CREATING A SCHOOL LIBRARY MAKERSPACE

Guide and Resources

MISSISSIPPI DEPARTMENT OF EDUCATION

Ensuring a bright future for every child

Mississippi Department of Education

SCHOOL LIBRARY PROGRAM

Acknowledgements

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WHAT IS A MAKERSPACE?

Makerspaces are part of a growing movement of hands-on learning environments to make and remake the physical and digital worlds. These spaces promote invention, creation and STEM/STEAM learning.

- Makerspaces are aligned with the Educate to Innovate Initiative
- Increase math and science scores
- Enable mentor-led learning between students, teachers, and other members of the school community
- Extension of the school library's mission - a place of lifelong learning

CREATING A MAKERSPACE

- Designated area away from learning areas or quiet reading areas
- Available power source
- Quality signage and storage
- Easy access to materials and supplies
- Create a schedule to allow small groups or whole classes to use makerspace
- Develop small makerspace stations for multiple activities or
- Limit the makerspace to a select few activities or
- Set up a 'maker cart' that can travel around the library or to classrooms

WHY MAKERSPACES BELONG IN SCHOOL LIBRARIES[1]

MAKERSPACES GIVE ALL STUDENTS ACCESS TO RESOURCES

The school library has long been a central hub for ***all*** students in schools. Libraries provide resources freely to students, regardless of their academic standing, what classes they take or what teachers they have guiding them in the classroom. Any student can come to the library to get the help and resources they need to be successful. In the past, this meant solely books and periodicals. Then computers, online databases and digital citizenship guidance were added. Makerspaces are next in the evolution of resources that we provide for our students.

THERE IS EDUCATIONAL VALUE IN PLAY

Play has long been criticized in education, especially as the grade levels rise. But there is a great deal of research available on play and its value in education. Children and young adults (and regular adults too) can learn through play. What often looks like "just play" to adults is actually a reflection of much deeper learning.

MAKERSPACE PROJECTS CAN ENRICH THE CURRICULUM

There really are endless ways to connect makerspace projects to the curriculum and to literature. One of the best ways is by collaborating with classroom teachers. If met with resistance, get them excited by conducting mini workshops or maker stations during professional development days. As for test scores, it can be hard to draw a direct correlation between makerspaces and test score data. But academia has begun more research on makerspaces. MIT is working on developing assessments to help create data on the educational value that makerspaces create.

THEY ENHANCE THE LIBRARY PROGRAM

More students are drawn into the library by the makerspace. They stop at book displays and get interested. They talk to other students in the space who they normally don't socialize with. They check out books related to the projects they're working on.

LIBRARIES ARE EVOLVING

Libraries were quiet places for individual study with wooden study carrels, heavy tables, tall stacks and the stereotypical librarians who angrily shushed everyone. But this does not apply to the libraries of today. Yes, libraries still provide space for quiet individual study, as there are students who need that environment. But more and more active learning is happening in our schools and in our libraries. Our libraries need to support this style of learning and makerspaces can do just that.

[1] https://ideas.demco.com/blog/5-reasons-makerspaces-belong-in-school-libraries/

MAKERSPACE IDEAS

ELEMENTARY MAKERSPACE: LEGOS + LITERACY

Use Legos as a launching pad for students to write stories about their creations and improve literacy skills. https://education.lego.com/en-us

- Increased attention span
- Memory development
- Language and vocabulary skills
- Logical mathematical thinking
- Problem solving
- Scientific reasoning
- Tactile and kinesthetic learning increase student understanding

MIDDLE SCHOOL MAKERSPACE: STOP MOTION ANIMATION

Stop motion animation is a filmmaking technique that makes inanimate objects appear to move on their own. https://huehd.com/animation/

- Science: illustrate the process of erosion, life cycles, food webs, and planet rotations
- Math: use manipulatives to learn place value and fractions
- Language Arts: create book reports or re-enactments of short stories or poems
- Social Studies: re-enact events from historical figure's life or depict timelines

HIGH SCHOOL MAKERSPACES

Adding a makerspace to the library can inspire teachers to teach differently and can promote peer teaching/learning. https://www.makermaven.net/

- Science: Animal and Plant Cell
    - Students create and build cells with removable parts using 3D Printers or other materials
    - Creations can be used as part of test review

STAR Net

In the STEM Activity Clearinghouse, librarians and library staff can find high quality, vetted STEM activities that are appropriate for library use. STEM stands for **S**cience, **T**echnology, **E**ngineering, and **M**ath.

