Demco® makerspace

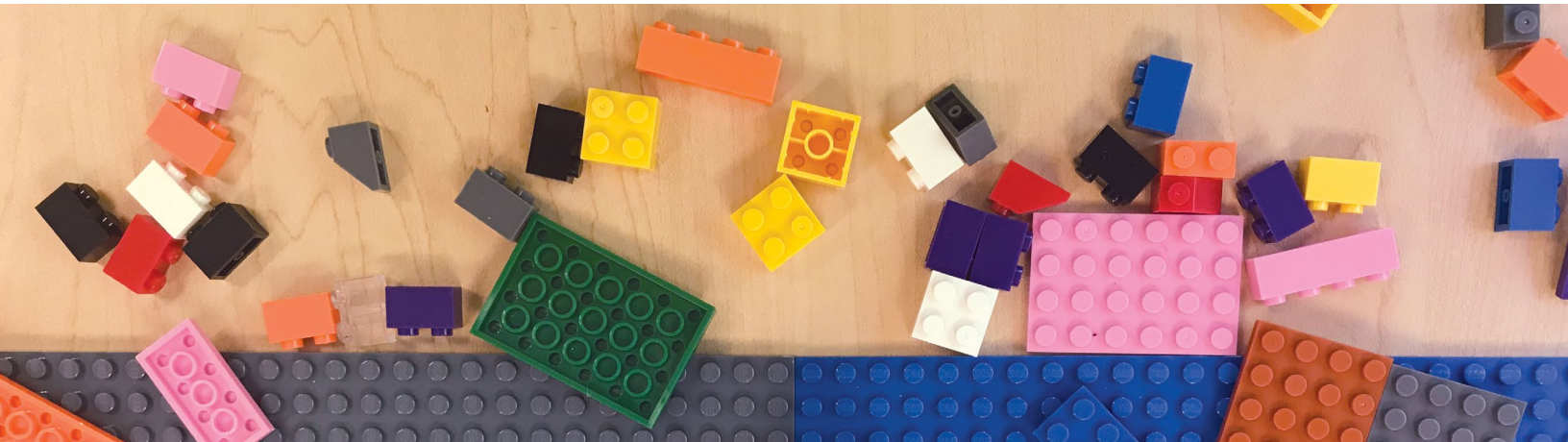
everything maker | everyone making™

How to Start a Makerspace

Planning and Resource Guide

"Makerspaces provide dynamic environments where our students can hone the skills of collaboration, creativity, communication, and critical thinking. No matter where they want to go in the future, these skills will help them to get there."

– Diana Rendina, Media Specialist



5 Reasons Makerspaces Belong in Schools and Libraries

By Diana Rendina

If you or your stakeholders are still on the fence about starting a makerspace, keep reading for five ways makerspaces benefit students and the broader community.

1. ALL Students Deserve Access to Making

Any student can come to the library to get the help they need to be successful, and makerspaces are next in the evolution of resources we provide for our students. The library is accessible to *everyone*, and we need to help bridge the gap to provide STEM and maker opportunities to *all* students.

2. They Help Meet Evolving Educational Needs

More and more active learning is happening in our schools and in our libraries. Students are expected to do more than write papers or create presentations, and collaboration is encouraged. Our schools and libraries need to support this style of learning, and makerspaces do just that.

The most important thing we can do to help foster the skills needed to excel in future careers is create dynamic learning environments where our students can thrive.

3. Play Provides Educational Value

There is a great deal of research available on the value of play in education. What often looks like "just play" is actually a reflection of much deeper learning: the enhancement of design, innovation, critical thinking, imagination, storytelling, and creativity skills.

4. Makerspace Projects Enrich Your Curriculum

There are endless ways you can connect makerspace projects to your curriculum and to literature. Students can take concepts they are learning about in their academic classes and apply that knowledge to projects they are working on in the makerspace to build the skills they'll need in the 21st century workforce.

