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Construct a Boat & Make it Float: Construction, Trial and Error, and Boat Revisions

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Subject Areas: ELA, Science, Social Studies

Grade Level: Grade One (While this lesson targets grade one - it can be implemented in grades K-2)

Time Frame to Allow for Lessons: Five 40-45 Minute Sessions

Introduction: After learning about the parts of a ship and reading maritime themed books to build prior knowledge (see bibliography), grade one students will choose from a variety of materials to construct a boat with all the necessary parts to make it float. After construction, the students will experience trial and error to see if their boat floats. Students will make revisions based on outcomes of the trials and errors. First graders will share their boat making process with the class and classmates can ask questions about the steps taken.

Common Core Standards:

- ❖ CCSS.ELA-LITERACY.RI.1.7 Use the illustrations and details in a text to describe its key ideas.
- ❖ CCSS.ELA-LITERACY.SL.1.3 Ask and answer questions about what a speaker says in order to gather additional information or clarify something that is not understood.
- ❖ CCSS.ELA-LITERACY.SL.1.4 Describe people, places, things, and events with relevant details, expressing ideas and feelings clearly.
- ❖ CCSS.ELA-LITERACY.SL.1.5 Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.
- ❖ CCSS.ELA-LITERACY.SL.1.6 Produce complete sentences when appropriate to task and situation.

Science Standard:

2.1 Materials can be classified as solid, liquid or gas based on their observable properties.

Social Studies Standards:

CIV 1.5 Follow agreed upon rules for discussions while responding attentively to others when addressing ideas and making decisions as a group.

CIV 1.7 Explain how people can work together to make decisions in the classroom.

CIV 1.9 Describe how people have tried to improve their communities over time.

Current Units of Study/Connection to the Featured Lesson:

- ❖ **Current Language Arts Unit of Study:** Reading to Learn: Features of Non-Fiction Texts (photographs, labels, diagrams, glossary, index)
- ❖ **Current Science Unit of Study:** Solids, Liquids, and Gases (properties of matter, sink/float)
- ❖ **Current Social Studies Unit of Study:** Civics (Processes, Rules & Laws)

Compelling (Essential) Question: How is a boat designed?

Recommended Prior Knowledge: The grade one students should have some prior knowledge of how to read a diagram to learn key details about a topic. Students should be able to determine if an item is a solid, liquid or gas. Students should understand how to work together to improve their environment and their community. To build background knowledge of sea history and the important role boats played, students should be exposed to books on boats and sea history.

Pre-Assessment: To determine the prior knowledge of the grade one students in the classroom, the teacher might ask students to draw and label two solids and indicate if they predict the solids will sink or float. This pre-assessment should be used to determine the next steps. Some students may need more small group instruction before moving on to the featured lessons.

Lesson Vocabulary: collaboration, solids, liquids, matter, diagram, labels, watercraft, mast, sail, rudder, revisions, restoration

Objectives for Lesson:

