ACTIVITY GUIDE

michelee puppets

Empowering lives through the art of puppetry.

MISSION STEAMPOSSIBLE

for Grades 3-5

SCIENCE IS FOR EVERYONE!

Discover how to apply science to unlock the mysteries of our universe; and how to use technology to solve the problems of our world.

Activities were designed by Angela Roller and Kimberly Seaver, educators with Orange County Public Schools. Thank you!

GETTING READY

Mission STEAMpossible is designed to connect with children through a compelling story that engages students on an intellectual and emotional level. Puppets and captivating visuals draw students into the world of our main character, Magnificent. Magnificent is a teen inventor, who dreams of becoming an engineer on the first mission to Mars. Magnificent's hilarious robot sidekick, DinoBot, is programmed to fetch balls and to help Magnificent use the scientific method to compete in the Mission STEAMpossible Challenge. When her dreams collide with the needs of her little brother, Marcus, who is physically disabled, Magnificent learns that through her own ingenuity and engineering skills, she can help her brother and still reach for the stars.

MicheLee Puppets has a long history of using puppetry to dispel stereotypes and to elicit understanding between people who are different. Mission STEAMpossible tackles the stereotypes of "science nerds" and the false notion that girls are not smart enough for science and math. Even as we feature a female main character, girls and boys alike are spellbound by the captivating story that unfolds.

Please help us make this program more valuable to your students by preparing them for our visit.

PERFORMANCE REQUIREMENTS

- We arrive 2 hours before the first show to load in and set up. Please assign a contact person and/or custodian to meet our team so that we can load into your building right away. It will take 30 minutes to unload the van, and then we will move the van to your designated parking area.

- Make your cafeteria/auditorium space ready by clearing your stage completely. We have a large set and will use the entire stage area.

- If you have windows in your cafeteria, please use black craft paper to block outside light. We are using black light in the show, and the effects won't work unless your room is dark.

- We want your students to have an extraordinary experience. If possible, we prefer for the kids to be seated on the floor, centered in front of the stage for the best sight lines. If you cannot have the tables moved for the kids to sit on the floor, the second option is to push tables toward the center so that no one is sitting too far to the right or the left of the stage.

- Teachers present to help students stay in their places during the performance.

PRE-SHOW

Discussion

WHAT IS A PUPPET?

A puppet is an inanimate (non-living) object that is brought to life by the manipulation/movement of a puppeteer. Mission STEAMpossible uses the styles of “hand puppet” and “hand and rod” puppet.

- **Hand Puppet:** A hand puppet is a puppet which is controlled by a puppeteer’s hand. In Mission STEAMpossible, DinoBot is a hand puppet.
- **Hand and Rod Puppet:** A hand and rod puppet is a puppet which is controlled by both hands. The puppeteer’s hand goes into the head of the puppet, operating the mouth. The puppeteer’s other hand controls the “arm rods” connected to the puppet’s hand or hands. In our story Magnificent’s brother, Marcus, is a hand and rod puppet.

WHAT IS A PUPPETEER?

A puppeteer is a performer that manipulates a puppet to tell a story. The puppeteer’s role is to use an audience’s “willing suspension of disbelief” to convince them that the object being performed is a living, breathing character. Two puppeteers perform live voices for the characters, Marcus and DinoBot, in Mission STEAMpossible.

WHAT IS THE ROLE OF THE AUDIENCE?

MicheLee Puppets encourages an interactive audience experience including laughing, sharing of ideas, and active listening. A successful live theatre experience requires the focus of both the performers onstage and of the audience offstage, including students and teachers.

DISCUSS AUDIENCE ETIQUETTE

- **How is a live performance different than a TV show or movie?** In a live show the performers can see and hear you. What can you do to keep from being distracting?

- **How can I respect my fellow audience members?** Being considerate of others’ space and talking only when prompted by the actors. How else?

- **How can I respect the performers?** Clapping shows appreciation to the performers. Following directions and staying focused on the show make a better experience for all. How else?

PRE-SHOW SURVEY

5th Grade Teacher: Pass out pre-show survey that was provided to you. (The pre-show and post-show surveys can be printed on the front and back of the same sheet of paper.)

