Grades K-2

Who Sank the Boat?

Making Connections through Reading

Literature, both fiction and non-fiction, makes a great beginning for most lessons. Try these books:

Who Sank the Boat? by Pamela Allen (Putnam & Grosset Group, 1982)
The Magic School Bus Ups and Down, (Scholastic, 1997)

Ready!

Prior Knowledge

Teacher

- The teacher should review the design brief, guided portfolio, and rubric to become familiar with the challenge, criteria, and materials needed to complete the activity.

Children

- Children should have prior exposure to the concept of float and sink.
- Children should have prior hands-on experience with discovering what floats and sinks.

Materials & Tools

What can children use?

- Check the design brief for materials before you begin the lesson. You may add or delete materials from the list on the design brief before copying it for the children. Children may **not** alter the materials list. Children do not have to use all of the materials provided.
- All students should have access to general supplies such as markers, crayons, glue, pencils, scissors, rulers, etc.

Suggested materials for *Who Sank the Boat?*:

milk cartons
Styrofoam
flat meat trays
liter bottles
straws
rubber bands
newspaper
tissue paper
magnets
craft sticks
glue

Suggested tools for *Who Sank the Boat?*:

scissors
pencils
rulers

Manage the materials.

- Use paper bags to control materials. Prepare one paper bag of materials for each group. Place all of the materials the group may use to complete the challenge in the bag. Each bag should hold a variety of materials, but all bags don't have to contain exactly the same materials. Make sure to provide enough materials for the children to experiment. They will only be allowed to use what you initially provide them.

What materials are needed for testing the boats?

- classroom sink OR large tub or bin to use as body of water
- plastic table cloth, oil cloth, or large garbage bag to keep the floor dry
- sponge or paper towels
- water and way to fill tub
- pennies

The tub can be heavy when full. Consider filling it using a pitcher of water. It may take many trips, but the children can handle this on their own. They can empty the tub the same way, one pitcher at a time.

Safety Issues

- All materials should be clean before children handle them.
- Discuss proper use of rubber bands.
- Children should be supervised at all times near the containers of water.

Classroom Management

- Children should work in pairs or in small groups.
- Prepare one paper bag with allowed materials for each group.

Set!

Approaching the Activity

Choose an appropriate way to introduce the technology activity to the class.
Possible approaches:

- Introduce *Who Sank the Boat?* in a manner appropriate for your class.
- Put the design brief on an overhead transparency or copy it on chart paper. Use as part of the reading lesson. This is a good place to practice shared reading skills.
- Children may work within their small group to help each other read the design brief. (Make sure to set your cooperative groups up with children having a wide range of reading comprehension skills and writing abilities so that they can help each other.)

Differentiate Instruction through the Challenge
Be sure to differentiate instruction as needed. Ways to differentiate instruction include:

- simplify the criteria
- add to the criteria to make it more challenging
- present the design brief to the class as a whole
- assign the design brief as an independent reading lesson
- rewrite the design challenge to incorporate the criteria and remove the separate checklist of criteria.

The Challenge

Review the design brief, guided portfolio, and rubric to become familiar with the challenge, criteria, and materials needed to complete the activity.

Who Sank the Boat?

Design Challenge:
Design and build a boat that can move in water without being touched and hold at least ten pennies for three minutes without sinking.

Criteria:
Your boat must
- ☐ hold at least 10 pennies
- ☐ hold at least 10 pennies for 3 minutes without sinking
- ☐ move in the water without being touched.

The challenge provides a way for students to apply knowledge from across the curriculum. The criteria are considered part of the challenge. In the early grades, criteria may be listed separately to assist children as they learn to understand the problem. In later years, criteria are often incorporated into the challenge statement.

Go!

The Design Process

*Introduce the **Design Brief**.*

- Review and discuss the background statement with your class.
- Discuss the challenge. Make sure that students can restate the challenge in their own words.
- Clarify the criteria. The criteria are part of the challenge and create a framework that the children must work within.
- Review the materials that the children are allowed to use when designing and building their boat.

*Introduce the **Guided Portfolio** and the **Design Loop.***

Independent or Small Group Work

1. Using their own words, students work together to answer, "**What is the problem?**" This is recorded in the guided portfolio. Students meet with the teacher to discuss their understanding of the problem before they begin planning their solution.

2. Students begin to **"Brainstorm solutions."** They use their productive thinking to generate many, varied, and usual ideas. They record their ideas in the guided portfolio with either sketches or words.

Students use decision-making skills to come to a consensus on which idea is the best solution. They frequently combine ideas from their guided portfolio to create the final solution.

3. Each team uses the approved materials to "**Create the solution you think is best.**" In this case it will be a boat. There is room in the guided portfolio for students to record problems as they occur AND how they solved the problems.

Whole Class

4. Upon completion of the boat, the whole class meets to **"Test your solution."** When testing the solution, remember that if the project meets the criteria of the challenge it was successful. This is recorded in the guided portfolio.

Small Group

5. Children return to their small groups to **"Evaluate your solution."** Evaluation of the project should be entered in the guided portfolio.

Time Management

Ready!

Introduce and discuss the book. Establish prior knowledge.

Set!

Share the challenge/design brief.

Go!

The guided portfolio can be broken into a number of sessions depending on time. Consider the following breakdown as a guide for planning your time.

- Understanding the problem is often achieved in one session.
- Brainstorming and choosing the best solution make a good lesson together.
- Creating the solution can happen over one or more sessions.
- Sharing and testing the boats requires time for discussion. Allow classmates the opportunity to ask/answer questions over one or more sessions.
- Evaluating the boats is important to the completion of the guided portfolio and requires a short session.

National Standards Targeted

Science:

K-4 Standard B: Physical Science Standards

As a result of the activities in grades K-4, all students should develop an understanding of

- Properties of objects and materials
- Position and motion of objects

Language Arts:

Standard 4 Communication

Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.

Standard 12 Applying Language Skills

Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information).

Standards of Technological Literacy:

Standard 2: Students will develop an understanding of the core concepts of technology.

In order to comprehend the core concepts of technology, students in grades K-2 should learn that

D. Different materials are used in making things.

E. People plan in order to get things done.

In order to comprehend the core concepts of technology, students in grades 3-5 should learn that

H. Resources are the things needed to get a job done, such as tools and machines, materials, information, energy, people, capital, and time.

J. Materials have many different properties.

L. Requirements are the limits to designing or making a product or system.

Standard 3: Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.

In order to appreciate the relationship among technologies, as well as with other fields of study, students in grades K-2 should learn that

A. The study of technology uses many of the same ideas and skills as other subjects.

Standard 8: Students will develop an understanding of the attributes of design.

In order to comprehend the attributes of design, students in grades K-2 should learn that

A. Everyone can design solutions to a problem.

B. Design is a creative process.

In order to comprehend the attributes of design, students in grades3-5 should learn that

C. The design process is a purposeful method of planning practice solutions to problems.

D. Requirements for a design include such factors as the desired elements and features of a product or system or the limits that are placed on the design.

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