Introduction Lesson Plan #3
"Take Me Away" Boat Design
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JMU CTA Children's Engineering class for graduate credit
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TITLE/TYPE OF LESSON: In "Take Me Away" Boat Design, students will review what they know about sinking and floating while watching something float that you wouldn't expect to see: a pineapple float. The pineapple has many pockets of air in it; therefore, it floats in water. Objects that weigh less than water float and objects that weigh more sink. Can you name a type of boat? The teacher-librarian will present the different parts of a boat and discuss the different types of hulls. Why does a displacement hull float better than a planning hull? Students will construct a boat that will float under the weight of 10 decorating stones.

CONTEXT OF LESSON/TOPIC: This lesson is meant to be a reading, library and STEM activity for kindergartners and first graders who have already learned the concepts of sink and float in the classroom. I plan on reading the book Dory Story by Jerry Pallotta to activate prior knowledge about sinking and floating and then bringing in this boat activity to incorporate the elements of STEM. This boat lesson should take two 45 minute class periods.

Kindergarteners and first graders need to design and create based on their own ideas. This boat activity allows them to imagine a product that solves a problem, make a sketch and design a solution. The book Dory Story is developmentally appropriate as it ties in the intellectual curiosity that a young boy has about the ocean to the concepts of sink and float. Students will feel accomplished as they create, design and test their own boats that fulfill a practical need.

GRADE LEVEL: Kindergarten and 1st

LEARNING OBJECTIVES:

- Critical thinking and problem solving through design and construction
- Listen, comprehend, and discuss fictional texts
- Understand and use prior sink and float knowledge to help design and create a boat
- Sketch, design and create a product to meet a need
- Use aluminum foil, straws and other recycled materials to make boats that float
- Use knowledge that vehicles move people from place to place to make a boat that floats
- Understand that living organisms such as animals depend on water
- Use a ruler to find the length of pieces of masking tape and aluminum foil used in boat construction
- Be able to discuss the nautical aspects of the fiction book Dory Story
- Be able to count decorating stones as they are added and the seconds a boat stays afloat when it is full of stones

LITERATURE: Dory Story by Jerry Pallotta

MATERIALS NEEDED:

- 1 sheet cardstock per pair
- 12 inch squares of aluminum foil
- paper clips
- paper fasteners (brads)
- 10 popsicle sticks per pair
- 1 clear Rubbermaid tub as the "ocean"
- decorating stones
- Ruler
- Crayons and markers
- scissors
- 1 pineapple
- straws
- 24 inch pieces of masking tape
- limited art supplies
- construction and scrap paper

TIMEFRAME: 1 hour and 30 minutes

15 minutes read-aloud of Dory Story

5 minutes of activating prior knowledge of sink and float with a pineapple

5 minutes of background on boats/sketching ideas/showing rubric and portfolio

20 minutes of project time and checking out books

20 minutes of project time

25 minutes of boat testing and checking out books

STRATEGIES/ACTIVITIES: read aloud a book about boats, use a pineapple to activate knowledge of the sink and float concept, view a slide presentation on boats, sketch boat ideas and show rubric and portfolio, test boats in a clear Rubbermaid tub by dropping decorating stones in them, time the boats' seaworthiness in seconds to see how long they will last loaded with decorating stones

GROUP SIZE: partners

SAFETY: review the how-to of scissor safety

VIRGINIA STANDARDS OF LEARNING:

Language Arts K.9 The student will demonstrate comprehension of fictional texts.
a) Identify what an author does
and what an illustrator does.
b) Relate previous experiences to what is read.
c) Use pictures to make predictions.
d) Begin to ask and answer questions about what is read.
e) Use story language in discussions and retellings.
f) Retell familiar stories, using beginning, middle, and end.
g) Discuss characters, setting, and events

Language Arts 1.9 The student will read and demonstrate comprehension of a variety of fictional texts.
a) Preview the selection.
b) Set a purpose for reading.
c) Relate previous experiences to what is read.
d) Make and confirm predictions.
e) Ask and answer who, what, when, where, why, and how questions about what is read.
f) Identify characters, setting, and important events.
g) Retell stories and events, using beginning, middle, and end.
h) Identify the main idea or theme.
i) Read and reread familiar stories, poems, and passages with fluency, accuracy, and meaningful expression.

Science K.7 The student will investigate and understand basic needs and life processes of plants and animals. Key concepts include
a) animals need adequate food, water, shelter, air, and space to survive;
b) plants need nutrients, water, air, light, and a place to grow to survive;
c) plants and animals change as they grow, have varied life cycles, and eventually die; and
d) offspring of plants and animals are similar but not identical to their parents or to one another.