5. They Enhance Your Library Program

Literacy and makerspaces happily go hand in hand. Attendance, behavior, and circulation are enhanced, as more students are drawn into the library by the makerspace. They get interested and stop at book displays. They talk to other students in the space who they normally don't socialize with. They check out books related to their projects.

Will it get loud sometimes? Yes.
Will it be messy? Yes.
Is it worth it? Absolutely.

Learn more about the benefits of maker learning:

When School Leaders Say Yes to Makerspaces

These Are the Students Who Benefit from Maker Education

"Meaningful making helps students apply their skills in real-world, authentic opportunities."

– Kristina Holzweiss

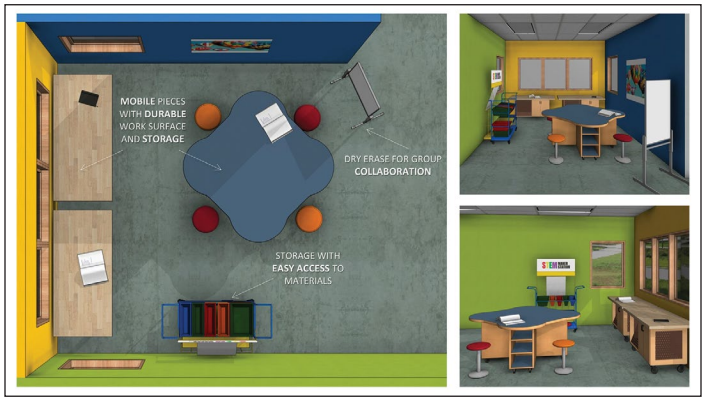
MAKERSPACES DEVELOP CRITICAL SKILLS

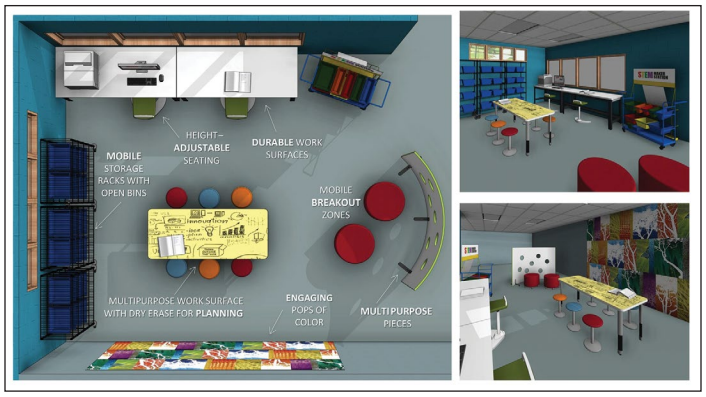
- *Communication*
- *Collaboration*
- *Creativity*
- *Critical thinking*
- *Problem-solving*
- *Flexibility*
- *Adaptability*
- *Productivity*
- *Initiative*
- *Perseverance*
- *Leadership*
- *Imagination*

STEP 1: Planning Your Space

Your makerspace can be as high-tech or low-tech as you want — the only requirement is that it inspires your students or patrons to become creators! Follow the tips below to create a space for making.

- **Seek input:** The way your space will be used will determine what it needs to look like. Involve students and staff by seeking their input on what they'd like to learn and topics they're interested in exploring.
- **Map out your space:** Evaluate the different areas of your library to determine how often each space gets used. Then, think about how you could consolidate, rearrange, and capitalize on any underutilized space. Solutions also include weeding your collection or transforming a former computer lab.
- **Make it mobile:** Look for carts and storage designed specifically for maker tools. This allows several libraries, classrooms, or schools within a system to benefit from shared resources.
- **Opt for flexibility:** Mobile, flexible furniture can transform your space into a multifunctional area. Tables that fold, nest, and roll aside; chairs that stack; and mobile whiteboards can easily be rearranged for individual work, collaboration, and large-group instruction.
- **Consider power:** Think about where you'll need power outlets and charging stations to power the tools you'll provide. There are many modern solutions for power, such as Connectrac, which allows you to run power anywhere, charging stations on wheels, and tables and seating with built-in power options.
- **Consider storage:** Where will you keep your tools, extra supplies, and works in progress? Labeled bins and storage will organize your creation space and make it easier for users to find what they need. Secure storage options will help keep your tools safe.