We are going to meet Magnificent. She wants to be an engineer and she is entering NASA's Mission STEAMpossible Challenge. STEAM is an acronym which means that each letter in STEAM stands for a word. The letters in STEAM each represent an area of study that Magnificent will have to bring together when working on the challenge. On the pre-show survey, fill in the acronym. If you are not sure, just take your best guess.

- **What do you think the S in STEAM stands for?**
- **How about the T?**
- **The E?**
- **The A?**
- **The M?**

During the show, pay close attention to see if you can check your understanding about the components in STEAM and the characteristics that help Magnificent in her engineering project for the Mission STEAMpossible Challenge.

Have students complete the rest of the survey before seeing the performance.

VOCABULARY

OBJECTIVE

Introduce students in grades 3-5 to definitions of vocabulary words from Mission STEAMpossible

Asteroid	A rocky or metallic object that orbits the Sun and is much smaller than a planet
Bionic	Having artificial body parts that imitate living systems
Constellation	A group of stars forming a recognizable pattern
Engineer	A person who designs, builds, or maintains engines, machines, products, structures or public works
Engineering Design Process	Ask, Imagine, Plan, Create, Improve
Experiment	A scientific test or procedure that is carried out under controlled conditions to answer a scientific question
Force	Push or a pull that one object exerts on another object with or without direct contact
Friction	A force that opposes motion when one object rubs against another
Gravity	A force that pulls objects towards each other
Inference	An explanation based on evidence that is not directly observed
Investigation	An organized scientific study of the natural world that may include making systematic observations, asking questions, gathering information, analyzing data, summarizing results, drawing conclusions, and/or communicating results
Moon	Information about the natural world gathered through the senses and/or scientific instruments

VOCABULARY

Mechanical Energy	A type of energy an object has due to its motion or position
Observation	Information about the natural world gathered through the senses and or scientific instruments
Planet	A large body in space that orbits a star and does not produce its own light
Prediction	A statement that can be tested scientifically through experiments and/ or other scientific investigations
Revolution	The motion of one object around another object
Rotation	The turning of an object on its axis
Sextans Constellation	A star formation introduced by the Polish astronomer Johannes Hevelius and named for the sextant, an instrument he used to measure the angular distance between stars
Solar System	A system of planets and other bodies that orbits a star
Star	A large object in space that is made of gas and produces its own light
Technology	The use of science in industry, engineering, etc., to invent useful things or to solve problems

POST-SHOW DISCUSSION

POST-SHOW SURVEY

Teacher-pass out post-show survey.

SAY...Since watching the show, I'll bet we learned something new and even adjusted some of our thinking. Have students complete the rest of the survey

POST-SHOW QUESTIONS

These question samples may help you to engage students in meaningful discussion:

- What career did Magnificent want to have in the future? How is she working toward her goals?
- What challenges do you think Magnificent experienced? What did she do to overcome her challenges?
- Why does Magnificent want to go into space? Do you think she will make it? Why or why not?
- What do you think an engineer does? What qualities and skills do you think an engineer needs to be successful?
- Why do you think Magnificent felt responsible for her brother Marcus?
- How do you think Magnificent built DinoBot? What technology do you think she used?
- What would you like to invent for yourself?
- How can science and technology make our lives better?
- Can science and technology cause problems or unforeseen consequences? Can you think of an example?
- How many of you would be interested in a future career in science or technology? What would you like to do?
- What did you like best about the show?
- What did you learn that you never knew before?

ACTIVITY

Build a Constellation Projector

SIMPLE CONSTELLATION PROJECTOR PLAN FOR YOUNG STUDENTS:

PlaygroundParkbench.com/Printable-Constellation-Cards

READ THE SCENARIO BELOW

Marcus enjoys looking at patterns of stars every night. These patterns of stars are known as constellations. In the play, Marcus is not always able to view the constellations.

When was Marcus unable to view the constellations? What are some other possible reasons Marcus would be unable to view the constellations?

