Abstract: Recent trends in librarianship point to themes of crafters, artisans, and makers in library spaces. The American Library Association's Center for the Future of Libraries includes the Maker Movement as one of its trends. Librarians can support these makers and entrepreneurs by thinking of libraries as a place to create through community building and engagement, and considering job skills needed for success and confidence to staff such spaces, but this transformation requires administrative support. This article summarizes this movement for libraries and suggests a route to success through a case study of a year-long grant on Making Maker librarians.

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This article describes the research and case study funded by an LSTA grant awarded through the North Carolina State Library while the authors were at the University Libraries of the University of North Carolina at Greensboro.

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Librarians as Makers

Librarians as Makers

Recent trends in librarianship point to themes of crafting, artisans, creators, and makers in library spaces. The Center for the Future of Libraries of the American Library Association (ALA) was created to support librarians with resources and information on key trends affecting libraries and their communities (American Library Association, n.d.). One of these trends is the Maker Movement, which calls for the return of the artisans, creators and makers - and for ways libraries can support these movements and entrepreneurs. Shifts in library environments are not new, as the topic of the changing nature of libraries has been covered in numerous articles, books, and conference presentations for decades. Articles range in extremes from libraries are dying to libraries are thriving. Doucett (2016), in her book *New Routes to Library Success*, offers creative ways – often looking outside traditional library world – for libraries to serve their communities, pointing out how libraries advocate for the arts and collaborate with artists. In order for libraries to transform and remain relevant, library leadership (and library educators) must rethink the library culture as well as what job skills are needed to be successful in this maker environment.

In order to transform, it is best to step back and look to the role librarians play in serving their communities and users.   Rosenweig (2013) states:

Librarians will increasingly act as guides, experienced climbers who have the skill and leadership ability to assist others on the trip up the mountain and back. This kind of transformation will require libraries and librarians to revise their image of themselves… [to] basecamps, out there in high country where people want to go climbing (p. 63).

Climbing is analogous to learning new things, experimenting, and forging new paths – all of which involve testing, failing, getting up, and trying again, also known as an iterative process. As users seek guides for their endeavors, they need research and support along the way, from learning the how-tos to gathering or borrowing the necessary supplies. Libraries are now looking to new tools and learning spaces to support users in carrying out their ideas by providing openness to experiment, iterate, and create (Johnson, Adams Becker, Estrada, & Freeman, 2015). The 2015 Association of College and Research Libraries' Environmental Scan points out in their section on 3D Services, Makerspaces, and Technology Services that academic libraries have opportunities to provide "a hub for cutting edge technologies that allow students to experience and make use of new technologies" (p. 17) for such making experiences from hands-on art to building a robot.

In order to provide creative, flexible learning spaces and help guide library users on their learning journey, the library staff need training to support them. Organizational flexibility and innovative practices through library leadership allows libraries and their staff to make this shift. While necessary leadership support is important in all types of libraries, the authors are academic librarians, and this article looks primarily at such libraries.

Administration and library leaders play a critical role in setting the tone, supporting training and initiatives for their staff, building community and campus partnerships, and developing a positive organizational culture that embraces change and resiliency. Leadership and organizational culture are widely believed to be linked in the process of change (Sarros, Cooper, & Santora 2008). Typically research universities are incubators for new discoveries and innovations that can reach local to global communities, but as Johnson et al. state (2015) "it will require visionary leadership to build these flexible, creative, entrepreneurial environments that

are able to quickly change processes and strategies as startups do" (p. 9). Mathews (2012) states

when discussing this paradigm shift in libraries that is both transformative and disruptive:

"...don't think about making vacuum cleaners better, think about cleaner floors" (p.1).

Leadership must impress on its staff the desire to seek the outcome they wish to reach and not

simply improve the existing spaces, process, or services. Ubiquitous technological shifts in the

last few decades have pushed libraries to rethink their role in their communities, and users,

needs. Technology can be a catalyst for promoting a culture of innovation in a widespread, lean-

startup, cost-effective manner. In many ways, this shift is being driven by the technologies that

students use in their daily lives and that extend to learning (Johnson et al., 2015).