Demco's interior design team can help you envision the possibilities for your new space.

"Design your space around the needs of your students and staff, and you will find it packed and messy on a regular basis."

– Nicholas Provenzano

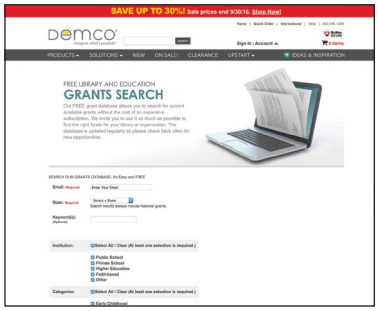
Need help reimagining your space?

Explore furniture and storage options at **demco.com** (search ***makerspace***), or contact a Demco interior solutions consultant for expert advice at **800.747.7561**.

STEP 2: Securing Funding

You've come up with a plan for your makerspace — now how do you go about securing the funds and supplies needed to turn your vision into reality?

- **Apply for grants:** The quickest way to fund a makerspace is to write grants. They are not easy to get, but they can jump-start a space very quickly. The most important part of any grant request is the narrative you tell — it needs to focus on student learning. Search the database at demco.com/goto?grants for grants currently available. Look for state-specific funding and target smaller grants, as they are easier to attain than larger competitive giveaways.



- **Connect with your PTA:** PTA members are always looking for creative ways to support learning in their schools. For larger purchases, such as a 3D printer, reach out to your PTA to see if they can donate the funds or ask them to help coordinate a fundraiser. You could also host a family night at school with a focus on coding, robotics, circuitry, and more and ask the PTA to help provide funding for the tools. Invite additional stakeholders to your events to showcase your space and garner their support.

- **Make a donation wish list:** Create a makerspace wish list to stock up on consumables, such as glue sticks, yarn, craft sticks, cardboard, and other art supplies. Send out a list in the summer when parents start buying school supplies and another list at the midyear point. Put old computers, phone chargers, phones, and other old tech on the list for students to take apart, reassemble, and destroy for art projects.

- **Appeal to local businesses and service organizations:** Set up face-to-face meetings if possible, and come prepared with details about your planned makerspace. Assistance may come in the form of funds or expert help.

- **Start a direct fundraising campaign:** Crowdfunding sites like PledgeCents, Kickstarter, Indiegogo and DonorsChoose.org can be an effective way to raise funds, as can reaching out to library users through email.

- **Get grant-writing tips:** Learn more about how to write a successful grant by visiting ideas.demco.com:

  6 Tips for Writing a Successful Grant

  Grant-Writing Tips

  Anyone Can Write a Grant Webinar

  5 Tips for Funding Your Makerspace

  Tips for Successfully Funding Your Makerspace

STEP 3: Getting Buy-In from Students and Staff

You have the support you need from your administration — now it's time to get users excited about all the new learning opportunities. Below are four simple ways to engage staff and community members.

1. **Gather Feedback:** Your first step should be to gather community feedback to make sure you're investing in supplies that will interest your learning community. Start by finding out what they are interested in learning. This research is fundamental to building a space that will have student and staff investment over time.
2. **Professional Development:** Allow staff to explore and make a few things during PD, before or after school, or during lunch. Make sure activities are short so they can accomplish them in the time frame and feel successful. If you have a teacher or staff member who is already using the space, team up with them to walk others through specific examples to help them fully see what is possible.
3. **Co-plan/Co-teach:** Some teachers are hesitant because they are afraid the technology won't work well or that they won't fully understand how to use it. You can help teachers feel more comfortable by offering to work with them and support their use of the tools in the makerspace.
4. **Promote Your Space:** Use every chance you get to share the learning happening in your space with your school and community in your newsletters, on social media, and by inviting parents, caregivers, administrators, and community members to visit.

