

INNOVATION STUDIOS GALLERY

The purpose of our Innovation Studios exhibit is to provide students with a hands-on learning experience that allows them to explore their creativity and problem-solving skills and think like great engineers! The Innovation Studios gallery is a great place for students of all ages to explore and learn. Students can experiment with physics and forces on the Bed of Nails, build a pinwheel and test their design on the air tables and more. From investigating shadows and colors to building and creating, this area is a great place for students of all ages to explore and learn different STEM concepts and applications.

THE ENGINEERING DESIGN PROCESS

The design process provides a structured way to take an idea from its initial idea to its “finished product” stage, learning from mistakes that are made along the way. Engineers always expect to fail during the Design Process; they see failure and mistakes as steps that lead them to a good solution to the problem. The Engineering Design Process give engineers a framework to help them solve problems.

1. **ASK:** identify the problem; before building, engineers define the problem they want to solve and come up with a variety of solutions—the more, the better.
2. **IMAGINE:** brainstorm the possibilities of the challenge; Engineers share their ideas about solutions with team members this is called collaboration.
3. **PLAN:** think, sketch the design, label the working drawings; Engineers write and sketch their ideas and solutions. Their drawings are detailed and labeled.
4. **CREATE:** make the prototype following your plan; Engineers gather materials and build.
5. **TEST:** test the prototype to see what parts work well and what parts don't; Engineers run tests on their prototype.
6. **IMPROVE:** what needs to change to improve it; Engineers learn how to find what specific parts work well and what parts do not work well, then they work on fixing just those parts rather than beginning the whole project over which can waste valuable time.
7. **REFLECTION:** give careful thought to the solution; Engineers present their work to colleagues to show how they solved a problem. They learn new ideas and approaches from each other.

GRAVITY WELL

What is a Gravity Well? How can you demonstrate the pull of gravity that a large body exerts in space? Step into the captivating world of gravitational forces and explore the fascinating concept of a gravity well. As you embark on this journey, you'll uncover the secrets behind what keeps planets in orbit, galaxies together, and even guides the motion of light itself. The more massive the body, the deeper and more extensive the gravity well. Our sun exerts a deep and vast gravity well relative to other bodies in our solar system which keeps the planets rotating around it.

Things to consider:

- Does the ball increase speed as it travels down the well or is it a constant speed?
- How long does it take for the ball to drop? Have your students play a game with a friend to see whose ball lasts the longest in the well.
- Try to set the balls in motion without using the ramps!



BED OF NAILS

One of the most captivating features of the Innovation Studios Gallery is the "Bed of Nails" exhibit. This unique and engaging installation offers an insightful exploration into the principles of physics and the wonders of pressure distribution. This interactive experience challenges your understanding of weight, force, and surface area. This exhibit demonstrates the remarkable way in which pressure is distributed across a surface!

WIND TUNNEL

Students will be delighted to explore air pressure by inserting different creations into the opening and watching them fly around inside the tube. Newton's laws of motion, the Bernoulli principle and aerodynamics can be further explored by providing experimenters with a variety of changing materials such as paper plates, cups, yarn and cardstock and having them build, test and modify their very own flying creations!

TURN TABLE

Experiment with rotational motion and collisions when you roll disks across the turntable! As the disks roll in a straight line across the rotating surface, they appear to take a curved path, a principle known as the Coriolis effect. This principle is important for any type of science that deals with the Earth and its planetary motion, from studying ocean patterns to setting flight paths. Students love the challenge of getting the disks and rings to stand on edge on the turntable!

DESIGNER STUDIO

Designer Studio, known as the light room, invites students to explore the science behind electromagnetic radiation or UV light. The special lighting landscape invites the students to explore a variety of interactive activities throughout the studio, including a giant Lite-Brite board!

INVENTOR STUDIO

Inventor Studio is focused on STEM based tinkering. Guests are invited to work through the Engineering Design Process as they ask, imagine, plan, create, test, improve, and share their creations. The studio is arranged to gradually facilitate the independent learning process. At times this studio will focus on technological tinkering as well!

IMAGINER STUDIO

Imaginer Studio is a place that invites imagination, where guests form mental image of what they're learning in the studio. The idea for this studio is to provide real information about a variety of science and history topics. It leaves room to explore the KWLs (Know, Wonder, Learn). Guests are invited to use their senses and curiosity to explore live animals, science specimens, and manipulatives.



TEKS:

K: 2B, 6A,B,C,D,

1ST: 2B,C,D,E, 3A,B, 6A,B,C

2ND: 2B,E,F, 3A,B, 6A,B,C

3RD: 2A,E, 3A, 6A,B,C

4TH: 2,A,E, 3A, 6,A,B,C,D

5TH: 2A,B,E, 6A,B,C,D

6TH: 2A,B, 3A, 8A,B,C,D,E, 9C

7TH: 2A,B,E, 3A, 7A,B

8TH: 2A,B,E, 3A, 6,A,B,C

CLASSROOM CONNECTIONS

PRE-VISIT ACTIVITIES:

Explore with Newton's Laws:

Introduce Newton's three laws of motion using real-life examples, such as a ball rolling or a car stopping. Provide hands-on activities that allow students to experience these laws firsthand, like using toy cars and ramps to demonstrate inertia and acceleration. Challenge them to create diagrams or posters illustrating each law and its implications.