Users can search by audience, content level, and difficulty. Almost all the activities in the Clearinghouse have pictures or videos of real libraries doing these activities. Activities developed outside the STAR_Net Project will include tips and tricks for implementing in your library, and will link you back to the original source content so you can explore more.

BINARY BEAD CRAFT
Write your own name or nickname in binary code using beads on a bracelet.

DIRECTIONS
chandra.si.edu/binary/bracelet.html#bracelet

TEACHER GUIDE
www.raftbayarea.org/readpdf?isid=303

CONTENT AREA
Technology and Computing

AGE GROUP
6th - 12th

TIME TO COMPLETE
20-40 minutes

TIME TO PREP
Under 5 minutes

COST
$1 - $5

MESS LEVEL
Low

VOCABULARY

- Binary: A notation that utilizes only two options for each selection.
- Bit: Short for "Binary Digit." It is one digit's location in a binary number.
- Code/Coding: Transformation from one representation to another.
- Decode: Convert a coded message into something familiar.
- Delimiter: A delimiter is one or more characters that separates text strings.
- Encode: Convert a familiar message into code.

For more STEM-related library activities, check out clearinghouse.starnetlibraries.org/.

CIRCULATING MAKER KITS

By circulating maker kits, the time and space needed for creating is moved from the library space to the classroom or home. This can connect learning in the library with learning in the classroom or at home and advocate the library program to teachers, administrators, parents, and other school community stakeholders. Anticipate having some loss and need to make replacements, so keep the circulating maker kits cost low.

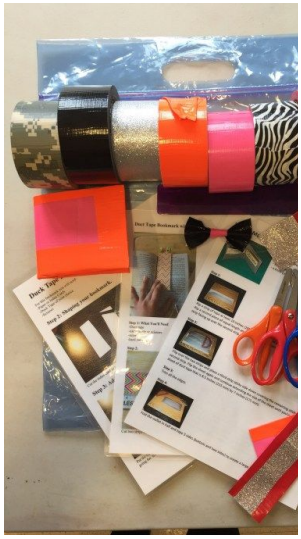
- Parent/student agreement (if kits can be checked out by students)
- Pick a theme for each kit

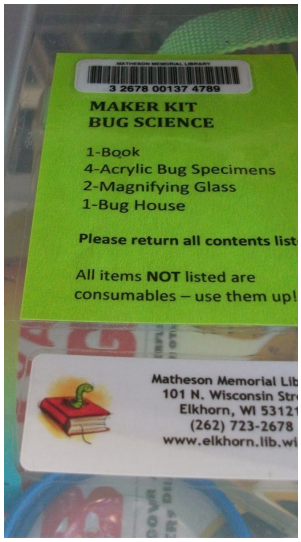
  Example: Legos
- Call Number: **MK 688.7 LEG**

  Prefix: MK (Maker Kit)

  DDC: 688.7 (Lego Bricks)

  Cutter: LEG (Kit Theme)
- Sturdy storage box or bag
- Laminated checklist of items in kit
- Instructions and other resources





MAKER SPECIAL COLLECTION

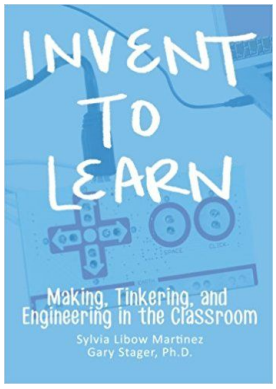
Create a special collection that is near the makerspace or professional collection. Each special collection needs a particular call number, spine label, and even circulation policies. The makerspace special collection should follow along with Dewey Decimal Classification. The special collection should have quality signage to promote the use of the resources. Each call number will consist of a **PREFIX**, **DDC** number, and **CUTTER**. The call number of the spine of the book should match the call number listed in the automated system.