Science 1.5 The student will investigate and understand that animals, including humans, have basic needs and certain distinguishing characteristics. Key concepts include
a) basic needs include adequate air, food, water, shelf, and space (habitat)
b) animals, including humans, have many different physical characteristics; and
c) animals can be classified according to a variety of characteristics

Science K.5 The student will investigate and understand that water flows and has properties that can be observed and tested. Key concepts include
a) water occurs in different phases
b) water flows downhill;
c) some objects float in water while others sink

Math K.8 The student will identify the instruments used to measure length (ruler), weight (scale), time (clock: digital and analog; calendar: day, month, and season), and temperature (thermometer).

Math 1.9 The student will use nonstandard units to measure length, weight/mass, and volume.

Math K.13 The student will gather data by counting and tallying.

Math 1.1 The student will
a) count from 0 to 100 and write the corresponding numerals
b) group a collection of up to 100 objects into tens and ones and write the corresponding numeral to develop an understanding of place value

AMERICAN ASSOCIATION OF SCHOOL LIBRARIANS STANDARDS FOR THE 21ST CENTURY LEARNER:

1.1.2 use prior and background knowledge as context for new learning

STL: 6 products are made to meet wants and needs
8 elements of design
18 vehicles move people from place to place

"Take Me Away" Boat Design Brief by Michelle Hinkle

Background: You have already learned about what makes an object sink or float in water. We just read the book Dory Story by Jerry Pallotta in which a boy has a new red toy to play with in his bath. While playing with his new toy, the boy imagines real creatures from the ocean. This toy transports the boy on exciting adventures in Dory Story featuring ocean creatures large and small. The boy's knowledge of boats helps him enjoy his adventures.

Design Challenge: You will have to design and create a boat that could take you on as many adventures as the boy's boat in Dory Story did. We will test the seaworthiness of your boat by adding sea creatures (stones) one at a time. Your boat must float for 7 seconds after each sea creature is added. Whatever you design and create must be colorful and pleasing to the eye for potential sailors!

Criteria:

- Must be a boat
- Hold the weight of 10 sea creatures (decorating stones)
- Float without human assistance for 7 seconds after each sea creature is added
- Be colorful and pretty

Materials:

- 1 sheet cardstock
- 12 inch square of aluminum foil
- 4 paper clips
- paper fasteners (brads)
- 10 popsicle sticks
- 10 straws
- 24 inches of masking tape
- limited art supplies
- construction and scrap paper

Tools:

- 1 clear Rubbermaid tub as the "ocean"
- decorating stones
- Ruler
- Crayons and markers
- scissors

Michelle Hinkle

K and 1 Boat Design Brief

CTA STEM graduate course July 2017

1. STL 6 products are made to meet wants and needs
2. STL Standard 8 Elements of design
3. STL Standard 18 vehicles move people from place to place
4. SOL Science K.7/1.5 basic needs of animals (water)
5. SOL Science K.5 sink and float
6. SOL Math K.8/1.9 identify and use a ruler
7. SOL LA K.9/1.9 listen, comprehend and discuss fictional texts
8. SOL Math K.4/1.1 Counting
9. AASL 1.1.2 Use prior and background knowledge as context for new learning.

“Take Me Away” Boat Design Portfolio

Name: _____

Team members:

_____ _____

1. What is the problem?

Tell your partner the problem in your own words. Ask for help if you need it.

2. Brainstorm solutions.

Sketch or describe some possible solutions.

3. **Create the solution you think is best.**

4. Test your solution. Ask for help if you need it.

Does your boat look like a boat? YES NO

Does your boat hold the weight of 10 sea creatures? YES NO

Does your boat float for seven seconds after each sea creature was added? YES NO

Is your boat colorful and pretty? YES NO

5. Evaluate your solution.

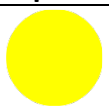
Was your boat the best solution? YES NO

Draw a better boat below that you could make.

Name:_____ Date:_____

Rubric for ”Take Me Away”_Boat

Design_____

Criteria Assessed	Exceeded Expectation	Met Expectation	Partially Met Expectation	Did Not Meet Expectation
Portfolio				
Student worked with a partner to sketch a plan.				
Restated the challenge in his or her own words.				
Work and Social Skills				
Demonstrated working well with other students				
Final Product				
Student constructed a boat (meeting all criteria)				
Student participated in testing his or her boat				