

## STEAM: Science, Technology, Engineering, Art, and Math Workshop Lesson Plan for Middle School Students

### What's the Big Idea?

Creative Problem-Solving

You are ~~an~~ artist  
an engineer

### STEAM Tour and Workshop Purpose

*Students will use the High's collections as evidence of creative problem solving, learning directly from the objects about how artists create innovative solutions to complex problems.*

### Essential Questions

These should be used as guiding questions as you lead students through the workshop.

- *What can we learn from the artistic process to help students become creative problem solvers in the 21<sup>st</sup> century?*
- *How is an artist similar to a designer, explorer, or scientist?*
- *How do artists use science, technology, engineering, and math?*
- *How do art and design affect people?*
- *How are art and design a part of society?*

### Objectives

Students will...

- make connections between the works in the Permanent Collection and how those artists used creative problem solving to create their works of art
- use creative problem solving techniques to solve a design challenge
- consider how art and design can have a positive impact on society
- think critically about solutions to social and environmental issues in their communities
- work collaboratively to create a solution to a design challenge

### Procedures

1. Introduction: Use artist El Anatsui to highlight how artists are creative problem solvers. El Anatsui is a Nigerian artist who works with discarded bottle caps, among other materials. The first bag of bottle caps he ever found was thrown away in a bush. He asked local community members where he could find more and discovered that local beverage companies reused glass containers but not the caps. He used creativity and critical thinking skills to repurpose this found material. Highlight *Taago*, a work of art in the Permanent Collection that demonstrates his innovative use of aluminum bottle lids.



*Taago*, El Anatsui

- In 1999, Anatsui created a series of work inspired by huge piles of waste. In *Peak Project* he used milk tins to create mounds that resemble the physical landmark created by trash.



*Peak Project*, El Anatsui

- Questions for reflection: How is El Anatsui a creative problem solver? How is his work an example of how art and design affect people and are a part of society? How is design important to the message he is trying to send about consumption and waste?
2. Introduction of the Design Challenges: Explain to students that they will be creative problem solvers today. They will be given a challenge and they must work together to come up with a solution to solve a real-world problem. Students will consider how design can impact society. Their designs should be both functional and aesthetically pleasing.
  3. Project Logistics: Each table of 4 to 5 students represents one group. The group will pick a challenge out of a jar that the instructor passes around. Students have 18 minutes (or, about one quarter of the total amount of time of the workshop) to solve their challenge.

4. Working as a Team: Students self-select who will read the directions and who will collect supplies. If desired, students can be given a “role” such as “Supplies Manager,” etc. As a group, the students will decide on their supplies and gather them from the supplies table. Go over “The Rules” that is listed on each Design Challenge Card. Answer any questions or concerns.
5. Closing and Presentations: After the 18 minutes, one person from each group will present their design prototype. Students should be prompted to share how their solution integrates design and functionality. How might their design have a positive impact on their community? How is this different than if they created a solution that didn’t integrate design and art?
6. Clean-up: Leave time for students to clean-up their work areas.

### **Vocabulary**

Prototype

Design

Structure

Community

### **Materials for the Instructor**

Timer

Graph paper (1 sheet per table for designs)

1 container with 6 Design Challenge Cards for students to choose from

6 Design Challenge Cards (located below)

Fan for Design Challenge #2

Cans for Design Challenge #3

Ping Pong Balls for Challenge #5

# Design Challenge #1

## THE CHALLENGE

This year a new law went into effect allowing larger and louder fireworks to be shot off in Georgia. This Fourth of July tradition comes with a cost. Many dogs are afraid of loud, booming noises and often run away out of fear. The weekend following Fourth of July, a local animal shelter was overrun with three times as many animals as it was designed to hold. The shelter had 465 cats and dogs but only space for 150.

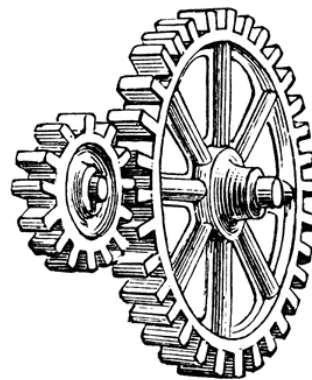
Your job is to design a model for a shelter that can house a single animal to be used in the event of future overcrowding. The structure needs to be sturdy enough to withstand various types of weather, should include a safe locking mechanism that animals can't open or close, and should be collapsible for easy storage when not in use.

## THE RULES

- Your group has 18 minutes to complete your design and then you will share your prototype design with the rest of the group.
- You must work together as a team to produce one design.
- Your design must be functional, but also aesthetically pleasing.
- You must use at least 4 different types of materials from "THE MATERIALS" category below. All materials used must serve a function in your design.
- You may use the Idea Brainstorming Worksheet to sketch out your ideas.