> *"Celebrate the creativity and innovation of your students in the same ways you celebrate academic and athletic accomplishments."*
>
> – Dr. Jacie Maslyk

Try one of these activities to kick off your makerspace and build excitement:

1. **Cardboard Overload:** Gather a big pile of cardboard and give your students the freedom to create anything. Introduce them to Makedo™ cardboard tools, and they'll produce amazing cardboard creations.
2. **Maker Contest:** Prime the pump with a maker contest. For example, challenge students to form teams of four, identify a problem they see at home or in the community, and invent something to solve it using the tools in your makerspace.
3. **Ready-to-Go Projects:** Have a few projects on hand that have simple, clear instructions. This approach will help students feel immediately successful and pique their interest to explore on their own.

STEP 4: Keeping It Simple — Low-Tech Ideas

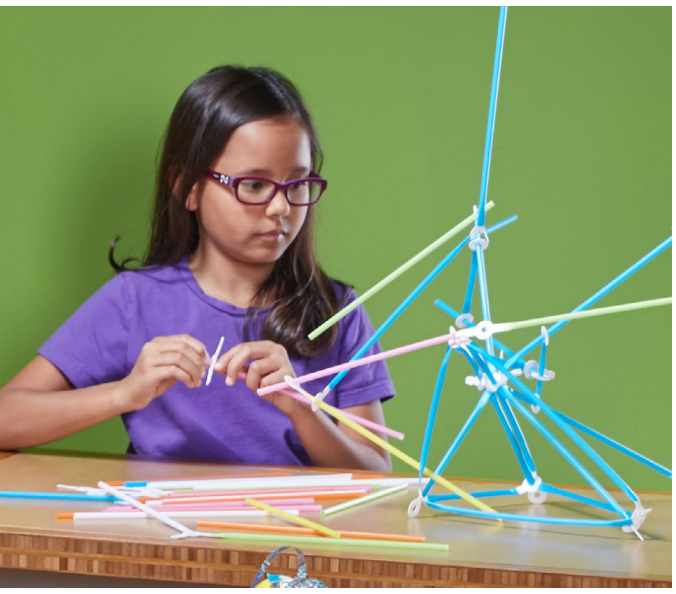
Technology is nice, but it's far from a makerspace requirement. There are many inexpensive (or free) items that offer limitless possibilities for supporting communication, collaboration, creativity, and critical thinking.

Use these tools to support learning across the curriculum from math to literacy and everything in between.

- **As much cardboard as you can find:** Save tissue boxes, toilet paper rolls, and other boxes. Some projects work better with corrugated cardboard, so it's a good idea to have multiple types.
- **Makedo™ Toolkit:** If you were impressed with your students' creations before, wait until you see what they do with Makedo. These handy cardboard tools and connectors help students create and iterate.
- **Basic tools:** Purchase a set of screwdrivers, wire cutters, and pliers.
- **Glue:** You'll want to stock up on hot glue and several hot glue guns.
- **Plastic bottles/jars/containers:** Put a collection box in the cafeteria and staff lounge to collect 2-liter bottles and coffee cans; within days you'll have plenty of stock. And don't forget to save the caps for wheels, etc.
- **Strawbees®:** Beginners and experts can use these plastic straws and connectors to build problem-solving skills.
- **Pool noodles:** They are very easy to cut and can be used for so many things. They're sturdy enough to serve as wheels, and you can easily poke straws or skewers through them to build some amazing structures.
- **TeacherGeek®:** These economical all-in-one activity kits encourage guided creation as well as open-ended invention and iteration.
- **Origami:** There are so many great literature connections to get kids excited about creating with paper. Makeables projects and origami bookmarks from Demco's Upstart line will jump-start the creativity.

"School leaders have to remember that messy learning is good learning. When students deconstruct, build, and create, their imaginations are activated."

