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Using STEAM Resource Package: Sample Lesson Plans

This document provides a sampling of lesson plans utilizing STEAM strategies in a variety of ways. Additional STEAM activity ideas and lesson plans related to specific curriculum areas are available with many of our Curriculum Topic Resource Packages. STEAM lesson plans are also available as a Teacher Tool with many individual videos on our website.

Sample Lesson 1: Model Building

Type of Teacher Tool: Small Group
Targeted Grade Level(s): 6-8/9-12
Targeted Curriculum Areas: Visual Arts/Math

Learning Objectives:
The learner will:

1. understand the use of geometric shapes in a building construction..
2. experience collaboration in producing a model.
3. create a model of a house.

National Standards:

1. National Math Standard
   Use visualization, spatial reasoning, and geometric modeling to solve problems
2. Grades 9-12 National Core Arts Standard Creating VA: CR1.2.IIIa

Resources/Materials Needed:

1. Architecture 1: You Are Here—Frank Lloyd Wright House
2. Paper, rulers, pencils, tape, glue

Teacher Instructions:

1. Inform students they will work in groups to design a house for someone to live in.
2. As a class or in each group, have students view the video Architecture 1: You are here: Frank Lloyd Wright House and note the types of geometric shapes employed in building the house.
3. Have each group brainstorm ideas for designing a house using the following geometric shapes: triangle, square, parallelogram.
4. Sketch ideas for the house design.
5. Select the sketch that makes best use of the triangle, square, and parallelogram.

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6. Construct a model of the sketch

Extension Activity:

1. Construct a scale model using ¼”=1’ scale

Assessment/Evaluation Option

1. Oral critique of the practicality of the design.
2. Oral critique of the use of limited geometric shapes.
3. Oral critique of the aesthetics of the model
4. Oral critique of the use of scale in building the model

Sample Lesson 2: Bridge Over Troubled, or Untroubled, Water

Type of Teacher Tool: Small Group or Individual/Differentiation Activity
Targeted Grade Level(s): 6-8/9-12
Targeted Curriculum Areas: Music, Engineering

Learning Objectives:
The learner will:

1. understand the use of geometric shapes in a building a bridge.
2. experience collaboration in producing a song.
   create a song about bridge location.

National Standards:

1. National Math Standard
   Use visualization, spatial reasoning, and geometric modeling to solve problems
2. Grades 9-12 National Core Arts Standard Music Creating: MU:Cr1.1.5b Generate musical ideas (such as rhythms, melodies, and accompaniment patterns) within specific related tonalities, meters, and simple cord changes
3. Grades 9-12 National Core Arts Standard Music Creating: MU:Cr2.1.T.Ia Select melodic, rhythmic, and harmonic ideas to develop into a larger work using digital tools and resources

Resources/Materials Needed:

1. Engineering 1: What factors determine what kind of bridge goes in a particular location?
2. Engineering 9: The Science Behind the New Mississippi River Bridge, Part 1
3. Engineering 10: The Science Behind the New Mississippi River Bridge, Part 2
4. Engineering 13: You Are Here—Eads Bridge
5. Engineering 15: Design Considerations
6. Engineering 16: Why a Cable Stayed Bridge
7. Viewing Screen
8. Paper, computer, pencils, tape, glue

Teacher Instructions:

1. Inform students they will be working to solve a real world problem to design and build a model of a bridge that could be constructed at a location in their area.
2. Use the videos listed above to learn information about bridge design and construction.
3. Visit the web-site (https://blogbydonna.com/bridges-are-metaphors-for-everything-in-life-bridge-quotes-photographs/) or do a Google search for "bridge metaphors"
4. Note what factors determine the location for bridges and the types of materials and geometric shapes employed in building bridges in the videos listed above.
5. Brainstorm ideas for designing a new bridge in a location near you.
6. Sketch ideas for the design.
7. Construct a model of the sketch.
8. Brainstorm bridge metaphors (for example: "Friendship is a bridge over life's storms.")

9. Create a song about bridges as metaphors for life experiences.

Extension Activities:

1. Construct a scale model of your bridge design or a bridge in your area using ¼”=1’ scale
2. Using Garage Band lay down different instrumental tracks for your bridge song.

Assessment/Evaluation Option

1. Oral critique of the practicality of the design.
2. Oral critique of the use of limited geometric shapes.
3. Oral critique of the aesthetics of the bridge metaphor in your song lyrics and instrumental tracks
4. Oral critique of the use of scale in building the model.

Sample Lesson 3: Flying

Type of Teacher Tool: Small Group Activity
Targeted Grade Level(s): 8-12
Targeted Curriculum Areas: Science, Visual Art

Learning Objectives:
The learner will:

1. gain a greater understanding of the nature of flight and aircraft and the design and function of aircraft.
2. explore methods to design, build and program aircraft.
3. engage in critical thinking and creative thinking.

National Standards:
1. Science as Inquiry - Science as inquiry requires students to combine processes and scientific knowledge with scientific reasoning and critical thinking to develop their understanding of science.
   1. Abilities necessary to do scientific inquiry
   2. Understandings about scientific inquiry

2. Visual Art Creating VACr1.2.1a
   Shape an artistic investigation of an aspect of present day life using a contemporary practice of art or design.

Resources/Materials Needed:
Use any of all of the videos below to explore flight.