What can we as librarians do better to support an engaged, participatory community

through a culture of creativity, for research, learning, and scholarship, especially if many of our

foundational library roles and services are no longer needed, can be found elsewhere, or even

done better by others? In the future we may still work "as a librarian," but a traditional physical

library will have shifted, especially if library services are integrated elsewhere on campus or in

the community. "This is why we need to be open to the definition of what an academic [or other

type of] library is and focus on what people need it to become" (Mathews, 2012, p. 2) in order

for our users to be successful. What our users need is shifting, and part of the shift is a need for

new spaces that allow for more than information seeking to using information for creating and

constructing.

Library as Place to Create

Seymour Papert's theory of constructionism – learning through the act of construction –

 focuses on the art of learning or "learning to learn" and can be experienced in a library as a

living learning laboratory (Papert & Harel 1991). How learners engage in a conversation with

artifacts – both theirs or others – and how these conversations boost self-directed learning and the construction of new knowledge using tools, media, and context in human development is all part of constructionism or the making theory (Ackermann, 2001). Making sense of our own individual experiences and then optimizing these interactions with the world demonstrates the application of making to learn. As Houhgton (2013) says in her chapter in the Library 2020 book:

> We need physical and virtual technologies to facilitate our communities' creativity, as well as people to install, maintain, and train on these technologies. The library will become a host to locally created content, featuring local authors, musicians, artists, and videographers...giving voice to the community itself (p. 38).

This locally created content can often be used, shared, and built upon by others. Libraries are already prepared for this role to host, share, build upon, and reuse content for their local community. Libraries are particularly well suited to support the creators in their community with a built-in audience.   Collective impact, connected learning, and sharing economy are all key trends from ALA's Center for the Future of Libraries that fit this library maker culture (American Library Association, n.d.). The future of libraries is about a user community engaging to create content and using it for "community building, connecting people, engaging students, assisting researchers, and advancing knowledge production" (Mathews, 2012, p. 3).

Community Building and Engagement

Lankes, Stephens, and Arjona (2015) state "while learning specific types of technology is important, professionals should also look at the bigger picture and figure out ways to engage the community" (p. S65) as well as learning with and through their communities. By taking a proactive approach in developing services, spaces, and opportunities for active engagement with

our constituents, libraries consider their users or their community as the keystone. Every library

community will vary, drawing on individuals' needs that create together a full picture of the

whole of community. Libraries can create a community of practice to support these library

making environments.   A community of practice (CoP) is a group of people who share a

common concern, a set of problems, or interest in a topic and come together to fulfill both

individual and group goals (Cambridge, Kaplan, & Suter, 2005). Making is a very general term

but it constitutes creating knowledge, learning, experiences, prototypes, research, and so on. A

CoP includes a domain of knowledge (in this case, something related to making), a community

of people (the community the library supports) and the shared practice within their domain

(collaborating on projects, sharing knowledge as a group), with member benefits: assistance with

challenges, access to expertise, team contributions, confidence building, enjoyment, meaningful

participation, and a sense of belonging (Wenger, McDermott, & Snyder, 2002). Making is about

individual action but as part of a larger community of learning, with active participation by a

group.   A group's knowledge is also, "an integral part of their activities and interactions, and

they [the CoP] serve as living repository for that knowledge" (Wegner et al., 2002, p. 9).

Libraries are a repository of knowledge created formally and informally, and recent literature

suggests they are becoming living laboratories as well. Making maker communities of practice

fits into any library's vision and practice.

