

**Slide 1:** Good morning. I'm Melendra, and I'm the Youth Consultant for the North Central Kansas Library System, a group of more than 35 libraries in Kansas. This morning, I'm going to be talking to you about creating mobile makerspaces.

As noted in YALSA's "The Future of Library Services for and with Teens: a Call to Action," "Today's teens are part of an increasingly global and competitive society. Success in that environment requires an expanded set of skills that . . . includes learning and innovation skills (such as creativity and innovation, critical thinking and problem solving, [and] communication and collaboration)" (pg. 3). Such skills can be encouraged through Maker activities that allow teens to participate in connected learning. While, most teen librarians may dream of adding a makerspace to their library, many libraries are intimidated by Makerspaces feeling that they don't have the resources, space, or expertise to create one in their community.

Librarians have addressed this issue in a number of different ways. Some have added making to their other programming; some have created tiny maker areas; and some have started sharing resources with the branches and libraries around them. The North Central Kansas Libraries System falls into this last category. We decided to create circulating makerspace kits that can be checked out by the libraries in our system.

**Slide 2:** I didn't have Christie Gibrich's questions in front of me when I was considering the creation of mobile makerspaces, but when I read them on Teen Services Underground, I realized that these questions succinctly capture the information I collected in order to convince my administration that Makerboxes were a good idea. I'm sharing Gibrich's questions now, because as I built this presentation I used them to keep me focused on the information that impacts the creation and use of the makerboxes within my library system.

**Slide 3:** NCKLS had a number of system wide goals in mind when we created our circulating makerboxes. Broadly, we wanted to allow our libraries to experiment with the maker movement and expose their communities to this re-envisioning of library space. Also, we wanted our librarians to become comfortable with some of the technology and tools that can be used in a makerspace. We wanted them to understand that makerspaces can be built using a wide range of resources and utilizing varied plans, spaces, and budgets. And, we hoped that by providing the makerspaces in a circulating format we would inspire the librarians to experiment with new topics and stretch their skills.

Another essential goal was that the libraries begin to host more programs for teens. I work with very small, rural libraries. Most of which don't have a separate children's librarian position, let alone a teen position, and getting them to plan and perform teen programs is difficult. Many of them don't have a teen area, collection, or regular programs. If the makerboxes motivate the libraries to expand their teen services, they fill a significant hole. Finally, we hoped that the makerboxes would help our libraries build local partnerships.

Of course, like all libraries and library projects, we have limitations. We have a fixed budget, and as often as possible, the resources we provide need to be materials that can be reused. Our makerboxes are also transported long distances, and the items in them need to be durable and replaceable. Finally,

since the makerboxes circulate to libraries of all sizes and librarians of all level of technology skill, the materials in each cannot have too steep a learning curve and need to be flexible enough to use for a variety of programs.

**Slide 4:** When I started this project, I had a partner in crime. She was a young IT professional who was very excited about the maker movement. I was new to my position and had a lot of free time on my hands, so we were the perfect pair. We started brainstorming ideas for what sorts of mobile makerspaces would fulfill our requirements, searching online for maker crafts that were both cool and not too complicated, and discussing the pros and cons of reusable versus consumable items. We wanted the makerboxes to be more than craft projects. While I know that crafting is making, for these kits we wanted to push the boundaries into more of the STEM zone, focusing on science, technology, engineering, and math. We came up with lots and lots and lots of ideas, and just as we started to narrow things down to themes we could use, my partner in crime was tempted away from the library by a much higher IT salary.

**Slide 5:** Although I felt a bit overwhelmed, I was still excited about this project, and over the next 2 years, I created the makerboxes listed here. Each of my mobile makerspaces contains theme related physical items that are mobile because they are transportable. I transport and store all the materials in 66 quart Rubbermaid tubs, which are both very sturdy and can hold a lot of stuff. I secure the lids with plastic zip ties when I send them to libraries via a statewide courier or on our rotating collection van. When they aren't checked out to a library, they live in a closet in my office where they are all stacked on top of each other.

