEAM programs we offer."

"Gardening classes with partners from the Alabama Extension Office were very popular."

"We partner with the Ohio Small Business Development Center, and this has allowed us to bring in local hopeful entrepreneurs and those who just want to explore how to take an idea and make it a business."

The LJ survey also provided many comments that we can apply to improve our makerspaces.

"Our most successful maker programs involve making a custom thing that a patron can leave with. . . . Our less successful programs have been "open-hours" type programs that are meant to introduce people to the space. Our patrons need a specific project/thing to do in a space and aren't as amenable to open-ended activities."

"Our school-age kids and teens *love* our tech toys. We take our toys around to the Boys and Girls Club, as well as create programming in the library—we have seen an increase in program attendance. Students are excited to work with tech toys and have even started to teach other students about basic principles of technology!"

"I wish we connected maker programming better to the broader mission of libraries—helping people access information in new formats, etc. Too often it looks like it's just the cool thing to do, when maker programming actually has potential to build real skills in our communities. I wish we did a better job in the library world connecting that to our overall mission."

The answers were as varied as our spaces—robotics, graphic art, recording studios, VHS conversion stations, e-sports, and so on. All resulted in programs that drew in users.

Sewing also came up on our respondents' list of successful programs and is something I've seen growing in our makerspace as well. Respondents said their teens who have attended sewing programs feel that they've learned a valuable skill.

Aside from 3D printing, successful programs varied considerably. Crafts were mentioned multiple times. Making Chapstick and holiday- and Pinterest-inspired crafts lead to successful programs.

The results from the LJ survey of public libraries differed from my survey in several ways. Again, these variations are likely due to the number of children's programs offered at public libraries, but craft programs comprised the largest percentage of the programming offered, with technology and robotics making up a much smaller portion. The LJ survey asked respondents what programs were offered and ranked those offerings by percentages. This gives some feedback as to the popularity of the programs; however, for both surveys it is likely that the popularity of a program and what's being offered need to be taken into consideration.

Would these figures change if different programming was offered? For instance, a library that offers more craft programs would likely respond that crafts are most popular, and a library that offers more technology-based programming would report the same.

From the LJ survey we learned that 72 percent of the libraries responded that they offer craft programs; 67 percent offered knitting, crocheting, etc., while only 40 percent of the respondents offered 3D printing. Going down the chart we don't see technology-based offerings until we get to music production, with 12 percent of libraries reporting that they offered this type of service/program. These figures remained relatively the same for adults, teens, and children in the LJ survey.

In some ways we can look at our two survey results and see that much of what we report as popular is based on a particular library's offerings.

My survey reflected more technology-based programming. The respondents from my survey were from institutions that had dedicated makerspaces.

The LJ survey reflected more traditional programs, and for good reason. Fifty-seven percent of the respondents did not have a dedicated makerspace. While a dedicated makerspace is not essential to having successful maker programs, the lack of that space would have a huge impact on whether a

library could offer some of the more popular technology-based makerspace programs.

What Makes a Program Popular?

To determine what makes a program popular, we have to look at how we measure the popularity of a program. As with most library programming, we measure that by attendance. For makerspace programming we may have to look at other ways to assess the popularity of a program. Adding the number of attendees and correlating the number of programs offered would give a bit more insight into the success of a program. Going forward I would also add in requests for programs and repeat users. Ultimately what we want for makerspaces is not just a single visit to the space. True success would require us to add in an assessment for return users—those people who learn from a workshop or program and return to the space over and over to create something new.

The LJ survey gave us some important information gained from tracking attendance, and that is that half of the public libraries surveyed reported their adult programs increased, with around 40 percent reporting teen programs increased and six out of ten attendees reporting that children's programs increased.

Based on those survey responses, it was clear that there were pieces that could be pulled from each response to create successful programs.

What I found to be a common theme in the successful programs was a combination of hands-on training, access to equipment not available elsewhere, knowledgeable staff, ease of use, and public demand.

What Pieces of Equipment Are the Most Popular and Why?

The 3D printer still reigns. A versatile piece that we see making a big impact in makerspaces is the Cricut cutting machine.

Popularity of an item varies by user and institution. Flashy, expensive items are still a draw, but many have found that simple crafts and sewing open the makerspace to more users.

Many respondents noted their most popular items were ones they could not afford on their own. Table 1.2 lists some cost-prohibitive items that are popular.