Library Skills and Training Recharge

To allow for this important shift, a first consideration must be on "the critical importance

of new and vital competencies for academic library employees—competencies that are aligned

with reinvigorated visions and strategic directions" (Smith, 2016, p. 2).   Most libraries have a

solid aspiring vision and strategic plan goals and measures, which are reevaluated annually and

applied in daily work and decisions including those related to space and positions. Though these

spaces and positions will constantly change, the need for foundational training in making and

creating will keep librarians in the field grounded for years to come (Moorefield-Lang,

2015). Rethinking what library staff skill sets are needed in this community-engaged maker

space culture is critical. There is no doubt as to the benefits of engaging learners in creative,

higher-order problem solving through hands-on design, construction, and iteration (Johnson et

al., 2015). The 21st century has signaled a shift in what types of skill sets have real, applicable

value in a rapidly advancing world, including what tools are now accessible to more people,

although not all – but libraries can assist by providing access to those who do not have the means

or access.

Looking back over the past 20 years in her 2008 article "Reinventing Our

Work", Goestch reflects on the major transformations of services, collections, facilities, and

generally what we do in libraries (2008). She refers to Bridges' (1994) article in *Fortune

Magazine,* "The End of the Job," stating the "post-job organization has several characteristics....

work is defined by customer needs and not a job description" (p.158). The customer, our users,

our unique and individual communities are what drives the future of each library. Goestch

asked, "How are we responding in the first decade of the 21st century? Are we creating library

jobs that address new and emerging user needs? What are the skill sets needed to do this work?"

(p.159). Libraries can both reinvent traditional library positions and create new roles that require

technical skills as well as flexibility and ambiguity. This will require continuous learning on the

job and support for this retooling or retraining by administration, possibly a shift in the library

culture, as well as rethinking our professional education.

A more recent study by San Jose State University School of Information (2015) analyzing over 400 professional job postings shows this shift in mindset and skills might be happening, with 37% of job postings in 2015 categorized as "emerging" or jobs that require emerging skills. The breakdown of common duties within this area however does not indicate new learning spaces design or makerspaces and related skills as something on the horizon at all. Searching the document for the word "spaces" had no results, indicating to the authors, a need for more library leaders to become aware that these trends and skills sets are needed in their libraries in order to better serve the emerging maker communities seeking access and support to create and construct.

ALA President 2015-2016 Sari Feldman (2015), in a recent *American Libraries* magazine article, shares various library colleagues thoughts, including David Lankes: "We library professionals take pride in our degrees, but our job requirements are changing rapidly … If we believe that libraries are places of continuous lifelong learning … why not prepare ourselves as well?" (para. 2). Lankes et al. (2015) published a relevant article summarizing a discussion group at a 2011 global gathering of library educators called Libraries and Museums in an Era of Participatory Culture. This group developed recommendations for skills needed by librarians and museum professionals in today's connected and participatory world, including cultivating creative and imaginative learning experiences within library school education in order to develop a place for this participatory culture and community. Making maker librarians who can come into a library with this mindset is a significant step toward creating that culture but specific skills will fluctuate and change over time. According to Pryor (2014):

As technology shifts, so do libraries: for many years the technology of information

distribution was text and paper, and that was reflected in the technology collected and

provided by libraries. Technology now exists and is affordable to create and distribute

information in new ways … for academic libraries 3D printing creates possibilities for

teaching and research …. a technology that is affecting nearly every industry (p. 8).

Library staff also need to have the technical skills and especially the confidence to try to

manage a 3d printer service and other maker technologies. Pryor (2014), in discussing

implementation of a 3d printer service in academic libraries, lists policies and procedures

including understanding the basics of 3d printing software, files formats, and basic spatial

analysis, skills that would be surprising to find taught in many library schools now.

It is worth investigating how future librarians are being prepared for makerspace

development. A quick review of the current course offerings of the top library graduate school

programs in North at the time of this writing shows very little is being taught on this concept

currently or at least is not evident from course summaries.   University of Illinois' ischool reveals

one general class, LIS 490IL, Informal Learning Spaces and Pedagogies, which teaches about

spaces but not skills. It appears to focus on exploring the design of space and pedagogy for

informal learning in libraries, museums, and other public and private collaborative spaces,

including information and learning commons, learning labs, and makerspaces as well as

pedagogy and critical sociotechnical perspectives on technology and society. The University of