– Dr. Jacie Maslyk



- **Button makers:** Users can create their own designs for clubs, fundraisers, and more.
- **Copper wire:** Craft wire is available in different colors and can be used to make jewelry and hold just about anything together.
- **Wooden dowels and toothpicks:** These serve as great axles and can support otherwise floppy structures. You can also use kebab skewers.
- **Duct tape:** "Duct tape is to makerspaces as water is to life," says Heather Lister, so make sure you're fully stocked!
- **K'NEX:** These building tools offer endless possibilities for design and engineering challenges.
- **Strictly Briks®:** Watch students design incredible creations with building bricks and platforms.
- **StickTogether®:** Create a sense of community with collaborative mosaic posters that are fun for all ages.
- **Yarn:** Yarn is great for knitting and crocheting, but it is also great for adding a little hair to your coffee-can robot or a string to your balloon-powered car. Craft stores have inexpensive yarn and often offer educator discounts.
- **Broken/obsolete technology:** Ask your tech department for donations of old technology that's no longer being used. Students and adults alike will love taking apart technology, exploring the insides, and making their own creations, such as bracelets of their names with keyboard keys and necklaces featuring motherboard charms.
- **Perler beads:** These beads are inexpensive, and you can make some incredibly intricate designs. Creators can make their own action figures to use in stop-motion or green screen videos.
- **Coloring materials:** Coloring's not just for kids! Provide a relaxation break for all ages with Color Craze bookmarks and more.

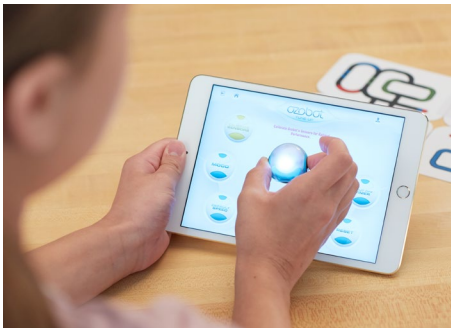
STEP 5: Go High-tech — Technology to Explore

Even if you're not the most technologically savvy, don't be afraid to jump in and try. You'll be surprised what you learn and what your students and patrons can teach you. That's what makerspaces are all about — innovation, perseverance, and learning from mistakes. A plethora of gadgets and tools on the market provide opportunities to experiment with technology to invent and create.

- **Makeblock Neuron Kits:** Kids as young as 6 can craft programmable electronic inventions in just 5 minutes with these comprehensive STEAM kits! Lego®-compatible building blocks connect with magnetic pins and no coding experience is required.
- **Snap Circuits®:** Introduce students to electronics with snap-together components and fun projects.
- **Squishy Circuits:** Use conductive and insulating play dough to teach the basics of electrical circuits in a fun, hands-on format.
- **Cubelets® Robot Blocks:** Magnetic blocks make it easy to engage young learners in building robots and practicing coding.
- **Dash & Dot Robots:** Boost coding skills with friendly, award-winning robots that can be programmed and controlled from a smartphone or tablet with free apps.
- **Sphero®:** Inspire creativity and invention with this app-enabled robotic sphere.
- **Ozobots®:** Teach the basics of coding with these tiny, app-enabled programming robots.
- **Edison Robot:** This modular, mobile robot immerses kids in robotics, programming, and STEM concepts and can be built up with building bricks.
- **Cue Robot:** Encourage advanced coding skills with a robot that features emotive AI technology that lets students switch between Block and JavaScript programming.
- **Rokenbok® Engineering Pathways STEM Lab:** Develop mini engineers with reusable 3D building blocks and an Arduino-compatible SmartBlock; includes comprehensive, project-based curriculum.
- **3D printers and pens:** Create real-world learning opportunities for budding inventors by creating anything from cookie cutters to models of cities. 3D design apps, such as Tinkercad, help expand design-thinking skills.
- **Multimedia production tools:** Students can use multiple tools, including digital cameras, green screen kits, audio equipment, and production software, to demonstrate their learning with video and audio projects.