Engineers solve problems. Today, we will act as engineers to help Marcus solve his constellation viewing problem! Marcus needs you to use the available supplies to design a constellation projector so that he can view constellations every night.

I challenge you to use science, technology, engineering, art, and math to build Marcus a constellation viewer that projects at least one star pattern on to the wall or ceiling in a dark room. You will have **(XX)** amount of time to complete your project.

XX: Set the amount of time you are giving students to complete the project

POSSIBLE MATERIALS

In engineering design, you can add, substitute, or subtract supplies as available or to achieve a desired effect:

- Aluminum foil
- Black construction paper
- Coffee Cans with lids or breadcrumb containers (cylinder shaped)
- Plastic cups
- Rubber bands
- White crayons
- Duct Tape
- Pieces of cardboard from cereal boxes, tissue boxes or any leftover cardboard around your school
- Something for poking star holes in device (i.e., sharpened pencil, wooden skewer, thumb tack, nail - you know your students best)
- Mirrors- to use to aim your light for reflection
- 1 flashlight per projector being made

CLOSED CIRCUIT SUPPLIES

- Wire or aluminum foil (conductive metal)
- Battery holder
- 1 D battery
- Flashlight miniature light bulbs
- Light Bulb holder

ACTIVITY

Build a Constellation Projector

SUGGESTED SETUP

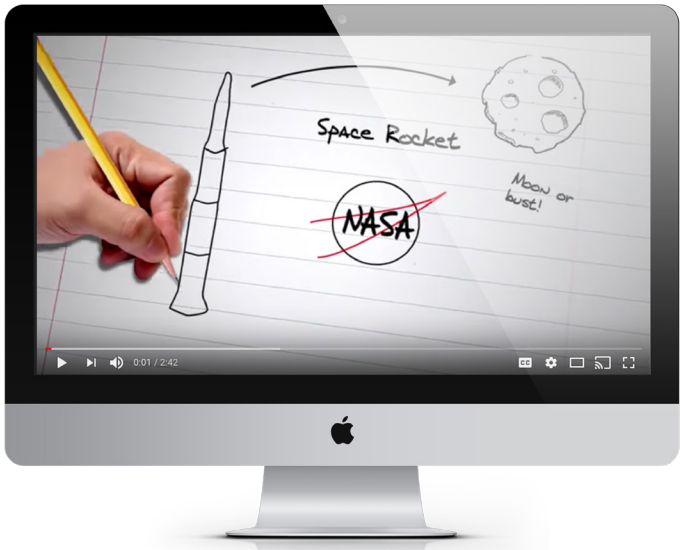
- Place dark bulletin board paper over windows and door openings, so the room will be dark to test students' constellation projectors.
- Layout materials for student selection.
- Students could work individually or in groups of 2 to 4.

WATCH THIS VIDEO

YouTube.com/watch?v=wE-z_TJyzil

Use this video to introduce the engineering design process. Stop to discuss each part of the engineering process: **ASK, PLAN, BUILD, TEST, IMPROVE.**

- **ASK:** Engineers are asked to solve a problem. What problem are you solving for Marcus?
- **PLAN:** Engineers plan. When you are planning, you should brainstorm many possible solutions to create a constellation projector, draw and label your designs, list materials you will need and imagine which design might work best considering any constraints you are under (materials available, time to complete, etc.).
- **BUILD:** Engineers then get to build prototypes. This is when you will construct your constellation projector.
- **TEST:** Engineers test so that they can see if their design works to solve the problem. They ask: What is working well? What is not working or could be working better?
- **IMPROVE:** Finally, engineers imagine ways that the device could be improved. Any of the areas that were not working well during the test should be addressed along with any possible improvements to make it work even better.