TABLE 1.2
Most popular equipment

My Survey	*Library Journal* Survey
3D Printers	Button Makers
Robotics Circuitry	3D Printers
Design Software	Cameras/Video Equipment
Sewing Machines	Laminator
VHS Conversion Station	Sewing Machines
Virtual Reality Equipment	Audio Equipment
Go Pro Cameras	Vinyl Cutters
Vinyl Cutters	Laser Cutters
Typewriters	Maker Kits
Laser Engravers	

Not everything listed as popular fell into the expensive category. Listed below are some of the lower-cost yet still popular items.

- typewriters
- sewing machines
- 3D pens
- sticker mosaics
- Rubik's Cubes
- hot plates (cooking, melt-able plastic, and crystal growing)
- paint kits
- paper crafts
- craft supplies

The results from the LJ survey showed an interesting turn from my survey. Again, these results likely stem from the majority of respondents not having a dedicated makerspace. Public libraries' most popular items and types of programs, according to this survey, were almost the exact opposite of the list above, with technology and large equipment ranking much lower, and crafts, painting, and cooking topping their list of popular programs. This held true whether it was adult, teen, or children's programming.

I would be very interested to note if we see a change in public library results in the next few years. Obviously funding and how we allocate funding

in public libraries could influence such changes if more funds were available to purchase technology and if more technology-based programming was offered.

The LJ survey offered some insight into who is teaching our programs. This proved extremely helpful because the results showed quite a mix. Eighty-six percent of libraries designed programming around the current skills of library staff, and six out of ten libraries partnered with other organizations to bring in people to present programs.

The LJ survey and the one I conducted touched on a similar theme, and that is: Successful programming comes from having trained staff or outsiders who can facilitate the variety of programming and skill sets that are present in the makerspace.

The two surveys used in conjunction give us a view into how different library makerspace programming can be. Often, we start out thinking of the makerspace as an expensive, technology-driven initiative, but what we've seen from the LJ survey of public libraries is that libraries are doing what they do best. They are finding ways to bring maker initiatives to their users in ways that best fit their budgets, their skills, and the interests of their users.

What Is the Next Step for Your Library?

Overwhelmingly the response was to add space and equipment, which tells us the makerspace is thriving!

Respondents from my survey had the following comments:

"Move back into our permanent location, which is currently undergoing a major renovation and expansion."

"Storage furniture to make items more readily available."

"Adding new and innovative classes that fit our community and what they are seeking to learn. We are currently purchasing fourteen Adobe Creative licenses for the months of February and March so that we can offer hands-on Photoshop classes. We're constantly showing people how to use the space and make the most out of it with hands-on classes, and that will continue. We also have one-on-one training, which will also continue. We're working on creating didactic tools for the makerspace; so, if any one staff member leaves, that knowledge is not lost

when that person goes. The information will live in a notebook or hard drive, not just in that staff member's brain."

"Expanding our space to cover as many STEM subjects as possible. We act as a bridge in this regard to provide children with a STEM program that the local schools cannot, due to budget constraints or curriculum constraints. Our biggest obstacle is that this library is operated by one person and with one very part-time employee. I do not have the time permitted to run my programs as often as I would like."

"Adding sewing machines, then formalizing a system for students to access the materials during the school day (it is currently an after-school program)."

"We're incorporating artificial intelligence work into our offerings. We're also going to showcase sustainable gardening that can incorporate electronics (Arduinos and such)."

Many respondents reflected on ways to change how they delivered programs. Some would like to bring in those with expertise; others would like to organize training and ensure that knowledge of equipment is transferable to new staff. Staffing and training are always a concern in makerspaces. Often, we start with just one or two staff who learn how to use and repair the equipment and then train our users. If the person with the knowledge leaves, you may be left starting over. Having backup staff and training materials is as essential to our makerspaces as it is to any department in our libraries.

Partnering with other departments and faculty made the list, with some utilizing this as a means to provide more training and a wider knowledge base.

Our respondents clearly indicated that growth is where we are headed. We've offered a variety of services and technology through the addition of makerspaces and created and run effective programming. Now we are looking at the next phase, which is wide open. It could be creating video studios, adding a virtual reality center, adding staff and equipment, organizing our equipment and training, finding additional space, partnering with other institutions, inspiring entrepreneurs, providing access to our technology users, and other things we could never have imagined.

If there is one thing libraries have done well for centuries, it's organizing information. This ties in with some of the aspects I mentioned previously.