North Carolina at Chapel Hill offers classes in related topics such as programming and web

development, but no specific maker classes. The University of Washington offers LIS 567,

Libraries as Learning Labs, which appears to focus on youth development practice,

programming, and resources including story times, book talks, and maker spaces. The

University of North Carolina at Greensboro's library school program offers an Emerging

Technologies course that often incorporates these making concepts, and on occasion has offered

a makerspace special topics course. Anecdotal evidence of the author's personal experience

hosting many practicum, internship, or independent study graduate students, observed that

interested students will seek experiences in these types of spaces and environments. Yet, as of

2016, the concepts of making and the skills needed to run these spaces is as uncommon as

instructional design courses in foundational librarianship programs.

At the same time, competencies for professionals in these emerging makerspaces are

beginning to appear in the literature. Challenges stated include finding the right personnel with

knowledge and skills to facilitate the learning; sustainable funding (since most makerspaces are

started by grant funding); advocacy, because users see makerspaces as a fad and only for

engineering students; and a strong vision for the space (Koh & Abbas, 2004). Beyond a strong

vision for the space is having a solid understanding of the library's community as each

community's needs are unique. Koh and Abbas (2004) interviewed key makerspace

professionals and determined top competencies, mainly soft skills, needed for those staffing

these spaces: ability to learn, to adapt to change, to collaborate, to advocate, and to serve diverse

people. They also address skills that can be more easily taught: management, program

development, grant writing/fundraising, technology literacy, and facilitating learning. Many of

these are taught or offered in library school programs or through professional development

workshops/online classes for those already in libraries. But the softer skill competencies listed

above are not as easily taught in school or workshops, yet these are the skills the case study

described later on in this article hoped to convey to the participants. Libraries and their

administrators are in a prime position to create a culture which supports growth in the softer skill

areas. The willingness of staff to be open to these changes is key, but the library environment or

culture, along with the support for staff to gain the skills through informal or formal education,

conferences, networking with others, and learning by doing, is a must. Many librarians consider themselves educators and became librarians because of the love of learning and helping others through their learning process, so this idea is not a foreign concept for librarians, though often we get stuck in what we know and are comfortable with doing.   Being open to constant change, innovative ideas, and new knowledge will propel libraries forward and better serve their communities.

A growing number of universities have established makerspaces as interdisciplinary hubs where students can experiment, create, or even invent products bolstering not only science and engineering departments but media and journalism schools and other humanities and social science areas as well (Johnson et al., 2015). This surge of makerspaces includes a growing interest for implementing makerspaces in libraries – an interdisciplinary space on campus or in a community. Maker culture goes hand-in-hand with the need for more STEM education. Participatory, engaging, and real-world, it emphasizes experimentation for learners. This experimentation, innovation, and the testing of theory through practical, self-directed tasks with actual artifacts and within informal learning environments is naturally found in libraries (Sharples, Adams, Alozie, Ferguson, FitzGerald, Gaved, McAndrew, Means, Remold, Rienties, Roschelle, Vogt, Whitelock. & Yarnall 2015). By offering these spaces, support, tools, and culture in a library, those usually without the means or access to such resource, now have a free place to create and learn, perhaps bringing more, possibly underrepresented uses to STEM fields. This makerspace trend carries with it a great deal of energy and enthusiasm, but as noted earlier often relies on librarians to teach themselves. While exploration and self-discovery are hallmarks of a successful makerspace, the deadlines imposed on librarians to manage such a

space do not often allow the time necessary for these methods of learning. This case study described next is aimed to assist librarians with this gap in knowledge and experience.

Case Study: "Making Makers"

During the 2014 to 2015 academic year, a team consisting of primary investigators Brown Biggers and Beth Filar Williams, Curriculum Coordinator Michelle Folkman and Graduate Assistant Corinne Luthy embarked on a project to provide in-depth experience with maker topics and technologies to UNCG Library and Information Studies students and library professionals across the state. The project was supported by a Library Services and Technology Act (LSTA) grant, administered by the State Library of North Carolina, and awarded with the intent to provide resources to assist librarians in quickly getting started on the use of maker-related technologies. Included were in-person training sessions, online workshops, and the project culminated in a day-long conference. One hope of this grant was to shift perspectives and build the confidence of attendees that "everyone is a maker." The grant team planned pre- and post-tests to assess how perceptions changed on making/makers before and after the grant workshops, webinar, or event. Researchers expected to see positive shifts in mindset.