THE ENGINEERING DESIGN PROCESS

Ask: What is the problem you are trying to solve? _____

_____

_____

Plan: Constellation Research _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Constellation Projector Diagram with Materials labeled:

Test: What is working well? _____

_____

What is not working well? _____

_____

How well does it represent the constellation when projected? _____

_____

Improve: What can you add or change so that your projector works better? _____

_____

_____

What is not working well? _____

_____

How well does it represent the constellation when projected? _____

_____

Questions to Ponder: Does your projector make your constellation appear to move across the sky from east to west? If not, could it? What causes this apparent movement of the real constellations? _____

_____

_____

_____

Is your projector able to change out constellations so that Marcus can view multiple constellations on the one projector? If not, could it? If yes, why is this a beneficial feature for your viewer? _____

_____

What other cool features could you add to your projector to make it the one Marcus would choose as the perfect constellation projector? _____

_____

Improved Diagrams:

ACTIVITY

Build a Constellation Projector

FOLLOW THE STEPS OF THE ENGINEERING DESIGN PROCESS TO SOLVE MARCUS' PROBLEM

Teacher - Pass out the Student Planning Page. The students use the planning sheet as they work through the process. Below are standards based, targeted questions teachers can ask during each stage of the process.

- **ASK:** Students need to understand the problem and constraints. Ask: What is the problem you are trying to solve? What materials are you able to use? How much time do you have to complete this project?

- **PLAN (ELA):** This is when your ELA activity should be completed. Research a constellation to use in your constellation viewer. Learn the Greek Myth associated with the constellation so that you can tell Marcus in video format the story of the constellation. Use FlipGrid to record your story so that Marcus could view it at any time. You will have 90 seconds to tell the story, so be sure to plan it out ahead of time to be prepared to tell it well when recording. (FlipGrid is free and super cool! Follow the link to learn more. Students will just need a device with a camera and the flip code to your grid - **Info.FlipGrid.com**)

  Here is the link to a brief example of what it does **FlipGrid.com/s/f665f46baffa**
  You will need student photographic image releases if you are going to use this in the final materials.

  While students are researching constellations to use for their projectors, ask:

  Science: What season is your constellation associated with? Why are the seasons and particular constellations associated? The stars in your constellation appear to be right next to each other in the nighttime sky. If you tried to view your constellation from Mars, what would you notice? What are some reasons some of the stars in your constellation appear brighter than other stars? While students are diagramming their plans, ask:

  Technology: How is the flashlight going to help you in solving Marcus' problem? Could the problem be solved without the flashlight technology? How can the internet help you in solving this problem?

  Engineering: How will this plan work to solve Marcus' problem? Will you be able to build your plan within the time restrictions set for this project? Do you have access to all of the materials that you are showing in your plan? What materials are you allowed to use?

  Art: What will your device look like? What will draw Marcus to your device over others if they were all set out on a table? If you were creating your own constellation, what would it look like?

  Math: How are you going to make the model of your constellation? How can you use measurement to help you? Do you see angles in your constellation? What math tools could help you build your model? What do you think will happen to the distance between stars in your constellation when you project it onto the wall? How many line segments are in your constellations? Vertices? Rays? Will the length of the line segments change when projected on the wall? Can you see 2D shapes in your constellation? Find the area of one of the 2D shapes in your constellation. How does the area change when you project your constellation? How are the small version and large version related? Could the stars make 3D shapes?

ACTIVITY

Build a Constellation Projector

- **BUILD:** Decide the amount of time you want to give your students to build their projector. Be sure to add this into the design challenge statement before presenting so that students recognize this as a restriction for their build. Remind students of the time constraints so that they will work diligently to complete the projector.

- **TEST:** Turn off lights, and test projectors. Teacher questions to ask during testing: What is working well? What could be changed to make it work better? Does it look like the constellation when projected? Can you make your constellation appear to move across the sky from east to west? What causes this apparent movement of the real constellations?

- **IMPROVE:** Make changes to your design to help it work, work better, or look better.

ELA EXTENSIONS

OPTION 1

Write a letter to Marcus. Tell how you came up with your constellation viewer. Explain how you worked as a team. Explain how each teammate contributed to the design. Tell Marcus what materials you used in case his viewer ever needs to be repaired. Tell Marcus which constellations you used and why you chose them.