**Slide 6:** All the makerboxes contain at least seven books related to the theme. Sometimes the books are novels; sometimes the books are nonfiction resources, and sometimes it's a mix. The makerboxes also include multiple projects and the supplies necessary to make them, as well as binders with program and project ideas, including movie tie-ins, websites, images of sample projects, and specific directions for individual ideas.

Within these binders, I've included information about the 40 Developmental Assets for Middle Childhood and Adolescents from the Search Institute as a reference for the librarians, as well as all the relevant information about how the makerboxes circulate. Finally, each kit includes an evaluation form for librarians to fill out after they've used a makerbox. I use these evaluations when I add or remove materials and projects from a makerbox and to help me build new makerboxes.

**Slide 7:** This is an example, from the Robot makerbox, of the types of activities and ideas I've included in the makerboxes to inspire the librarians when they are planning a program. As you can see, there are websites for both active and passive participation.

I also include photos or samples of ideas. The binder ideas and activities make it very easy to set out pieces of the makerboxes as passive programs which empower teens to follow their own interests, working at a pace that is comfortable to them.

Instructables, Make, and other do-it-yourself websites are great resources for finding activities with

clear directions. Also, I ask my librarians to add their own ideas and suggestions from their programs when they send the makerbox back to me. Not only does this “grow” the makerbox over time, but it also encourages some collaboration and buy-in on the part of the librarians.

**Slide 8:** One of the system goals for the makerboxes is that they will help our libraries expand their teen collections. By including books in the makerboxes, I hoped to encourage our librarians to become more familiar with teen books at the same time that program attendees are exposed to books their library might not currently collect. I encourage the librarians to use the books in the makerbox as part of promotional displays prior to and during maker events they host. Each makerbox also contains a list of links to book trailers for the included books so that librarians can promote books they may not be personally familiar with.

**Slide 9:** The makerboxes circulate for a 2 month period and contain multiple projects so that they can supply more than one program within that time. If, for example, the library has an ongoing club that focuses on a theme, they could use a different makerbox project each session for the 2 months.

When I started building my makerboxes, I focused on projects that are self-contained with all the pieces and parts included in one box. This made sense both for how I was envisioning the makerspaces and for the early makerbox themes. Self-contained projects are easier to transport, restock, and usually come with some directions that the librarian and teens can reference when they are working on the project.

The activities I selected are often a mix of consumable and reusable items. All consumable materials are replaced by NCKLS as needed. However, we reserve the right to ask libraries to replace any non-consumable materials that are damaged or missing when they return a makerbox. We’ve yet to need a library to actually replace anything.

**Slide 10:** Because the books included in the makerboxes are all theme related, I selected a mix of old and new books from a variety of genres. Initially, all the books fell squarely into those marketed by publishers as teen books, but as I went along, I started looking at books marketed for other ages that have teen appeal. Finding books with teen relevant content focused on each theme was more difficult than I expected. I ended up using Baker & Taylor and Amazon for my research, as well as Good Reads, YALSA’s Best Books lists, and review journals.

**Slide 11:** As I made the makerboxes, I quickly started adding materials for projects that were not self-contained. For the solar makerbox, I included the materials for the creation of a mini-solar oven made from mostly recycled materials, like a router box and leftover laminating film. The activities and ideas pages for the solar makerbox include instructions for creating a variety of solar ovens, suggestions for programs that test the cooking temperatures of these ovens, and tips for cooking s’mores in a solar oven. Information about other renewable resources is also included in the binder.

**Slide 12:** Because the projects in the Circuits makerbox are more free form, I made sure that some of the books provide ideas and instructions to help librarians and teens as they select and create projects.

Librarians can use the books to prepare for the programs in advance, or the librarian can be a co-learner with the teens as they explore the projects together. Having nonfiction books in the makerboxes also allows teens to follow their interests if they fall in love with a certain type of making. Giving teens the resources to make their own discoveries provides them the opportunity to practice critical thinking skills without the pressure of tests and grades.

**Slide 13:** As the makerbox projects became less self-contained, I ended up purchasing more supplies for projects. For example, because the circuit makerbox has a LilyPad Arduino, it also needs a LilyPad power supply, conductive thread, fabric, sewing needles, embroidery hoops, needle-nose pliers, and LEDs.