The team began with initial planning conducted via biweekly meetings with the primary investigators and the Curriculum Coordinator. As the project progressed, meetings were expanded to include other stakeholders, such as the geography and anthropology departments, the School of Education, and the Department of Library and Information Studies. The first two departments were included for the academic librarianship angle: How would academic librarians liaise and support making for their academic departments on campus, especially at a primarily liberal arts campus? These relationships, meetups, and workshops with geography and anthropology faculty and students were especially pertinent to LIS graduate student Luthy's

practicum work on the grant team. The School of Education and the LIS department were key stakeholders for the eHUBs and AcadeMake conference, both to be discussed later on, and the team also worked specifically with those enrolled that term in LIS 631, an emerging technologies course.

The following are the key pieces of the making-makers case study. Figure 1 shows the grant outreach. [Place Figure 1 about here]

Online Resources

Perhaps the earliest item developed by the team was an online resource termed the "Make Toolkit," created throughout the research and work of this grant. The Make Toolkit contains a compilation of maker information, links to resources such as tutorials, PDFs, web sites, online tools, and a list of local makerspaces with contact information. Over the year the team continually evaluated and added resources as they were discovered, created, or suggested by others. These resources are a useful training tool available for any librarian or administrator to review, to gain insight into the maker movement in libraries, or to gain needed skills. It is freely available to all from UNCG's University Libraries web site:

http://uncg.libguides.com/toolkit/make.

eHUBs

One important aspect of the grant work was its integration into the UNCG's Library and Information Studies Program curriculum by means of collaborating for eHUB meetings. The UNCG LIS department has a growing majority of online-only students, and the eHUBs are a way for LIS faculty to reach out to current and future members of the North Carolina library community in person at various prime locations around the state. The grant team collaborated with the LIS department on location and dates, assisting with marketing and recruiting attendees

and developing content for the day to introduce attendees to maker technologies, methods, and culture. For these eHUBs, the team was able to provide direct training in multiple 3D illustration and circuitry applications in four North Carolina locations: Charlotte, Raleigh, Asheville and Wilmington. Through these events, interactions and connections were made with librarians across the state. These face-to-face workshops gave librarians the chance to experience maker technology firsthand, dive in, and get messy – the way innovation works. As Mathews (2012) states in "Innovation is messy... it's disruptive. Real innovators get their hands dirty" (p. 12). Many participants at the eHUBS were able to put concrete definitions with what were previously abstract concepts and realize that the maker world can be accessible to all types of libraries, patrons, and budgets.

During the eHUB events, participants played with electronics kits and online resources. They were encouraged to break pieces and burn out components by running too much electrical current through them. The concept of makerspaces or workshops on making is to offer tools and the learning experiences needed to "help people carry out their ideas through openness to experiment, iterate, and create" (Johnson et al., 2015, p. 40). Failing is a critical part of learning. The resulting flash of light with the electronic kits was not only fun, but it also demonstrated that these parts were easily replaceable, and that mistakes and errors were acceptable and encouraged.

During the eHUB events, a round-robin discussion session allowed all participants to share things that each made. Whether it was quilts, cookies, or even chicken coops, nearly everyone is a maker. This was a joy to the participants as they came to understand that makers are not limited to 3D printers and circuitry as their only means of creation.

These eHUBS also built community. Attendees were from the local areas, but the staff

the various libraries often did not know each other. Now they can connect locally to share ideas

or stories, partner for trainings or events, and perhaps create a local shared maker-faire event one

day. Having multiple attendees from the same library or school was beneficial in other ways and

also built community. A triad of a teacher, librarian, and school principal attended together, each

for a different reason perhaps, but all left with a greater understanding and perspective one hopes

will continue this as they create a community of practice in their school community.