OPTION 2

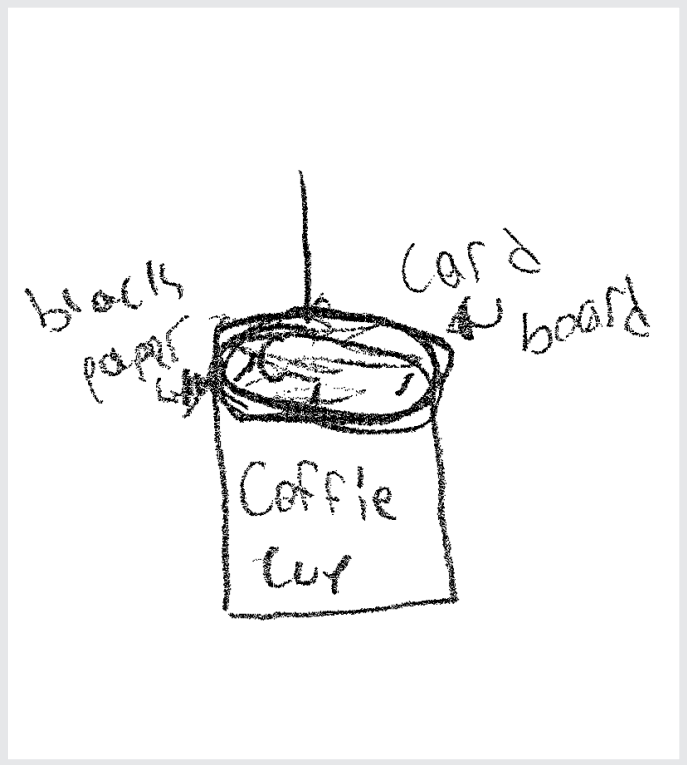
Draw a new constellation. Write a story to go with your constellation. Where did it come from? What shape is it in? What did you name it?

