Boat Building

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Subject: Physics

Grade Level: K-2

Standards: *Next Generation Science Standards (www.nextgenscience.org)*

K-2-ETS1-1 Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

K-2-ETS1-2 Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Schedule: 2-60 minute class periods

CCMR Lending Library Connected Activities:

Objectives:	**Vocabulary:**
Students will understand what it means to float and sink. They will think about materials in terms of their usefulness in building a boat.	Classify Properties Sort Float Float Hull Sink Buoyancy
Students Will: · Describe the properties of materials · Classify materials based on their properties · Write and draw about observations and findings · Engineer (design, build and test) their own boats based on their new knowledge of the given materials · Use new vocabulary related to materials' properties as well as boat design · Reflect on the engineering process through discussion and writing - Be introduced to the concept of buoyancy.	**Materials:** **For Each Group:** Balsa Wood Popsicle Sticks Paper Assortment Fabric Scraps Styrofoam Wire Wire Cutters Ping Pong Balls Aluminum Foil Clay Magnets Washers Plastic bags Rubber Bands Glue* Tape* Water* Scissors* Plastic Bins* ***Provided by the teacher*** **For the Class:** Different size cups* **For Each Student:** *Observation Packet* w/Activity Sheets 1-14
Safety	This activity does not contain any safety concerns.

Science Content for the Teacher:

Classroom Procedure:

Day 1

Engage (Time: 10 mins)

Select one of the materials to use as an example. Hold up the material for the class to see. Ask them to describe its properties. Keep a list on the board or on chart paper. Then ask the students what they would need to know about the material if they were going to use it to build a boat. Record their responses. Explain that they will be working in pairs to describe and test several more materials.

Explore (Time: 40 mins)

Students will work in pairs to describe the properties of each material. In order to test for flotation students will be given a small bucket of water. You can also have pairs work in a larger group and share testing information so that each pair does not have to test all of the materials.

Explain (Time: 10 mins)

All findings should be recorded in the student's observation packet (Activity sheets 1-12). At the end of day two, students meet with the facilitator in a large group to share findings.

Day 2

Engage (Time: 10 mins)

Use the PowerPoint to demonstrate how buoyancy works and to show images of boats. Ask students to describe what they see in terms of shape, design and materials. Record their responses. Explain that during today's lesson they will work in small groups, using what they learned in the previous lesson to design and build a boat that must support a Lego man. You can also have the kids take a cup and gently push it into a bowl of water. They should feel something pushing back. This is a buoyant force that boats use to float.

Explore (Time: 40 mins)

Provide the same materials used for Day one. Allow students to experiment with various boat designs. Encourage creativity and offer challenges to groups who are ahead such as limiting the materials they can use, or requiring that the Lego man sit below the water line, but still be dry.

Explain (Time: 10mins)

Students will fill out the remaining activity sheets (1 and 10). At the end of the lesson, groups will share their boats, explain why they chose the materials they did and what makes their boat different.

Extension Activities:

- Challenge students to float boats with extra weight
- Challenge students to design ways to propel their vessels
- Provide more/different materials

Other Resources:

Who Sank the Boat? (Picture Puffins) (24 November 1988) by Pamela Allen

"BBC - Digger and the Gang - Float and sink completed." 2009. 17 Jul. 2014 <http://www.bbc.co.uk/schools/digger/5_7entry/8continue.shtml>

Powerpoint: "How do Boats Float"
https://docs.google.com/presentation/d/1qQLIEg_EzWuU7xU156DUjt8xfkEFBibyS-Vplgn1JZU/edit#slide=id.p13

Assessment:

The following rubric can be used to assess students during each part of the activity. The term "expectations" here refers to the content, process and attitudinal goals for this activity. Evidence for understanding may be in the form of oral as well as written communication, both with the teacher as well as observed communication with other students. Specifics are listed in the table below.

4= exceeds expectations
3= meets expectations consistently
2= meets expectations occasionally
1= not meeting expectations

	Engage	Explore	Explain
4	Shows leadership in discussion and an established understanding of how to describe a material's properties. Thoughtfully comments on boat photos in terms of design and materials.	Shows leadership in working with their group to solve problems. Is very creative and approaches the activity scientifically.	Does an excellent job in speaking, writing and drawing about the boat. Makes thoughtful comments about the boat during the share out.
3	Contributes to the discussion by providing ideas about material's properties.. Makes good observations in looking at boat photos.	Communicates with group members to solve problems, follow directions and design a boat. Stays on task and is creative.	Communicates effectively in writing, drawing and speaking. Completes all work accurately. Makes comments during the share out.
2	Makes limited contributions to the discussion. Is able to describe a few properties and notices some features of boat design.	Makes some contribution to the group. Has some trouble staying on task. Needs help from the facilitator to complete the activity.	Limited ability to communicate about the activity process. Contributes less during the share out.
1	Makes little contribution to either discussion. Is unable to describe the properties of materials, or the design of the boats.	Needs constant reminding to stay on task, contributes little to the group's work.	Does not complete written/drawing work. Does not contribute during the share out.