Design a Pinwheel:

Using materials such as paper cone cups, paper plates, paper, masking tape and other classroom supplies, have your students create their own unique pinwheel. They will be able to test their inventions at the Wind Tunnels in the Innovation Studios Gallery during their visit! *You could also replicate this back in the classroom by using a box fan turned on its side.*

Create a Sky Spinner:

Attached to this guide is a copy of our Sky Spinner printable. You can print these for your class so they are able to cut them and color them ahead of time! They will be able to test their creations at the Wind Tunnels in the Innovation Studios Gallery! *You could also replicate this back in the classroom by using a box fan turned on its side.*

SPARK CURIOSITY!

Encouraging children to use **"I Notice, I Wonder, I Imagine"** questions during a field trip can help them engage actively with the exhibits, stimulate their curiosity, and foster their creativity and critical thinking skills. It also provides an opportunity for meaningful discussions and reflections on their experiences.

For Example: "I notice vibrant colors and many different things to build & create with, I wonder if I can build my own robot someday, I imagine programming it to explore distant planets and discover new things."

TRY THIS BACK IN THE CLASSROOM!

These lesson ideas will help extend the learning from the museum visit and encourage students to explore STEM concepts, fostering creativity, critical thinking, and a deeper appreciation for the wonders of engineering!

Toothpick Towers:

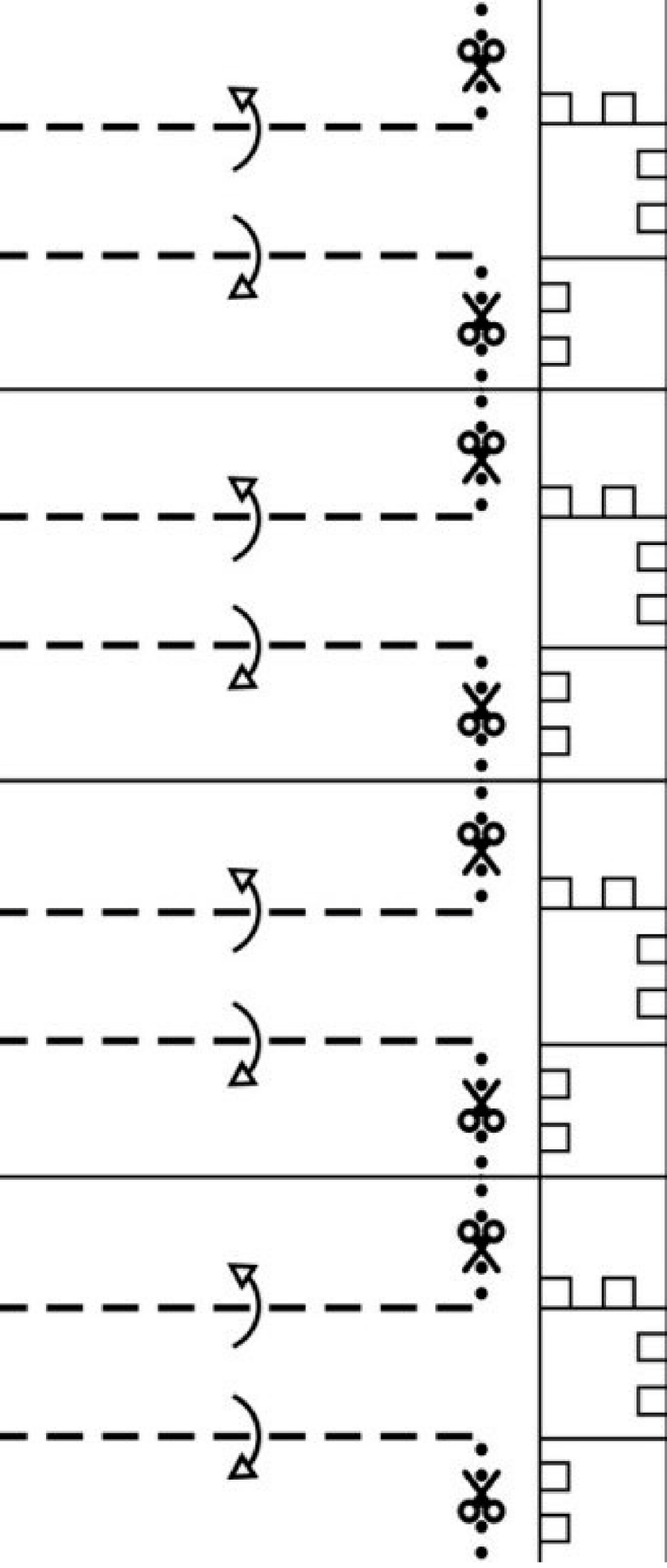
Toothpick towers are such a fun and simple STEM challenge and team building activity for students. This is great for all ages because it tests their problem-solving and creativity skills and you can change many elements of it to fit your classroom needs or for the seasons. For example, you could use different elements such as mini marshmallows, play-doh, candy pumpkins or gum drops! Have your students work together to see who can build the tallest tower!

Home Tweet Home:

Divide students into partners or groups and challenge students and have them conduct basic research about endangered birds. Have students plan and design birdhouses using recycled materials and classroom supplies, to attract an endangered bird species of their choosing. Encourage students to utilize the Engineering Design Process!

Balloon-Powered Cars:

Have students work together to design and build a balloon-powered car that can travel a certain distance in a straight line using the following materials: plastic bottle, four plastic bottle caps, wooden skewers, straws, balloon and tape! Emphasize the importance of creativity, innovation, and trial-and-error in the Engineering Design Process.



Sky Spinner
Cut on dotted lines and fold on dashed lines.

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Cut on dotted lines and fold on dashed lines.

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