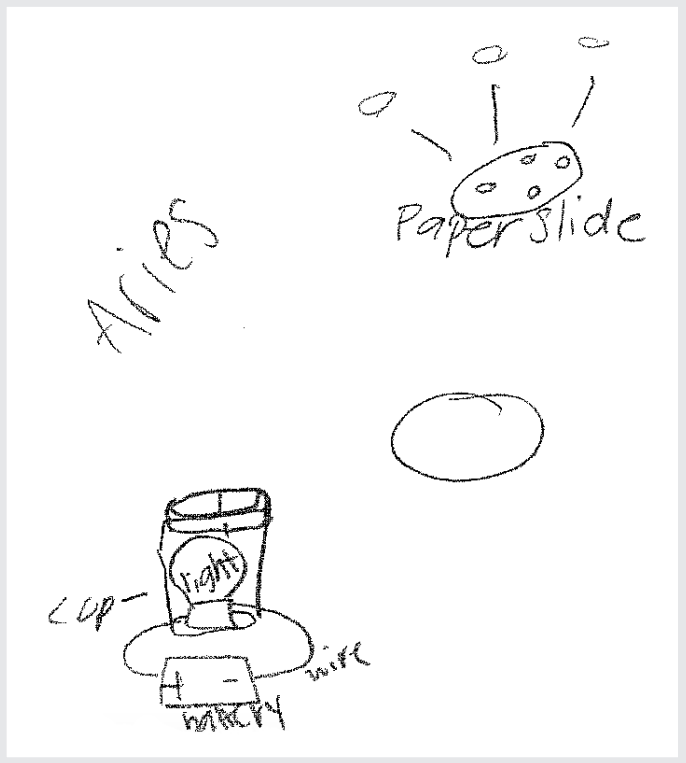
OPTION 3

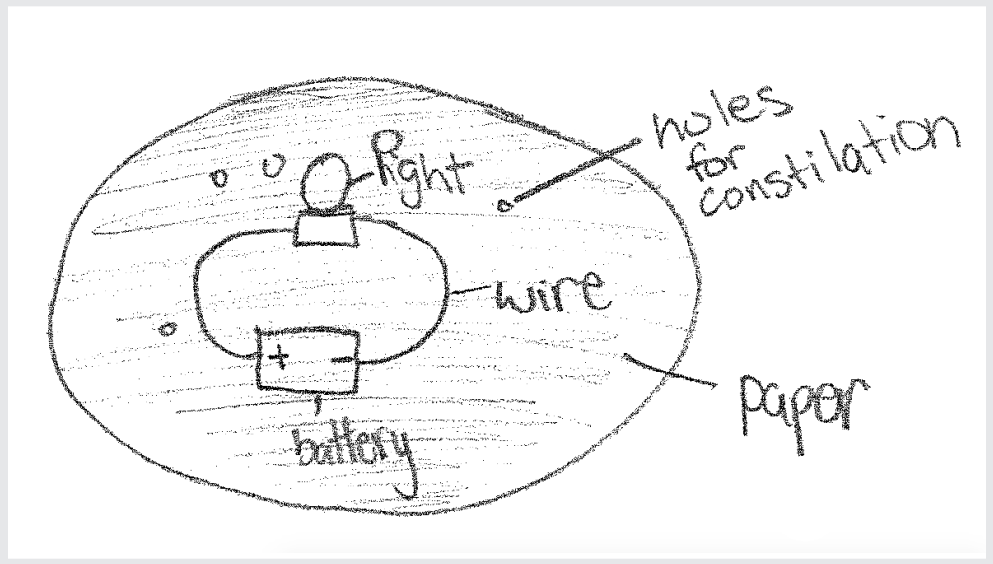
Does DinoBot remind you of any family pets? Which parts of DinoBot would you prefer in a family pet? Draw a picture of a robotic pet you would like to have. Label his unique parts. Compare and contrast his parts with organs of the human body. Does he have any parts that function in a way similar to the parts of plants? Use what you have learned about plant and human body parts as you write a story telling how your robotic pet would help your family members. Be sure to make some comparisons or tell how your pet's parts function differently than the parts of humans or plants.