MKS (makerspace) **629** (robots) **ROB** (first three letters of author's last name)

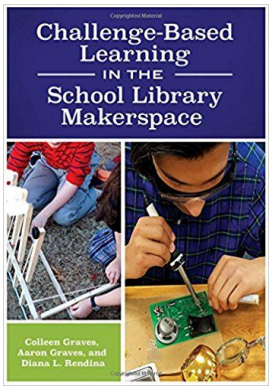
Basic Steps for Building Makerspace Resource Library

- Get at least one or two books geared towards maker educators to help expand knowledge
- Start building up a collection of makerspace picture books in an elementary library
- Add a variety of project books that can help students to build up maker skill sets
- Find books that can offer visual inspiration
- Make a list of all the tools and materials available in the makerspace - get a least one or two books on each of these tools

Books for Maker Educators

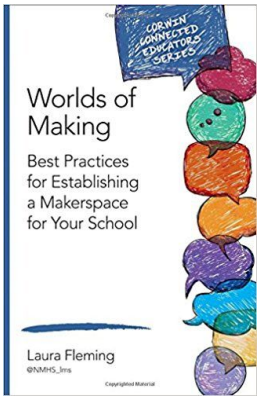


Invent to Learn: Making, Tinkering, and Engineering in the Classroom by Sylvia Martinez



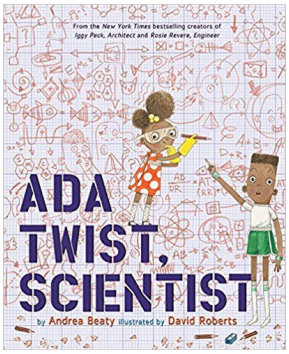
Challenge-Based Learning in the School Library Makerspace by Colleen Graves

Your Starter Guide to Makerspaces by Nicholas Provenzano

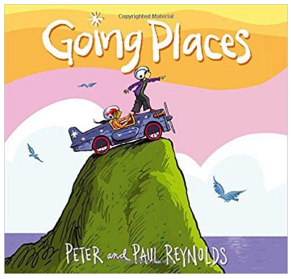


Worlds of Making: Best Practices for Establishing a Makerspace for Your School by Laura Fleming

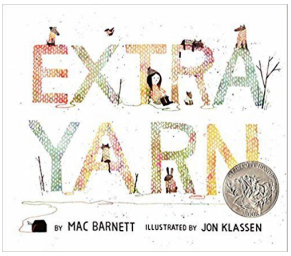
Picture Books for Young Makers



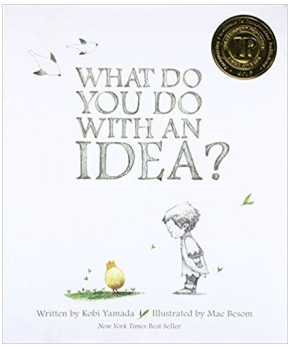
Ada Twist, Scientist by Andrea Beaty



Going Places by Paul A. Reynolds

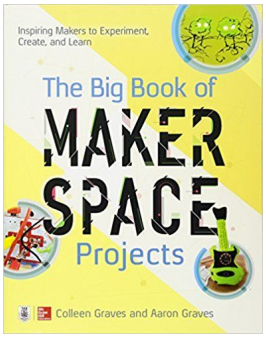


Extra Yarn by Mac Barnett

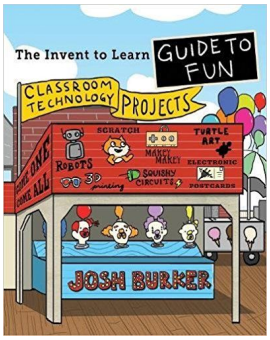


What Do You Do With an Idea? by Kobi Yamada

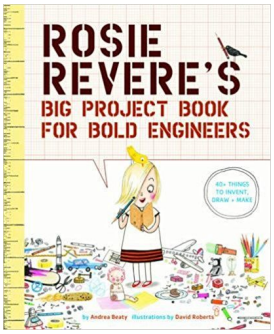
Project Books



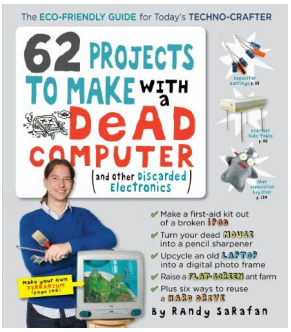
The Big Book of Makerspace Project by Colleen Graves