Figuring out what supplies I needed for each project was sometimes a challenge, as with my LilyPad example when I thought I'd purchased everything only to discover that I didn't have a way to upload code to the LilyPad because I was missing a cable and connector.

The makerboxes provide occasions for community outreach, such as when one library joined a local Mini Maker Faire by hosting a MaKey MaKey music station or when another librarian partnered with a local high school English class using squishy circuits to let students build character symbols out of clay and LEDs.

The Mini Weapons makerbox was my first foray into a kit that has no self-contained projects. The activities in this makerbox are all found in the included books and are created from inexpensive office and home supplies or recycled materials. Because it isn't possible to include all the materials for every idea in the books, I highlight some of the simpler projects in the activities and ideas section of the binder. But, I encourage librarians to give their teens time to browse the books and find the mini weapon that speaks to them.

**Slide 14:** This makerbox is fun, in part, because it can be used for programs focused on making the mini weapons, like this one at which participants built catapults and tested the distance and accuracy of their shots. Or it can be part of a larger event at which homemade weapons stations would be a perfect addition, like a Hunger Games or zombie apocalypse program.

I mentioned earlier that I used Amazon extensively when finding the makerbox books. I also ordered most of my project items through Amazon. This meant easy returns if things were damaged and easy reordering when I needed replacement materials. Amazon's "wish list" feature allowed me to create lists for each makerbox and have the cost of the materials approved prior to purchasing.

The books in the builder makerbox are all idea focused: no instructions and no fiction. In part, this is because it was quite difficult to find books related to a builder theme, but mostly it is because we discovered that getting teens to build boxes and towers is easy but getting them to think creatively about building other things can take some initial inspiration.

**Slide 15:** My big discovery for this makerbox was a stl file of connector pieces that could be printed on a 3D printer. The connector pieces allow you to build using any combination of LEGOs, Lincoln Logs, Tinkertoys, K'nex, and Bristle Blocks. Since all of these products are out of copyright, the file is an opensource document. Providing the connectors opens the individual products up to a wider range of imaginative projects.

The builder makerbox is perfect for building challenges, like the Bridge challenge during which participants make bridges from the materials at hand and test them against each other's creations for things like strength, length, or height. Such events are a great opportunity to partner with a local architect or an architectural department at a college or university.

**Slide 16:** We created 2 Photo Booth makerboxes, because the first was so popular. Photo Booth 1 has photography related fiction, while Photo Booth 2 has how-to books for using your phone or tablet to take interesting, artistic photos, as well as some prop design books.

**Slide 17:** The Photo booth makerboxes include a small photo printer that connects to smart phones and tablets. They have fabric for backdrops and premade photo-props, like masks, mustaches, and hats to set up a photo booth. Finally, they include supplies to make your own photo props.

To my mind, the photography aspect is what qualifies these as makerboxes, but they get used for all sorts of tween and teen programs. Actually, they get used for programs for every age. They're very versatile because they can be used by themselves or as an element of almost any program, from superheroes, to book characters, to no shave November.

**Slide 18:** Not surprisingly, the Repurposing Books theme was the easiest one to find books for, so this makerbox's books represent a fun range of genres. To be on the safe side, I've added a note stating that the included books are not for repurposing, but I offer to send weeded items from our rotating book collection along instead. However so far, all my libraries have their own weeded materials to use.

**Slide 19:** The Repurposing Books makerbox supplies mainly consists of the tools necessary to make something new out of a book, although special project provisions, like wire and toothpicks, are included. This is perhaps the least STEMish makerbox in the collection, but many of the crafts, such as origami and book safes, require teens to utilize mathematic and spatial reasoning, and use skills like patterning, structural thinking, measuring, and design.

The Repurposing Books binder is crammed with images, directions, and links because there are hundreds of tutorials and designs available for repurposing books. Some of the most popular are book safes, planters, and holiday ornaments, such as Christmas trees and pumpkins.

While, these projects take a considerable amount of time and patience, the makerbox is perfect for

shorter projects like origami bookmarks and baskets or passive programs like black-out poetry or paper collage poetry.