## THE MATERIALS (at least 4 different materials must be chosen)

10 index cards  
5 popsicle sticks  
3 strips of masking tape  
5 paper clips  
5 plastic straws  
2 cotton balls  
3 rubber bands  
1 piece each of red, blue, and yellow acetate  
1 piece of aluminum foil  
1 strand of 15 inches of string  
2 pipe cleaners



## FOR REFLECTION

Did you work collaboratively? Is your design functional? Is it aesthetically pleasing? How might your design have a positive impact on their community? How is this different than if you created a solution that didn't integrate design and art?

## Design Challenge #2

### THE CHALLENGE

The state of Georgia is prone to droughts during the hot summers. Coal and nuclear power plants consume large quantities of water worsening the problem. A more sustainable option is to utilize power generated from wind.

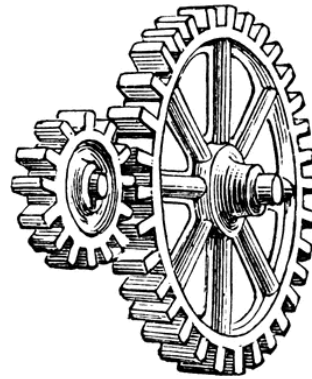
Your job is to design a wind-powered turbine. This turbine will be installed in the coastal area of Georgia, where more wind comes in from the ocean. It must be able to withstand storms and hurricanes. Additionally, tall turbines produce the most electricity. Your model must be a minimum of 10 inches tall. The motion produced by wind is what will create the power.

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## Design Challenge #3

### THE CHALLENGE

The state of Georgia has a 100-mile coast. Garbage, especially plastic, floats easily and takes a long time to decompose. Trash from cities and towns around the state travels down streams and rivers and lands in the ocean. When trash reaches the ocean, it is very harmful to creatures there. Some have gotten caught in plastic six-pack rings.

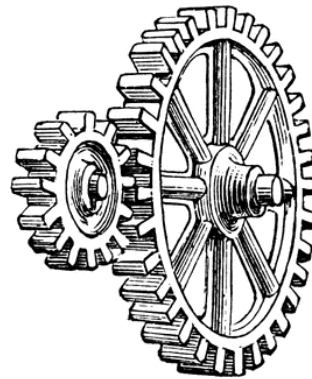
Your team has been hired by Coca-Cola to design a new holder for six-packs of soda. It must hold six cans, be convenient to carry, and safe for animals. The cans should be easy to remove, but still secure.

### THE RULES

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## Design Challenge #4

### THE CHALLENGE

Up to 100 million birds die each year as a result of flying into unseen windows. Many others are injured. Because birds can see reflected sky, trees, and clouds on the glass they don't realize that there is a hard surface ahead of them.

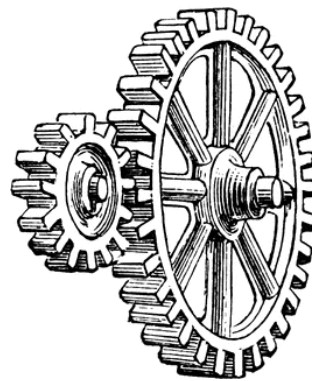
Your team has been hired by the High Museum of Art to make the windows of the buildings bird-safe. Using what you know about how light travels through space, design a window that still allows light to pass through while reducing the number of bird injuries.

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## Design Challenge #5

### THE CHALLENGE

Atlanta is one of the fastest growing cities in the country. This increase in population has caused concern surrounding transportation into and around the city.

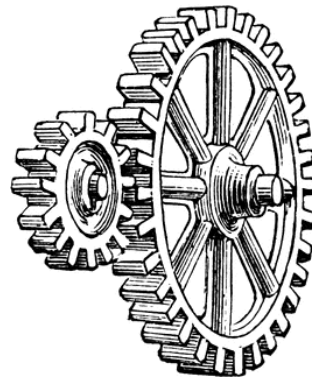
Your team has been hired by the Metro Atlanta Chamber of Commerce to design an environmentally-friendly vehicle that can move multiple people at once. The model for your design must travel at least one foot and should carry 4 ping-pong balls.

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## Design Challenge #6

### THE CHALLENGE

The largest source of water pollution in Georgia is stormwater. Stormwater comes from rain or melting snow that picks up litter, oil, pet waste, and bacteria as it flows across lawns, driveways, streets, and parking lots. The water is then carried to the nearest stream, river, or lake and therefore usually receives no sanitizing treatment.

Your team has been tasked with designing a system to make stormwater cleaner. How can you prevent litter and debris from entering waterways?

### THE RULES

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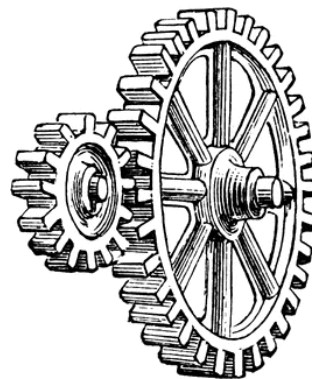
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# IDEA BRAINSTORMING WORKSHEET

IDEA #1	IDEA #2	IDEA #3