The Invent to Learn Guide to Fun by Josh Burker

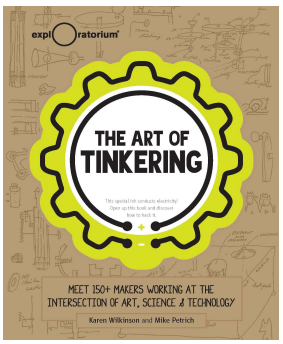


Rosie Revere's Big Project Book for Bold Engineers by Andrea Beaty



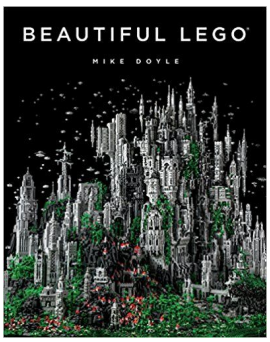
62 Projects to Make with a Dead Computers by Randy Sarafan

Visual Inspiration



Art of Tinkering by Karen Wilkinson, Mike Petrich

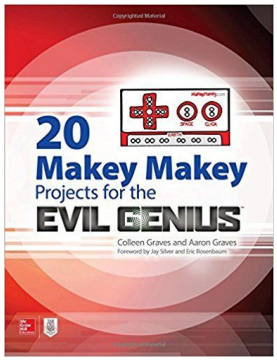
Make Space by Scott Doorley



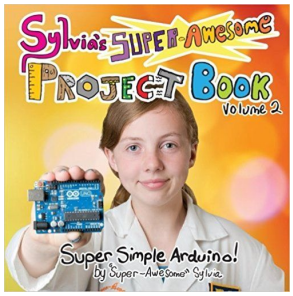
Beautiful LEGO by Mike Doyle

Things Come Apart by Todd McLellan

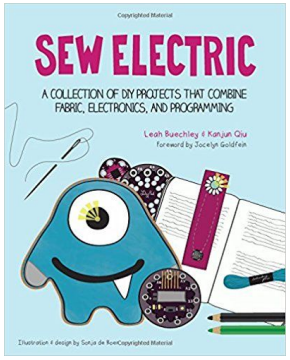
Tool Specific Maker Books



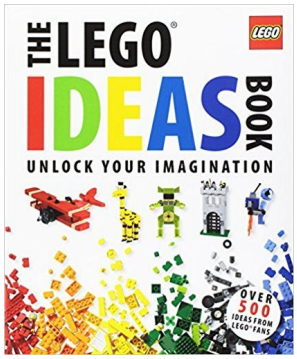
20 Makey Makey Projects for the Evil Genius by Aaron Graves



Sylvia's Super-Awesome Project Book by Sylvia Todd



Sew Electric by Leah Buechley



The LEGO Ideas Book by Daniel Lipkowitz

More Maker Books

- *Brick Flicks: A Comprehensive Guide to Making Your Own Stop-Motion LEGO Movies* by Sarah Herman
- *The Maker Movement Manifesto* by Hatch, Mark
- *Art Lab for Little Kids: 52 Playful Projects for Preschoolers* by Susan Schwake, Rainer Schwake
- *Make: The Makerspace Workbench: Tools, Technologies, and Techniques for Making* by Adam Kemp
- *Arduino for Beginners: Essential Skills Every Maker Needs* by John Baichtal
- *Papertoy Monsters: 50 Cool Papertoys You Can Make Yourself!* by Brian Castleforte, Netta Rabin, Robert James
- *Wearable Electronics: Design, prototype, and wear your own interactive garments* by Kate Hartman
- *Building a Rover with Python, Linux, Motors, and Sensors* by Wolfram Donat
- *Getting Started with littleBits: Prototyping and Inventing with Modular Electronics* by Ayah Bdeir, Matt Richardson
- *Video Game Programming for Kids* by Jonathan S. Harbour
- *Adventures in Minecraft* by David Whale, Martin O'Hanlon

MAKERSPACE FUNDING[2]

Budgets can be one of the most difficult aspects of being a librarian. A makerspace does not need much of a budget to operate. Tools and supplies can be donated or borrowed and many projects can be self-funded with community and parental involvement. However, there is always a new gadget or piece of technology to purchase and try. Develop a baseline budget and what type of makerspace to offer before purchasing. If there is a gap in funding there are numerous options for receiving grants or donations to fill the void.