STUDENT SAMPLES

Student Plans

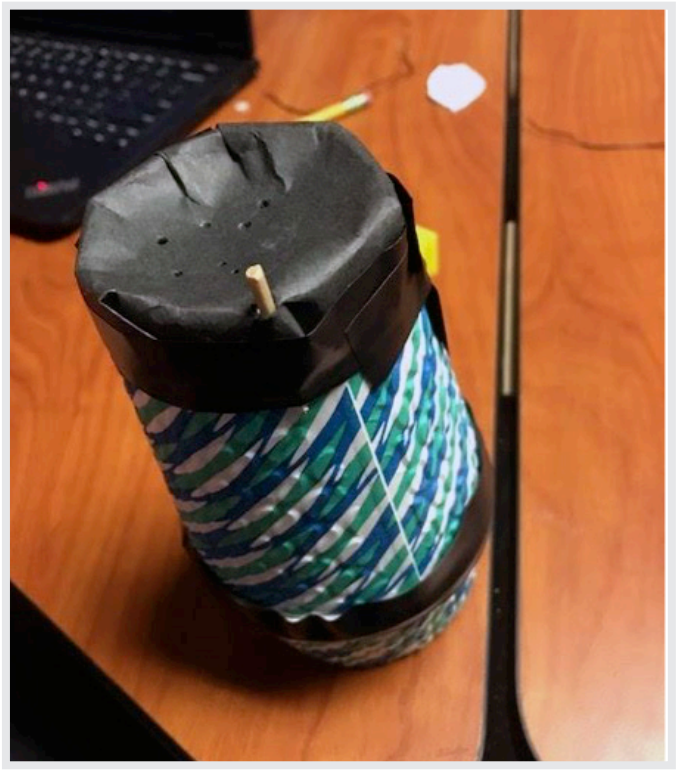


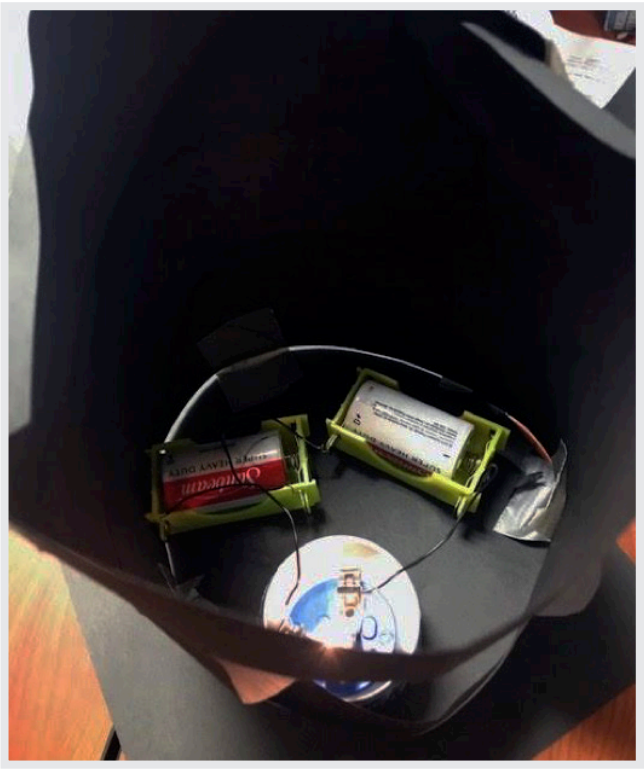


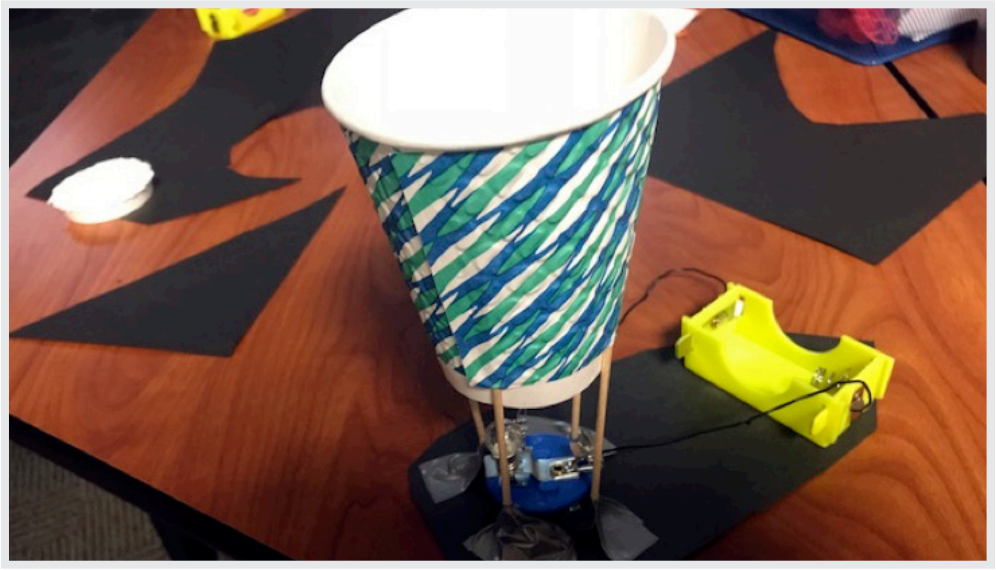


STUDENT SAMPLES

Student Constellation Viewers







TEACHER WEBSITES

Engineering Design Extension Videos and Activities

IRON MAN GIVES A BIONIC ARM TO A 7 YEAR OLD BOY

TheGuardian.com/film/2015/mar/12/iron-man-robert-downey-jr-gives-child-bionic-arm

Teacher Discussion Questions

- Who has seen the movie Iron Man?
- How do you think Iron Man's body parts were made?
- What material are Iron Man's body parts made out of?

A LOCAL STUDENT PRESENTS A NEED THAT IS SOLVED BY UCF COLLEGE OF ENGINEERING STUDENTS AT AN AFFORDABLE COST

YouTube.com/watch?v=qY5pKXmc8dU

Teacher Discussion Questions

- How are Magnificent and the boy's parents similar?
- What did you notice the UCF students do before they started building?
- What characteristics make the UCF students good engineers?
- How are the UCF student engineers similar to doctors?

LIMBITLESS SOLUTIONS

This video shows Albert Manero who is a graduate in the UCF school of engineering. Albert founded Limbitless Solutions which is a nonprofit devoted to bringing 3-D printed bionic arms and hands to children at no cost to their families.