"As a library media specialist, I believe it is my responsibility to continually introduce new resources to my students."

– Todd Burleson



Maker Projects to Get You Started

Below you'll find some tried-and-tested projects to get you started on your makerspace journey. Most can be done using simple supplies, and they'll help your students start building creativity, collaboration and perseverance.

Newspaper Towers

by Amanda Bressler

Challenge: See who can build the tallest tower out of newspaper and tape.

Skills Learned: Collaboration, communication, design, critical thinking, engineering

Age Range: 9+

Time Allotment: 30 minutes–1 hour

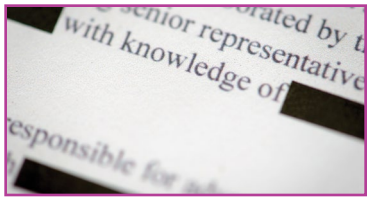
Supplies: lots of newspaper; rolls of masking tape, one per every three to four participants

Steps:

1. Divide the kids into teams of three or four.
2. Give each team a stack of newspapers and a roll of tape, and challenge them to build the tallest tower they can, using only the newspaper and tape.
3. It's up to each team how they achieve the goal.
4. When they are finished or you run out of time, have each group show off their creations and measure their towers.

Blackout Poetry

by Diana Rendina



Challenge: Create a poem by blacking out words and sentences in discarded books.

Skills Learned: Poetry skills (e.g., simile, metaphor, imagery)

Age Range: 10–18 (scale based on the complexity of the text)

Time Allotment: 1 hour

Supplies: Discarded books and magazines (or science books and magazines), black markers

Steps:

1. Give students black markers and discarded books and magazines, have students create blackout poetry (you can use science books and magazines if you'd like them to be science-themed).
2. Have students look for words that stand out to them and outline them to begin creating their poems.
3. Once students have found all the words for their poems, they can either black out or color over the rest of the text to make their poems stand out.
4. Ask for volunteers to read their poems aloud.

Egg Drop Contest

by Diana Rendina

Challenge: Build something that can hold and protect an egg when it is dropped from a ladder.

Skills Learned: Critical thinking, physics, mechanics

Age Range: Any age

Time Allotment: 1 hour

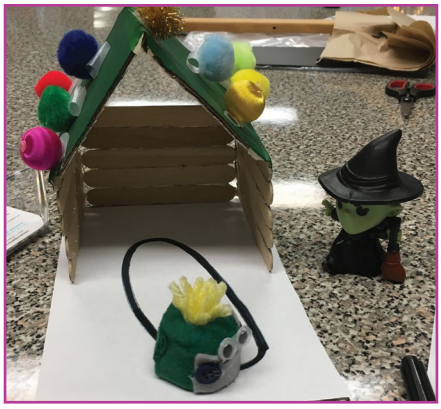
Supplies: Arts and crafts supplies; insulating materials, such as foam, cardboard, fabric, and packing peanuts; things used for attaching, such as tape, glue, yarn, paper clips, binder clips, etc.; a raw egg for each group

Steps:

1. Divide students into groups, and explain the challenge to them.
2. Give each group an assortment of arts and crafts supplies and a raw egg.
3. Let groups choose their insulating material and choose from the assortment of attachment materials.
4. Set a time limit so that they have to work quickly to build their contraptions.
5. After time is up, gather everyone together and test the egg holder contraptions. (Place a plastic tarp underneath the ladder to prevent getting egg goo on the floor.)
6. Once all of the egg holders have been tested, hold a discussion. What were the common characteristics of the contraptions that kept their eggs from breaking? How could the ones that didn't work be modified to work next time?

Robot Characters

by Alisha Wilson



Challenge: Re-create a favorite scene from a favorite book or story using programmable robots.