1. Aviation-2 "The Science Behind Aviation" (segment from 43:23 to 58:07)
2. Aviation-3 "Explore! Flying" (segment from 33:25 to 36:16)
3. Aviation-6 "How Does That Work? Bernoulli's Principle"
4. Aviation-7 "Gary Liming Experimental Plane Builder"
5. Aviation-9 "Propulsion"
6. Aviation-10 "How Does That Work? Flight Control Surfaces of an Airplane"
7. Aviation 13-"Four Forces that Affect Flight"
8. Provide variety of sizes of balsa wood rods, a variety of sizes of parchment paper, scissors, matt knives, super glue, white glue, and hot melt glue and glue guns.

Teacher Instructions:

1. Divide the class into groups and have them watch the videos listed above to develop an understanding of the science behind flight.
2. With the materials provided, and any additional items of their own, have each group design and create a model plane.

Extension Activity:

1. Have a class launch day to see if the model airplanes will fly.
2. For students interested in learning more about flight, they could watch any of these additional Educate.Today videos:
   Aviation-2 “The Science Behind Aviation”
   Aviation-3 “Explore! Flying”
   Aviation-4 “The Science Behind Flight: Soaring the Sky 1
   Aviation-5 “The Science Behind Flight: Soaring the Sky 2

Assessment/Evaluation Option

1. Using aviation vocabulary, discuss the success of the model planes that flew
2. Evaluate the aesthetics of the construction of the model planes and the impact on flight success.

Sample Lesson 4: Icarus and Me

Type of Teacher Tool: Whole Class
Targeted Grade Level(s): 5-8, 9-12
Targeted Curriculum Areas: Engineering, Music

Learning Objectives:
The learner will:

1. explore the design of airplanes.
2. engage in critical thinking and creative thinking.
3. collaborate in creating an original song about flying.

National Standards:
1. **Next Generation Science Standards**
Middle School (6-8)
MS-PS2-5 Motion and Stability: Forces and Interactions
Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact
High School
Structure and Function: Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different compounds, and connections of components to reveal its function and/or solve a problem.

2. **Fine Arts: Music Creating**
MU:Cr1.1.5b Generate musical ideas (such as rhythms, melodies, and accompaniment patterns) within specific related tonalities, meters, and simple cord changes
MU:Cr2.1.T.Ia Select melodic, rhythmic, and harmonic ideas to develop into a larger work using digital tools and resources.

Resources/Materials Needed:
Various construction materials such as paper, tape, balsa wood, glue)
Assorted musical instruments
Computer with music composition software or music tunes available
Any of the following Educate.Today videos providing information about aviation
Aviation—2, 3, 4, 5, 6, 7, 9, 10, 13, 14, 15, 16, 17, 18

Teacher Instructions:

1. Split the class into four groups and have each group watch different aviation videos. Videos 2, 3, 4, and 5 are archived programs of about one hour in length each. The other videos are short videos ranging from 3 to 10 minutes. Descriptions of each video are available on their video play pages on the Educate.Today website. Search for them by using the keyword aviation or typing their name and number in the keyword search box (ex: Aviation-2); be sure to include the dash.

2. As students watch the videos, have them listen for the following information and take notes:
   a. Types of planes identified
   b. Emotions that people share about flying
   c. Different types of planes
   d. Explanations of plane design and features that affect a plane's ability to fly
   e. Principles of flight
3. Once each group has viewed their videos, have them compare notes on what they learned and design and then construct a paper airplane.
4. Separately from their work watching the videos and constructing the plane, have students research and read the myth about Icarus.
5. Once students have read the Icarus myth, have them compose a song that shares important information they learned from the videos they watched as well as the story of Icarus.
6. Have each group present their song to the class and also fly their airplane.
7. Compare information presented in each song and the success of each airplane as it flew. What do students notice about how the plane's design affected its flight? What information that they learned stands out to them?

Alternative Assignment:

1. Have each group break into subgroups to watch the videos and/or research the Icarus myth and then share information with each other as they compose the song and design and construct the plane.

Assessment/Evaluation Options:

1. In class contest for flying paper airplanes.
2. Discussion about the aerodynamics of the paper airplane designs.

Each group performs their song for the class and then an oral critique is given about the rhythms, musicality, and the feelings about flying used in the songs.

Sample Lesson 5: A New Monument

Note: This lesson plan is created with St. Louis in mind but it can be modified quite easily for your location. Have students watch the videos as examples of monuments and design a monument for your town.

Type of Teacher Tool: Individual/Differentiation
Targeted Grade Level(s): 5-8
Targeted Curriculum Areas: Visual Art/Science

Learning Objectives:
The learner will:

1. Discover how the building process occurs
2. Research current St. Louis monuments
3. Create a new St. Louis monument

National Standards:
1. Visual Art VA:Cr2.38A
   Select, organize, and design images and words to make visually clear and compelling presentations.
2. Science MSETS1-2
   Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

Resources/Materials Needed:
1. Videos—Engineering 11, 12, and 13
2. Paper, colored pencils

Teacher Instructions:

1. Have the student watch the three videos listed above.
2. Instruct students, as they watch the videos, to sketch design ideas for a new St. Louis monument.
3. Instruct the student to evaluate her/his sketches using the following criteria:
   a. Historically true to St. Louis History
   b. Will attract tourists to the area
   c. Will utilize the Mississippi River in some way
4. Either individually, or in small groups, have each student select their one sketch that best meets the criteria.
5. Once the idea has been selected, instruct the student to create a poster sized drawing of the new monument.

Extension Activity:

1. Have the student use the poster and make a presentation to the class about the nature of the new monument. She/he should include historical accuracy, the Mississippi River and why it will attract tourists.

Assessment/Evaluation Option

1. The assignment should be evaluated on the execution of the art work and clarity of the presentation in following the criteria.