In order to create a solid grant application, the following will need to be evaluated:

- Think about the library's current state: A lot of space is not needed to create a makerspace in the library, if there is not an area that can be used as a makerspace, consider storage needs and movable furniture.
- Craft the argument around the library's strategic mission: After determining the needs of the library and the school community, write an argument as to why the grant is necessary or how it supports the mission and strategic plan of the library.
- Discuss the focus of the makerspace: Explain in detail how the makerspace provides innovative activities and new processes for learning while complementing the school curriculum. Discuss the benefit to as many students as possible and provide evidence of the student benefit.
- Detail the budget request: Include specific information, vendors, and costs. Be realistic in this area because it is better to get a small amount than to get a grant denied because the cost was too much. Some crowdfunding funds are only given if the total amount is donated.

Adopt a Classroom
www.adoptaclassroom.org

Created to help teachers purchase supplies and materials for classrooms through direct donations.

DEMCO Grant Search
www.demco.com

FREE grant database allows you to search for current available grants without the cost of an expensive subscription.

Donors Choose
www.donorschoose.org

Civic crowdfunding that allows individuals to donate directly to public school classroom projects.

Get Ed Funding
www.getedfunding.com

A grant-finding resource dedicated to helping schools identify the funding that matches their needs.

PledgeCents
www.pledgecents.com

PledgeCents connects individual investors and corporations with schools seeking alternative ways to receive additional funding.

STEMfinity
www.stemfinity.com

STEM Funding Opportunities and Free Grant Writing Services: Funds may be used for expanding learning activities or any area of STEM enrichment.

[2] http://www.renovatedlearning.com/

3D PRINTERS FOR BEGINNERS

3D printing allows for more authentic exploration of objects that may not be readily available to schools, including fragile items like fossils and artifacts. The exploration of 3D printing, from design to production, as well as demonstrations and participatory access, can open up new possibilities for learning activities.

3Doodler

edu.the3doodler.com/

3Doodler is a 3D printing pen. It works by extruding heated plastic that cools and hardens instantly, allowing users to literally draw in the air. The site does contain tutorials, user guides, and curriculum resources.

Printrbot Play

printrbot.com/education/

A compact 3D printer for beginners and students that comes fully assembled and ready to use. The site does contain tutorials, user guides, and curriculum resources.

DaVinci Jr.

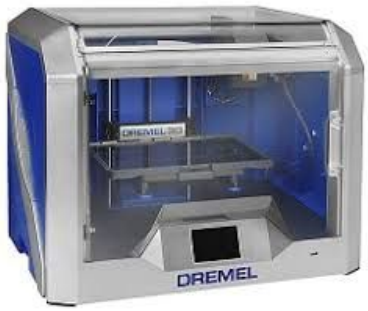
us.xyzprinting.com/steam

Wireless 3D printer with auto-calibration and large build size for students. The site does contain tutorials, user guides, and curriculum resources.

JellyBOX

https://www.imade3d.com/jellybox/

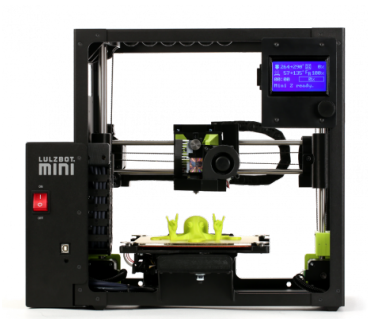
JellyBOX takes 3D printing to the next education level by having the user build the actual printer! There is no better way to learn 3D printing in-depth than to build your own machine! The JellyBOX creators wanted more education value in their printer and also wanted to satisfy their high demands for ease of build, use, and print quality.



Dremel 3D Printer

digilab.dremel.com/

With the out of the box curriculum, educators can integrate 3D printing right into the classroom. Written by actual subject matter teachers, the curriculum and instructional guides provide you with hands-on lesson plans that tie an abstract concept with a printed model for better understanding.