**Slide 20:** The Break It reMake It makerbox is designed around taking apart computers, hence the computer, coding, and hacking theme demonstrated in this collection. This makerbox is a perfect example of how having mobile makerspaces available for teens gives young adults access to tools and resources they might not otherwise have. We all know that not everyone has a computer, but even fewer teens have access to a computer that they can take apart just so they can play with the internal pieces.

Such hands-on experiences spark teen thinking while resource links included in the makerboxes allow for self-directed learning and make it easy for them to explore as deeply as they wish.

**Slide 21:** When I circulate the Break It reMake It makerbox I offer to send a computer tower or laptop to take apart, but along with the weeded books I mentioned earlier, my libraries usually have their own computers they are looking forward to destroying.

This makerbox contains both the directions and tools for safely taking apart a laptop and a desktop tower as well as putting them back together again so a library can have a program focused on computer repair or discovering how computers are built. The makerbox also includes the necessary materials to create earrings, bracelets, and necklaces, among other crafts, for teens more interested in making new things out of the computer's guts.

**Slide 22:** Each of the four LEGO makerboxes contains a copy of The Unofficial LEGO Builder's Guide and one other "idea" book as well as a Lay-n-go play mat/bag. The LEGO makerboxes have extensive lists of LEGO challenges to inspire programs. Not surprisingly, the LEGOs have been so popular that many of the libraries who've checked out these makerboxes have then started successful LEGO clubs. Perhaps more surprisingly, many of these clubs were started with donated LEGOs, because when patrons saw the LEGO kits in use, they realized the library would be happy to take their children's outgrown LEGOs off their hands.

**Slide 23:** In addition to building and creation programs, LEGOs are perfect for stop motion animation programs and make-your-own game programs. In between LEGO events, the teens' creations can be displayed around the teen area, or the LEGOs can be used for passive programs. One such passive program is a community build during which patrons can add to a project a few pieces at a time over the space of a week or a month.

At this point, we need a break from staring at the PowerPoint, so now you get to stop listening and start talking instead. I'd like you to form groups of 10 to 15 people to brainstorm programs that you could throw using the NCKLS makerboxes. Then try adding a STEM requirement to the programs.

I've got a handout for each group that lists the contents of the makerbox you'll be using. We'll spend about 8 minutes brainstorming ideas before we come back together to share ideas with the group.

**Slide 24:** Great! I'll make a list of program ideas that were shared and add it to my presentation slides on the YALSA Symposium website so that everyone can access them later.

Now that we have some ideas, remember, you don't have to be the expert. In fact, the makerboxes provide a perfect opportunity for the librarian to be a co-learner with the teens or to partner with the broader community to bring in an expert. Exposing teens to resources and contacts in the community will enhance their academic and career prospects. You can look to local community colleges, universities, your unified school district, or even job training programs to find STEM and maker expertise. Beyond the educational world, members of military and service organizations are good partners both as knowledgeable presenters and as prospective financiers for a maker program. Clubs like Rotary International and the Lions Club International have members from a variety of educational and business backgrounds, so you might find partners for a wide range of programs in one club.

**Slide 25:** Sometimes local and international youth clubs seem like the easiest place to start when you're considering partners for tween and teen events. Boy Scouts and Girl Scouts have STEM and Maker movement focused opportunities and activities. And, if you are in an area with an active 4H community, they are a wonderful resource with a STEM curriculum and educational kits. They are, by far, the club partnered with the most frequently by my librarians.

This is a good time to mention that although NCKLS checks the Makerboxes out only to system librarians, the makerboxes can be used by other organizations within a library's community. If a librarian wishes to share a makerbox with a community partner, such as a local club, the library can do so. Sharing the makerboxes as a community resource is a great way to build or strengthen local partnerships. We do ask that when a library lends a makerbox out to a 3<sup>rd</sup> party, the library takes responsibility for any damaged or missing items when the makerbox comes back to NCKLS.

**Slide 26:** One of the fabulous things about the maker movement is that there are lots of different people and groups that are interested in it, which means lots of opportunities for creating partners and volunteers out of individuals in your community. People with a hands-on, interactive interests, hobbies, or jobs can be great partners for putting on maker programs within the library.