Online Workshops

The team also created presentations and webinars in Blackboard Collaborate and hosted

on Youtube. In addition, some supplemental PDFs were created to go with the webinars. These

eight in-depth instruction sessions ranged from 10 to 30 minutes and emphasized free online

resources available to anyone with a computer. Some focused on 3D illustration programs such

as Inkscape, Tinkercad, Image to Lithophane, and Autodesk Homestyler; other sessions covered

basic circuits using the online circuitry application 123D Circuits. The recordings of these

presentations can be found on the UNCG University Libraries web site

(http://uncg.libguides.com/workshops/recordings under 2014-2015 Academic Year). These

online workshop recordings now act as a resource and tool for learning by many. They can

provide retooling options for current and future librarians and other learners.

AcadeMAKE Conference

Arguably the most significant feature of the grant work was the first ever AcadeMAKE

Conference held February 20, 2014 at the UNCG campus. Held in collaboration with the UNCG

School of Education SELF Design Studio (http://make.uncg.edu/), the AcadeMAKE conference

was intended to bring members of the library community together to see samples of what is

going on with makers. Although 138 individuals registered for the conference, due to bad weather about half of those actually attended. Attendees came for almost exclusively from North Carolina, with one person from New Jersey.

Over the course of the day, librarians and other members of the academic community gathered together for instruction sessions, poster presentations, and networking. Presentations, keynotes and lightning talks covered topics such as makerspace creation, management and outreach in public, school and academic libraries, creative events, making ideas and planning, and 3D scanning and reconstruction. Poster presentations focused on maker education, design, and support.

A highlight of the conference was the free play time in the SELF Design studio where attendees had an opportunity to experiment with an assortment of maker activities and materials, including the 3D printer, an assortment of circuit kits, a wind table, trash to treasure creation, and an eggbot machine. Many of the presentations are also available now on the AcadeMAKE website (https://academake.wordpress.com/).

Campus Presentations and Curriculum Integration

As part of the grant outreach efforts, the team created in-depth and discipline-focused department campus presentations for the geography and the anthropology departments. The Curriculum Coordinator and the practicum student worked together to research and compile materials with introductory maker related information that was specific to each department. Geography was introduced to DEM to 3D printing pipelines, while anthropology was shown repositories and printing of 3D historical artifacts. The grant's 3D printer was brought to each event. For most attendees this was their first opportunity to witness 3D printing, with the result that they saw the potential of the new technology. Professors in these departments were intrigued

as well, and several gathered afterwards to talk about how to integrate this work into the

curriculum for the next fall, so all their students would have an experience with these

technologies and concepts.

One of the PIs, Filar Williams, already the liaison to the School of Library and

Information Science, had been working with LIS 631, the emerging technologies course for a

few semesters. The faculty instructor worked with her to integrate makerspace learning concepts

into the course that term, which included the team teaching some online introductory

sessions, requiring students to attend live or view the recordings of an online workshops, and to

create a makerspace lesson plan as their final project.

Assessment Highlights

The team conducted assessments in the form of surveys, hoping to measure two outcomes

which were to determine whether the workshops were effective at meeting participant's

expectations and what participants' perceptions of making and makerspaces were prior to and

after attending the workshops. Participants attending any in-person and online sessions (which

could also be accessed via recordings) were asked to complete a pre-assessment prior to

attendance and a post-assessment after attending any offerings by the grant team. The pre-

assessment survey was sent to all registered participants within a few days prior to their chosen

session, while the post-assessment was sent out to all participants at the end of the semester and

again early in the spring semester. (Presumably, some of those who completed the pre-

assessment were unable to attend the workshops and would therefore not have completed the

post-assessment.) A total of 138 people registered for the online workshops, while 48 attended

the in-person workshops. There were 87 completed responses to the pre-assessment and 17

completed responses to the post-assessment. While not all of the findings were significant, a few

things stood out.