LULZBOT MINI2

www.lulzbot.com/education-pricing-program

A versatile, high performance desktop 3D printing machine engineered to deliver premium results print after print.

Other Materials Needed

3” Blue Painters Tape

Alcohol Spray

Tweezers

Artist Palette Knife

Squeegee

Spring-loaded wire cutters

Wiping Cloth

Synthetic Grease

PLA Filament

CODING AND ROBOTICS IN THE LIBRARY

"Coding" refers to creating instructions that a computer can understand, and there are literally hundreds of different computer languages that a computer can read. When this language is used for writing instructions, it is most often called a programming language. If you are writing a computer program, you are essentially creating instructions that tell a computer how to perform a specific task, whether that computer is embedded in a microwave, a digital watch, a singing greeting card, or a car.

- Amy M. Laughlin, *Coding: Resources to Get You Started*

ALA: LIBRARIES READY TO CODE www.ala.org/tools/readytocode

The Ready to Code Collection provides resources and strategies that are grounded in research, aligned with library core values, and support broadening participation. Start with basic strategies and how-tos or build on skills and resources you already have.

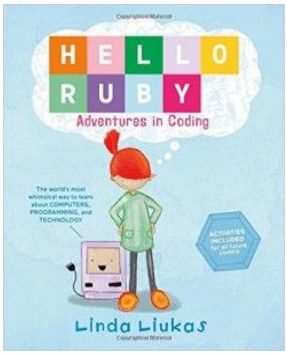
APPLE: EVERYONE CAN CODE www.apple.com/everyone-can-code/

Technology has a language. It's called code. And we believe coding is an essential skill. Learning to code teaches you how to solve problems and work together in creative ways. And it helps you build apps that bring your ideas to life. We think everyone should have the opportunity to create something that can change the world. So we've designed a program that lets anyone learn, write, and teach code.

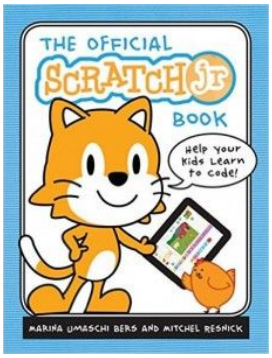
CS First by Google https://csfirst.withgoogle.com/s/en/home

CS First provides free, easy-to-use computer science enrichment materials that engage a diverse student population in grades 4-8. Facilitators use the video content to teach kids coding with Scratch, a block-based coding tool. There are 72 programming explorations and lessons across nine domains (e.g., art, gaming, sports, storytelling, and social media). Each lesson includes a minute-by-minute teacher script, student instructions, and example projects. The site also includes comprehensive help guides from setting up and maintaining a club to tips to classroom management.

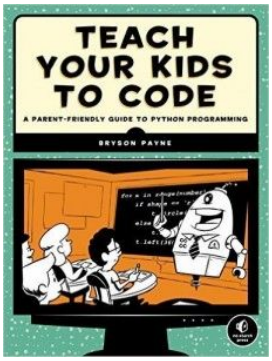
Books for Coding



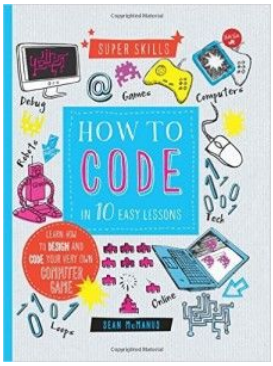
Hello Ruby: Adventures in Coding by Linda Liukas



The Official ScratchJr Book: Help Your Kids Learn to Code! By Marina Bers



Teach Your Kids to Code: A Parent-Friendly Guide to Python Programming by Bryson Payne



How to Code in Ten Easy Lessons by Sean McManus

Additional Resources

- MakeyMakey https://makeymakey.com/
- Code Monkey https://www.playcodemonkey.com/
- Tynker https://www.tynker.com/
- Scratch https://scratch.mit.edu/
- Scratch JR https://www.scratchjr.org/
- littleBits https://littlebits.com/pages/educators
- Sphero https://www.sphero.com/education/
- Wonder https://www.makewonder.com/
- Ozobot https://ozobot.com/stem-education/classroom

MAKERSPACE PLANNING[3]

Many librarians and teachers are eager and excited to start makerspaces in their school, but feel overwhelmed with information and unsure of where to start. Work with the library advocacy committee to develop a plan to help form a better foundation on which to build the makerspace.