Skills Learned: Coding, storytelling, character development, literacy, design, videography

Age Range: 10+

Time Allotment: 3–4 one-hour sessions

Supplies: Ozobots® or any programmable robot, paper, markers, cardboard, craft materials, and glue

Tips: We use Ozobots in our library for these activities because they are cost effective and offer a graduation of coding skills. Ozobots make great characters for a variety of age groups because they can be coded using markers on paper, drag-and-draw coding with the Ozobot Bit app, and drag-and-drop coding with the OzoBlockly app. However, any programmable bot will work for this activity.

If you are working with an entire class, having a class set of Ozobots is ideal. However, you could make this activity work without a class set, as the Ozobots can quickly change costumes and coding before showtime.

Steps:

1. Have students choose what story and what scene they would like to re-create and then reread, research, and brainstorm to decide what details to include.
2. Next, have students create their characters by giving the bots physical features. Ozobot sells plastic skins that students can draw on directly, but you do not need these to make costumes for the characters. Using simple materials like paper or fabric sized to fit works just as well. For example, cotton balls make a great beard for Dumbledore, and red and yellow yarn make a great scarf for a Gryffindor quidditch player.
3. Then have students think about the actions their "characters" will display in the scene. It is important that they experiment with the codes first to see all of the actions the Ozobot is capable of before deciding how their character will behave in the scene. Is the character pacing with nervousness or spinning around in a tizzy because he or she is flying around on a broomstick trying to find the snitch?
4. Have students create videos of their scenes. If the students are telling an entire story, they will want to record each scene and compile them into a single video. HUE Animation Studio is a great tool for making videos, and it comes with its own editing software. iMovie on an iPad is also a great option for recording and editing.
5. Share videos with the class and others.

Creature Challenge Storytelling

By Diana Rendina

Challenge: Design a creature that does something, using whatever materials you have available.

Skills Learned: Design, literacy, storytelling

Age Range: Any age

Time Allotment: 2–3 hours (can split over multiple days)

Supplies (lists will vary): cardboard, arts and crafts materials, Legos, K'NEX, Cubelets®, electric cardboard cutters, several hot glue guns and lots of glue, scissors, packing tape, acrylic paint and paintbrushes, tinfoil, plastic wrap, rubber bands, and lots of googly eyes

Steps:

1. Explain the challenge to students and let them get to work designing their creatures (e.g., a cardboard dog that recycles whatever it eats, a tape-eating hedgehog, or a horse that's shy and backs away from you when you get too close).
2. Have students write or record the story of their creature. By telling a story about a creature rather than themselves, this project can feel safer for students who are shy about sharing their own lives. There are multiple ways students can tell their creatures' stories:
   - Use a tablet to record the student sharing about their creature.
   - Have students create a stop-motion animation to share their creature.
   - Have students write a creative story or draw a comic strip about their character.
3. Once the challenge wraps up, have students share their creatures' stories through a presentation or a gallery walk. This would also be a great opportunity to host a video conference with another school and have your students share projects with them.

Build a Catapult

by Angela Rosheim

Challenge: Build a catapult that can launch something the farthest.

Skills Learned: Research, design, engineering, critical thinking

Age Range: 10+

Time Allotment: 12 days, 1 hour per day

Supplies: Craft sticks, rubber bands, binder clips of varied sizes, pompom balls, shoeboxes, boxes of varied sizes, plastic spoons, a tape measure, and a good selection of recycled materials

Steps:

Prep Work

- Set up a research template in Google Classroom.
- Preview databases and websites for student success.
- Get supplies ready for controlled practice builds.
- Set up a Google Doc to record launch results per class.

Day 1

- Ask students to brainstorm what they already know about catapults on their Google Classroom note-taking template.
- Lead students through identifying keywords to use for search purposes.
- Model/review for the whole class how to read for information.
- Allow students to spend the rest of the time reading for information independently or with a partner and jotting down questions they have. Let them use Encyclopedia Britannica online and kid-friendly search engines to do their research.

Day 2

- Continue to read and answer questions.
- Have students cite their sources on their Google Doc. This is an opportunity to review when and why they need to cite sources.