Partners can provide the expertise and possibly resources, while the library provides space and additional resources. Or, if the tools and equipment a program will focus on aren't portable, perhaps the expert provides the space too, and the library provides marketing and additional staff.

Partnerships with individuals introduce teens to a broader segment of your population and let them experience some of the tasks available in different careers, greatly expanding chances for connected learning. Additionally, such programs give the volunteers a different perspective on, and help them build relationships with, teens. This can build community support for library teen programs and provide teens with new role models and mentors.

**Slide 27:** The second activity focuses on partnership opportunities. Stay in the same groups, but use a new makerbox, and brainstorm programs that you could present with a community partner. Consider what the library would provide and what the partner would provide. There is a space on the forms to

list the program as well as the partner you'd collaborate with. Again, we'll spend up to 8 minutes brainstorming ideas before we come back together to share those ideas with the group.

**Slide 28:** Since their creation in May of 2014, the 13 NCKLS makerboxes have circulated **62 times to 21** of our libraries. The makerboxes seem to give our rural, all-purpose librarians the confidence to try presenting teen programs.

In addition to our libraries using the makerboxes for programs, since the makerboxes were introduced, I've seen an increase in requests for consulting related to teen topics, such as building teen collections, ideas for other teen programs, marketing to teens, creating teen advisory boards, and how to maintain positive discipline with teens.

We've also seen a significant increase in interest for makerspaces and STEM materials and ideas. Some of our libraries have purchased 3D printers and Sphero robots, while others have experimented with paper circuits, build your own games, and stop motion animation programs.

**Slide 29:** Because we started small with our makerboxes, and focused on inexpensive or reusable materials, my administration has provided funding and encouragement for the creation of new makerboxes, as well as providing the funds necessary to replace items within existing makerboxes as needed.

Currently, I'm in the process of creating 3 new makerboxes: a Rube Goldberg Machine makerbox, a Coding makerbox, and a Stop Motion Animation/Movie Making makerbox.

**Slide 30:** Before our last activity, I'm going to quickly share some things other libraries are doing with mobile makerspaces. These are makerspaces that are shared between libraries in systems, schools, and as state resources.

1. The Arrowhead Library System is in Rock County, Wisconsin, and their maker kits are a mix of high and low tech options, with LEGO and Play-doh kits as well as tablets, a sewing machine kit, and a light table kit.
2. The Ed Tech Team at the Blue Valley School District circulates their Tinker Tubs to the library media specialists at each of their buildings. Classroom teachers who wish to use the Tinker Tubs are encouraged to collaborate with their school librarians.
3. The Illinois State Library created 5 maker kits using a Knight Foundation Prototype Fund Grant. Any library in Illinois can borrow these kits through Interlibrary Loan.
4. The Knox County School District created four mobile makerspace carts that rotate among their four middle school libraries. The makerspace carts dock at a library for nine weeks at a time.

**Slide 31:** I think there is a good chance that all of you have seen or read about other systems or libraries that have created mobile makerspaces, and there are lots of different topics and materials that can be used in such makerspaces.

For our last activity, I want to give you a different perspective on Makerspaces by asking you to create

maker programs out of the contents of your supply closets. But, since I don't have access to any of your supply closets, I've brought a selection from my own. I'll give each group a Mystery Maker bag. Inside the bags there's a mix of stuff that you might find lying around a library's craft closet. Using these "resources" along with the tools you would normally have in the library (like scissors, glue, needle-nose pliers, markers, pencils, books, balloons, you know the stuff), brainstorm ideas for as many maker programs as you can. Pretend that you have an unlimited amount of each supply. If a program idea ties into a STEM topic, indicate how. If you have a partner in mind for a program, let us know that too, and be sure to list the essential supplies from the Mystery bag that inspired the program idea.

For this activity, I've planned a little more time. We'll spend up to 10 minutes brainstorming ideas before sharing them with the group.

**Slide 32:** Thanks for coming to my session. I hope you were inspired and gathered some good information. Feel free to contact me if you have questions about this presentation or the NCKLS makerboxes.