Question 1: What are the goals of the Makerspace?
While a Makerspace can offer various activities, it may be important to focus on one domain at the beginning.

Question 2: What resources does the school already have that can be used?
Consider what resources are available in the school when putting together the Makerspace proposal.

Question 3: How much physical space is available in the library?
Think about the amount of space that can be dedicated to storage and stations.

Question 4: How will teachers and students use the makerspace?
Consider if the Makerspace will be stationary or will it circulate. Find out the needs/wants of the students and teachers.

Question 5: Where will the supplies come from and/or how will it be funded?
Focus on smaller grants or donations and communicate the needs of the Makerspace to the school community.

[3] http://www.renovatedlearning.com/

MAKERSPACE POLICY EXAMPLE

The _____ will enable mentor-led learning and will introduce students and teachers to technology and equipment that is enabling new forms of creation and personal manufacturing. The _____ is about bringing people to create something using both technology and tangible materials. Creative hubs can enrich and empower library users' creativity and lives, which are an extension of the library's, mission - a place of lifelong learning. The makerspace project addresses a driving need to create lifelong readers and learners in students. Another important aspect of makerspace is documenting and sharing projects with other "makers".

Conditions of Service

- Students are required to check in before using the makerspace.
- No more than ____ people may be at a station at one time.
- Users must provide their own external storage devices and/or media. All images, videos, recordings and projects will be removed from the makerspace stations after use.
- Makerspace Users agree to:
    - Be courteous to other library patrons.
    - Comply with all rules, procedures, and restrictions developed by the library staff and or board.
    - Respect copyright laws and licensing agreements.

Use Agreement

First time users must read the *MakerSpace Policy and Rules* and parents must sign the agreement form stating students will comply with the rules and are financially responsible for any misuse or damage to equipment.

Rules

- The makerspace is open during normal library hours but scheduled classes get first priority.
- No food or drinks of any kind are permitted.
- If equipment is not working or having trouble with the equipment, please contact librarian immediately.

EQUIPMENT FORM

TYPE OF EQUIPMENT: 3D Printer

ASSIGNED NUMBER: EQP 51640

LIBRARY BARCODE: 5250000053

DATE RECEIVED: 9/4/15

MAKER	MODEL #	SERIAL #	ACCESSORIES	LOCATION	DATE REMOVED
Makerbot	Replicator 2	R0006310	• 4 rolls of filament • 3 strips of blue tape • Manual	Lab	

FUNDING SOURCE:

REMARKS/ REPAIRS MADE:

LOGIN INFORMATION:

ADDITIONAL RESOURCES

- 3D Printers: A Buyer's Guide https://www.iste.org/explore/Toolbox/3D-printers%3A-A-buyer?articleid=655
- Every Child a Maker https://makered.org/
- Instructables https://www.instructables.com/
- Lighthouse Creativity Lab https://lighthousecreativitylab.org/
- Make it @ your library http://makeitatyourlibrary.org/
- STEMfinity Resources https://www.stemfinity.com/index.php?route=information/information&information_id=16
- *Best Practices for Establishing a Makerspace for Your School* by Laura Fleming
- *High-Tech DIY Projects with 3D Printing* by Maggie Murphy
- *Tinkering: Kids Learn by Making Stuff* by Curt Gabrielson
- *Tape It & Make It: 101 Duct Tape Activities* by Richela Morgan
- *Whatcha Mean, What's a Zine?* by Esther Watson
- *15 Dangerously Mad Projects for the Evil Genius* by Simon Monk
- *The Library's Legal Answers for Makerspaces* by Mary Minow
- *School Library Makerspaces* by Leslie Preddy

For more information, please contact Elizabeth C. Simmons in the Office of Elementary Education and Reading.

601-359-2586 | **esimmons@mdek12.org**

Visit: **www.mdek12.org/Library**