# Build a Boat

<table>
<thead>
<tr>
<th>Grade:</th>
<th>First</th>
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<tbody>
<tr>
<td>Subject:</td>
<td>Engineering/Science</td>
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<tr>
<td>Technology Needed:</td>
<td>Stopwatch and video.</td>
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## Materials:
- Peer teaching/collaboration/cooperative learning
- Visuals/Graphic organizers
- PBL
- Discussion/Debate
- Modeling
- Straws, plastic wrap, a cup, and duct tape

## Instructional Strategies:
- Direct instruction
- Guided practice
- Socratic Seminar
- Learning Centers
- Lecture
- Technology integration
- Other (list)

## Guided Practices and Concrete Application:
- Large group activity
- Independent activity
- Pairing/collaboration
- Simulations/Scenarios
- Other (list)

## Standard(s)

K-2-ET1-2

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.

## Objective(s)

By the end of the lesson, students will demonstrate buoyancy by constructing rafts to hold 25 pennies.

## Bloom's Taxonomy Cognitive Level:

## Classroom Management- (grouping(s), movement/transitions, etc.)

## Behavior Expectations- (systems, strategies, procedures specific to the lesson, rules and expectations, etc.)

- Students are expected to move around the classroom quietly and respectfully.
- Students are expected to raise their hand and wait until they are called on to test their boats.
- Students are expected to responsibly use the materials provided to make the boats.
- Students are expected to clean up after themselves.
- Students are expected to work with zero voices when writing in their journals.

## Minutes

### Set-up/Prep:
- Set up a container filled with water away from the students’ building area.
- Consider why objects sink and float.
- Construct your own watercraft.
- However, have the watercraft sinkable from 15 or so pennies.

### Engage: (opening activity/ anticipatory Set – access prior learning / stimulate interest /generate questions, etc.)
- Bring the container with water to the front of the room where all the students can see from their desk.
- Explain that you are going to see how many pennies my homemade raft can hold.
- Place your raft in the water and put the paper cup on top. Begin placing a penny in one by one counting with the class.
- “Count with me everyone! One...two...three...etc....”
- At 15 or so pennies your raft should sink. “Well darn looks like my raft could only hold 15 pennies. Your challenge today is to build a raft that will be able to float while holding 25 pennies!!”

### Explain: (concepts, procedures, vocabulary, etc.)
- “Today I am going to be giving you four materials. Straws, plastic wrap, a cup, and duct tape. You are to construct a raft that can float while holding 25 pennies!”
- “First, let’s think. What causes a boat to float?”
- “They float because of a term called buoyancy. If something floats, it’s because the water that is pushing against the object weighs more than the object itself.”
- “What causes a boat to sink?” “The object weighs more than the water pushing upwards.”
- “Let’s watch a short video that helps us understand the term buoyancy.” (Play the video)
- [https://pbskids.org/video/design-squad-nation/2365306686](https://pbskids.org/video/design-squad-nation/2365306686)
**Build a Boat**

- “What might be some characteristics of a good boat?”
  - Allow students time to respond.
  - Sturdy, no holes, buoyant.
- “The first thing you are going to do is take out your science journals and brainstorm a plan for your raft. When brainstorming, consider these questions:
  - What makes a boat float well?
  - What kind of boat do I want? (Platform/Canoe)
  - How will my boat hold the pennies?
- “This is your design process. You will always have the chance to revise this.”
- “Once you have created your plan, you can gather your tools from the back table. I will be waiting back there to help you.” “You do NOT have to use all the materials if you do not want to. Remember, you want your boat to be waterproof, so which material might help you with that?”
- “Once you have constructed your boat, raise your hand at your desk quietly. When I call your name, you can come back to the water and we will test your boat. Once your boat has 25 pennies on it, you will start a stopwatch to time how long your boat can float.”
- “Are there any questions?”

**Explore: (independent, concreate practice/application with relevant learning task -connections from content to real-life experiences, reflective questions- probing or clarifying questions)**

- During this time, students will construct and test their water rafts. They will observe the materials they can use to determine the best way to design a boat. They will go through the design process to assess all of their worries. The materials available are straws, duct tape, plastic wrap, and a cup to hold the pennies. Once the students have completed their design, they may begin constructing. They are not to get the materials until they have a plan! Students will play with the term buoyancy by experimenting with floating rafts and weight displacement. They will practice writing in their journal the characteristics of boats that float well. Once they are ready to test their raft, they will bring it back to the water. The teacher will be there only if help is needed. Students are to carry out this experiment as independently as possible. If their raft fails, they are able to go and make revisions to make it float better. Once they have successfully added 25 pennies, they will use a stopwatch to time how long their boat can float. This allows them to practice recording results and using a stopwatch.
  - Once they are done, they should know to clean up their surroundings and bring back any materials they did not use.
  - They can take their boats home to show their guardians and family members their new creation.

**Review (wrap up and transition to next activity):**

- “Now that we have experimented with buoyancy, I want you to open up your journal to a different page. I would like you to respond to these questions that I have put on the board”
  - What worked or did not work about your raft?
  - What changes would you make if you did it again?
  - How might you make a raft that holds 50 pennies?
- “I would like you to write at least one sentence for each response.”
- “Once you have completed that, you may put your journals away and read a book.”

**Formative Assessment:** (linked to objectives)
Progress monitoring throughout lesson - clarifying questions, check-in strategies, etc.

Students should write responses to these questions in their journals before making their boat:

- What causes a boat to float?
- What causes a boat to sink?
- What are some characteristics of a good boat?
- How will you waterproof your boat?
- What shape will you make your boat?

**Summative Assessment (linked back to objectives)**
End of lesson:

If applicable - overall unit, chapter, concept, etc.:

**Consideration for Back-up Plan:**
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<td>Reflection (What went well? What did the students learn? How do you know? What changes would you make?):</td>
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