What Participants Wanted

One key outcome the grant aimed to assess was whether or not the sessions effectively

met participants' expectations for the workshop, webinar, or event. In the pre-assessment,

respondents were asked their reason(s) for attending and could choose as many reasons as

applied. Options included personal enrichment, learn a specific skill, integrate this technology

into my work, integrate this technology into user environment, class requirement, and

other. Nearly 70% said they wanted to integrate the technology into their work, while 60%

selected personal enrichment (See Figure 2). Among the reasons specified under "Other," one

respondent was attending the workshops for makerspace training required by work, one intended

to set up a makerspace at their high school, another said for a chance to meet LIS faculty and

students, and another wanted to use the information to teach students. [Insert Figure 2 here]

Analyzing how effective the workshop, webinar, or event was for attendees through a

post-assessment survey gave a deeper look at its outcome. If respondents were generally

comfortable with what they learned in the session, and if they intended to use what they learned

in the future, the outcome was gauged as "effective." Attendees were asked a series of five

Likert-scale questions during the post-assessment, which they rated in how much they agreed

with the statements on a scale of 1 to 5, 1 being not at all and 5 being very much:

- I am likely to use the things demonstrated in this workshop in the next 6 months.

- I now have a better understanding of making and makerspaces.

- I now feel more comfortable using the things demonstrated in the workshops /
  presentations / recordings.

- The workshop / presentation / recording was easy to follow and made sense to
  me.

- I would attend other maker-learning opportunities (workshops, online tutorials, or
  face-to-face workshops) if offered.

The responses were generally positive (See Figure 3). All 17 respondents indicated that

they now have a better understanding of making and makerspaces, and only on question 1 (the

likelihood of using this technology in the next 6 months) were there any negative responses or

responses below a "neutral" 3. [Place Figure 3 here]

Generally, respondents appeared to have conquered the understanding of making and

makerspaces. They also seemed keen on attending future workshops or learning opportunities,

indicating an interest in the topic and a willingness and interest to learn about making. This

aspect was further reflected in an open-ended question we asked, "What was the most important

thing you learned from the workshop / presentation/ recording?" The comment "makerspaces

don't have to be high tech. or elaborate. Letting students be creative at their own pace is the

key", reflects several of the respondents' thoughts about the takeaway being the "ease of use" of

maker technology and that the definition of makerspaces is broad and that they can "cover a wide

spectrum of creative activities."

Perceptions of Creativity

The second outcome assessed by the grant was determining if there had been any change

in participants' perceptions of making, technology, and creativity from the pre- to post-

assessments. By asking a series of Likert-scale questions on both before they attended any

session and then afterwards, using 1 to 5 scale, the goal was to see if there was an increase in the

responses with such statements as: "I see myself as a creative person" and "I am comfortable

with trying new technologies (i.e. Web 2.0, new applications)."   Respondents also rated their experience (again, from 1-5) with different technologies and platforms, such as PowerPoint, video editing, Photoshop, 3D modeling, and electronics.

From the pre- to the post-assessments, there was a slight increase in response to "I am comfortable with new technologies…" and on the questions asking respondents to rank their experience with programming and 3D printing, possibly indicating they increased their comfort. Yet without more in-depth or direction questioning (perhaps "Did the workshop change your perception of your creativity?), it is difficult to establish any correlation between the workshops and these perceptions. As mentioned above, however, people did say they felt more comfortable trying these specific technologies. Overall, the grant goal was accomplished: showing LIS students and current library staff that maker technology is accessible and can be incorporated into any library.

There was some very useful (and in a few instances, somewhat surprising) information gleaned from the assessment process. The post-assessments in particular provided much-needed feedback on what participants enjoyed about the workshops and what they would like to learn more about and specifically requesting more resource suggestions (such as tools or technologies to buy or use) and lists of makerspaces to explore virtually or visit locally. The grant team was surprised to see how many participants were from beyond the UNCG library community, drawing people from other academic campuses, as well as public and school libraries.