In order to obtain the funding we need to grow, we have to gather data and make it accessible to funders. I'm sure most of us have collected mounds of data. Now, we need to determine how to get that data reflected in national and state library statistics.

One thing is for certain: We have proven that makerspaces are not a trend. During the past ten years, we've changed the face of our libraries, revitalized a feeling of wonder and excitement in our users, and ensured that libraries will move forward as creators of knowledge.

Where's the Data?

The current data seems to skirt around the impact of makerspace programming, often listing out media centers and the technology available but stopping short of identifying how many libraries have makerspaces.

The National Center for Educational Statistics (NCES) surveys all types of libraries; however, the surveys reflect what we might think of as traditional library services. The data collected has not changed to reflect what our school and academic libraries have done to incorporate makerspaces in our libraries.[3]

> Congress uses the data to assess the need for revisions of existing legislation concerning academic libraries and the allocation of federal funds. Federal agencies need the data to evaluate and administer academic library programs. State education agencies and college librarians and administrators use the data for regional and national comparisons of library resources to plan for the effective use of funds. Finally, library associations and researchers use the survey results to determine the status of academic library operations and the profession.[4]

As you can see from the survey design logic above, this is an issue. Without statistics, a piece is missing in what we can do to advocate for the important role our makerspaces play in the creation of new library spaces. Possibly even more detrimental is the fact that federal funds are allocated based on these statistics. If the data being collected to make these determinations do not include statistics that reflect the true nature of what we're doing with makerspaces, how then do we gain the funds to keep moving forward?

It's not only the NCES that hasn't changed to reflect the times. When searching for data on public libraries through the Institute of Museum and

Library Services' (IMLS) public library system data collection I found little to reflect the impact makerspaces have on the public library system. That said, IMLS has still been a major funder of makerspaces. Just browsing through the mini-grants section, it is evident that multiple grants have been awarded to start makerspaces. They have been a great resource for getting makerspaces in libraries; however, we need to sustain funding to keep them growing.[5]

Reading the latest Public Needs for Library and Museum Services Survey, I found, once again, that we aren't asking the right questions. The survey includes questions about books, computers, and programs, but nothing to let our users express their need for or confirm their use of items that would be in our makerspaces. If we cannot identify a need or a user, how will we obtain federal funds?

To address where we are going, we must know where we are. Without data, and by that, I mean data that is gathered to obtain federal funding, it is almost impossible to make the case for the increase in funds needed to maintain a technology-based makerspace.

Gathering Data

The easiest way to work for a change in the funding is to reach out to those who gather the statistics and request change. We can make the case that we need to accurately report where our funding is being spent. Funding makerspaces has changed how libraries allocate their budgets. Now we must be able to reflect that in the statistics we report out. Frankly much has changed about how we allocate our funds, and still we see statistics that are geared toward how libraries have operated over the past ten years. When we report lower spending on our print budgets and less physical checkouts, it influences our level of funding. We do have the advantage of counting the numbers and programming in our libraries, and that has always been a driver for funding; however, the cost to provide new services, such as makerspaces, won't be covered by a budget geared toward outdated access measures.

New Survey Methods

Project Outcome was introduced in 2015. The Bill & Melinda Gates Foundation provided funding to provide libraries with the tools they need to gather

data and report outcomes. While this seemed promising, the surveys measured traditional services. Early childhood literacy, digital learning, lifelong learning, health, job skills, economic development, civic engagement, and summer reading categories were the basis for personalized survey kits. Here was an opportunity for libraries to expand some of these categories to reflect the services and assess outcomes of our makerspaces. Browsing the Public Library Association's (PLA) information on Project Outcome leads to data on library services but lacks data on any specifics of makerspaces. There is room for new surveys to be created, which could provide a way for libraries to begin a more accurate assessment of their makerspaces.[6]

We know what we've done to bring libraries into the future, but do those in government budget offices really know what we do? In most cases—if not all—they don't. They don't see the change reflected in our statistics and are very much tied to a traditional library model that no longer reflects our services.

Not to be all gloom and doom about our budgets. There are ways we can change how we report out with our statistics, and we can start with what we do best: providing research to those who make the surveys and those who set the federal budgets.

We see much more being written about the impact of makerspaces in libraries. From journals to textbooks, makerspaces have become an accepted and valued asset, and their impact is shown throughout library literature and is a highlight of many library conferences.

NOTES

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