UCF.edu/impact/albert-manero

Teacher Discussion Questions

- What was Albert Manero's dream?
- What was the problem that Albert Manero was trying to solve?
- How is this problem similar to Marcus' in Mission STEAMpossible?
- Would Albert Manero be able to help Marcus?
- How was Magnificent's solution for Marcus similar to what Alberto Manero designed?

TEACHER WEBSITES

Engineering Design Extension Videos and Activities

ASK, PLAN, BUILD, TEST, IMPROVE

PBSkids.org/designsquad/build/roving-moon

Students can design a rover while learning about forces and motion.
In this activity students are asked to build a rover for Marcus to send to the moon.

Teacher Discussion Questions

- What are rovers?
- Who uses rovers? And what are they used for?
- How is a rover similar to Marcus' wheelchair?
- How are rovers helpful to humans?
- How is a rover similar to Dinobot?

BUILD A ROBO ARM

PBSkids.org/designsquad/build/robo-arm

HELPING HAND

In this activity ask students to design a hand that assists with grabbing objects.
Materials and a video on how levelers work is included.

PBSkids.org/designsquad/build/helping-hand

Teacher Discussion Questions

- How would a robotic hand be helpful to Marcus?
- Who would design a robotic hand?
- How is a robotic hand similar and different than a human hand?
- Would a robotic hand need to be replaced often? What materials should be used to construct it?
- How should it be cared for?
- What activities would Marcus be able to do with the robotic hand that he couldn't do without it?

TEACHER WEBSITES

Engineering Design Extension Videos and Activities

ROBO WHEEL

Students can design a robo wheel using paper bowls. Students can fill in their wheels with patterns. Students can practice using the engineering process as well, asking what will they build? Plan their designs, create their designs, test designs, and improve designs.

PBSkids.org/designsquad/build/robo-wheel

Teacher Discussion Questions

- Ask students to make a list of everyday objects that use wheels.
- In what ways are wheels helpful to us?
- When wheels are in motion, what shapes are enabling them to rotate?
- How are the robo wheel designs similar to wheels on a wheelchair?

EXTRA READING

Asteroids

esa.int/esaKIDSen/SEMCM9WJD1E_OurUniverse_0.html

SolarSystem.nasa.gov/planets/profile.cfm?Object=Asteroids&Display=Kids

STANDARDS BASED STEAM FOLLOW UP ACTIVITY

with ELA standards also included

SC.3.E.5.1 Explain that stars can be different; some are smaller, some are larger, and some appear brighter than others; all except the Sun are so far away that they look like points of light.

SC.3.E.5.2 Identify the Sun as a star that emits energy; some of it in the form of light.

SC.3.E.5.3 Recognize that the Sun appears large and bright because it is the closest star to Earth.

SC.4.E.5.4 Relate that the rotation of Earth (day and night) and apparent movements of the Sun, Moon, and stars are connected. (Also assesses SC.4.E.5.1, SC.4.E.5.2, and SC.4.E.5.3.)

SC.4.E.5.1 Observe that the patterns of stars in the sky stay the same although they appear to shift across the sky nightly, and different stars can be seen in different seasons.

If you use the students build the light source for the device option then you are also hitting:

SC.5.P.10.4 Investigate and explain that electrical energy can be transformed into heat, light, and sound energy, as well as the energy of motion.

SC.5.P.11.1 Investigate and illustrate the fact that the flow of electricity requires a closed circuit (a complete loop).

For 5th grade, all of the above are tested science standards.

LAFS.3.SL.2.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.

LAFS.3.W.3.7 Conduct short research projects that build knowledge about a topic.

LAFS.4.SL.2.4 Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

LAFS.4.W.3.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic.

STANDARDS BASED STEAM FOLLOW UP ACTIVITY

with ELA standards also included

LAFS.5.SL.2.4	Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.
LAFS.5.SL.2.5	Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.
LAFS.5.W.3.7	Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic.
MAFS.3.G.1.1	Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.
MAFS.4.G.1.1	Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.
MAFS.5.G.2.3	Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category.