Day 3

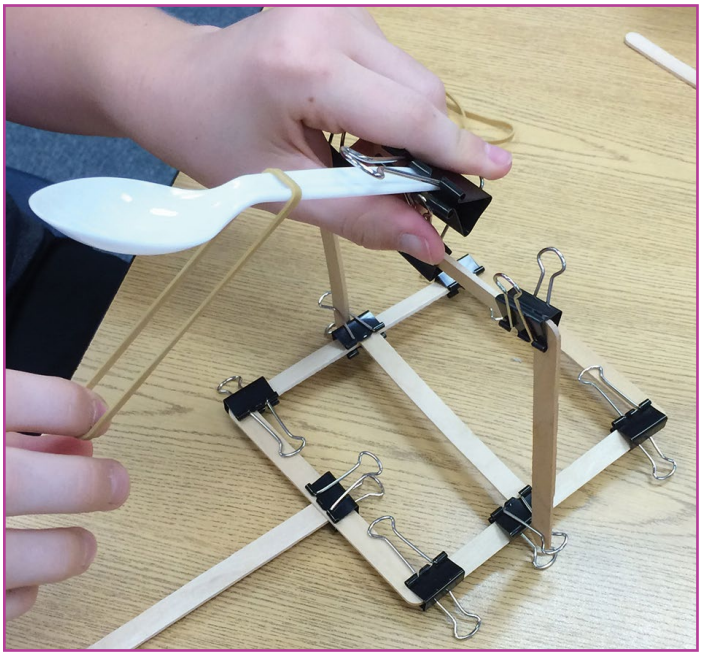
- Continue research.

Day 4

- Now it's time for them to start thinking about building their own catapults. From their research, they should be familiar with what catapults look like, how they work, how they have been used throughout history, and how they are still used today.
- Begin with a controlled build in order to learn what will work and won't work when building their own designs for a catapult. Each table should be given a supply of craft sticks, rubber bands, small binder clips, and pompom balls to launch.
- Students can work independently or with a partner.
- Designate a launch area for kids to test their builds.
- Based on launch distances, students should iterate their designs for improvement.

Day 5

- Allow students to spend one more day rebuilding catapults using the controlled materials based on what worked and didn't work last session — in other words, learning from failure!



Day 6

- Using what was learned with the controlled build, individuals or small groups should begin planning and designing a catapult out of materials available in the makerspace.

Day 7

- Students should continue planning and designing.

Days 8, 9, 10

- Build, test, fix, test, fix — and so on.

Day 11: Official Launching Day

1. Set up an official launch site with a tape measure.
2. Allow each group one test launch and two official launches with measurements taken.
3. Record the results and announce the winning team for each.
4. Have discussions about why their catapults worked or didn't work.

Day 12: Complete Launches and Final Reflection

- Spend a day reflecting on your catapult experiences. Each student should complete the following phrases: I liked ..., I learned ..., I wish ..., I would change ..., [The teacher] could .... These reflections help kids determine what they learned from this experience and how they can transfer that learning to future projects. The reflections also help the teacher improve the unit for the next group of students.

K'NEX Design Challenge

By Diana Rendina

Challenge: Using K'NEX, design a product that can hold a smartphone.

Skills Learned: Engineering, teamwork, marketing

Age Range: 11–18

Time Allotment: 45 minutes

Supplies: K'NEX, handheld devices (e.g., smartphones, tablets)

Steps:

1. Explain the challenge to students: "Using the K'NEX at your table and working with your table groups, build something that can hold a smartphone or tablet to take a picture or make a stop-motion video. You have 20 minutes. We'll share our designs with *Shark Tank*-style pitches."
2. Allow 20 minutes for prototyping (add more time if groups need it).
3. At the end of the 20 minutes, ask groups to demonstrate their inventions. If you need the activity to last longer, include the creation of a video into the time frame, and have students share their holders and videos.

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Need Help Getting Started?

Find all the products, services, and resources you need to prepare students for future success through hands-on, project-based learning.

Demco makerspace

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