Lessons Learned

Like the culture of the maker movement, the grant project evolved and changed throughout the year. As the team learned what was needed and what was of interest to the library community – through personal interactions, registrations for webinars on certain topics,

thoughtful questions asked at sessions, and our own research – the grant emerged and flowed into new avenues. When the grant was proposed the initial idea was to support library school students and work with the library graduate school department faculty and students to provide opportunities and resources on the topic. But in reality, it was the library professionals around the state who sought this knowledge and attended these sessions tenfold over any LIS students. The team did work with one LIS course studying emerging technologies, joining the online class as guest lecturers and assisting the faculty instructor with the final project assignment to create makerspace lesson plans. The team also originally expected to work with LIS students and other academic departments to develop more liaison-style interactions on maker technologies. Beyond our practicum student and the two departments excited to connect with the team, the need grew to focus mainly on practicing librarians around the state. It must be noted that the growing online degree program from UNCG includes many already practicing librarians, so perhaps the original goal to work with LIS students really meant LIS students already working in the field and seeking skills they saw first-hand are needed.

The hands-on workshops were the most successful and had the most positive feedback. Attendees had not only the chance for hands-on experimenting, but it was in a safe, encouraging, "okay to fail" environment which embodies the maker movement in practice. The in-person meeting also allowed informal networking to occur, as people left sharing contact information or perhaps already knowing each other but now reach out to each other as they implemented something maker in their own libraries. The participants also loved sharing ideas and concerns through a round-robin style at the in-person sessions. Though these sessions reached a limited number of people, the impact was great as people left with experience, confidence, and connections. The team would offer more in-person sessions in more locations

around the state (if there was a next time), as the outcome was worth the travel, cost, and

logistics. On the other hand, building a toolkit, which includes the short recordings from the

online sessions, reaches far more people and can be continually used, even now over a year after

the grant ended. It would be useful to add a method for others to share their stories, ideas, and

content within the toolkit, something the team would consider if done again in the future.

Unfortunately, the grant team has dispersed as they graduate or move on to new jobs, so a follow

up, survey 2 years later with all participants or facilitating this type of educational outreach again

is not easily possible but would be a good recommendation for others attempting something

similar.

Other recommendations and thoughts are summarized well by the grant's practicum

student Luthy in her article for *Computers in Libraries* (2015): providing practical examples of

projects went a long way; free resources allow play time with a huge investment; attend any local

maker events or visiting local existing makerspaces not only would build the team's' knowledge

but could result in collaborations; and promote the idea that a makerspace can be a small area or

mobile, and does NOT have to be a large, tech-filled, expensive space (p. 8).

Conclusion

The implementation of makerspaces in libraries takes planning and training along with

some sort of knowledge or background in making, hacking, inventing, crafting, or 3d

printing. But these are not standard skills for librarians, and hence this grant was to kick start

making concepts and skills with librarians in North Carolina. As Moorefield-Lang (2015) states,

"It is noticeable from interviewing librarians in the field that training, a professional learning

network, and online resources are vital when it comes to incorporating makerspaces and

technologies that are commonly housed within such spaces" (p. 108). The original intent of the

grant was to bring maker education to LIS students, but our impact far exceeded that. From the beginning it was apparent that library professionals from all kinds of institutions were eager to learn about making and makers, as we saw when we realized the number of practicing librarians coming the the eHUBS and online workshops. Nearly half of the attendees to these events were working in libraries, which indicated to us the usefulness of the grant work. As these professionals shared their experiences, questions, and concerns, we were able to respond in such a way that enhanced the grant work. For example, the list of makerspaces we created grew out of a direct request from the professionals at one of the Ehubs.

In 2014, the White House hosted its first ever Maker Faire, where President Obama highlighted the power of DIY to revolutionize American manufacturing, stoke innovation, and assist with job growth (Kalil & Miller, 2014). The growing making movement can revolutionize our country, if libraries are willing and able to provide a venue and support for users who might not otherwise to have the tools, spaces, skills, or community on their own. One small grant, in less than a year, provides library staff the impetus, confidence, basic skills, resources, and community to start the revolution.

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