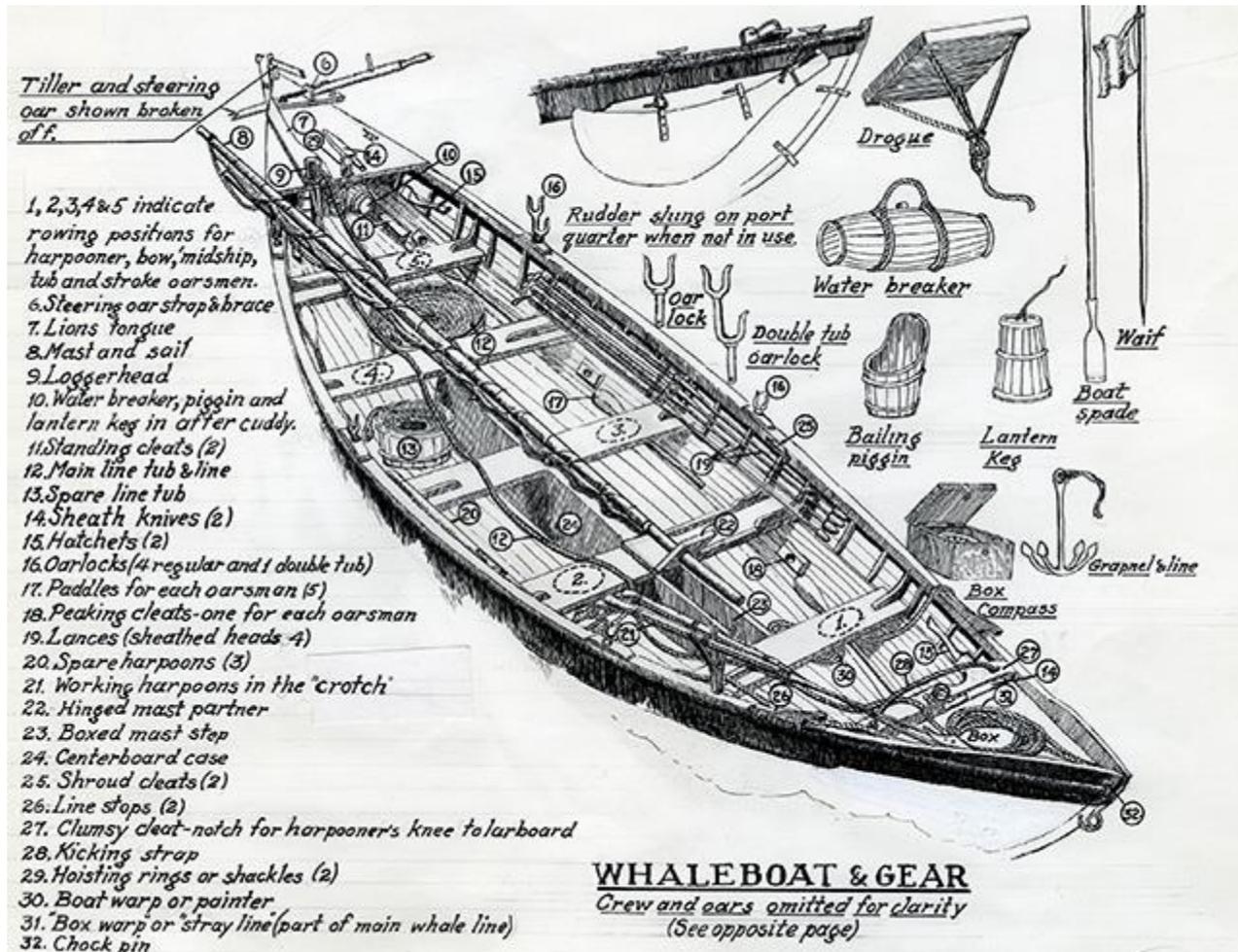
- Students will construct a boat that floats.
- Students will present their process of construction and any revisions needed to get their boat to float.

Integration of Twenty-First Century Skills: Students will develop twenty-first century skills by using non-fiction books and online resources to conduct research on the parts of a boat. Through an inquiry based approach, students will construct a boat with the materials of their choice. Students will present their finding after the boat floating trial. A question and answer session will take place allowing students to ask the speakers questions about the entire boat construction/trial and error process.

Assessments: Learning will be measured through daily do-now tasks. Student work should be collected and analyzed. Student understanding will also be evaluated through the ship construction and through the trial and error. The teacher can use a sheet with space to record observations as he/she facilitates around the room during the construction session. Students could record the materials used and whether or not they were helpful in the boat's construction by using the attached checklist. As students revise their boats to make the necessary changes so their boats will float, they can also use the checklist. To assess presentation skills, the teacher can use the rubric of their choice.

Materials/Resources

Boat Diagram



Additional Boat Diagrams

http://ahistoryofnewyork.com/wp-content/uploads/2012/11/whaleboat_diagram-480x271.jpg:

http://www.mysticseaport.org/wp-content/uploads/morgan_cutaway_222.jpg

<http://mysite.du.edu/~tlyler/ploughboy/whalingbarkbot.htm>

<http://www.mysticseaport.org/imagestorage/m115/m115353-05-r.jpg>

http://educators.mysticseaport.org/artifacts/leavitt_whaleboat_gear/

Literary and Informational Texts:

Sailing Home: A Story of a Childhood at Sea Told by Gloria Rand, Illustrated by Ted Rand

Wooden Ship Written and Illustrated by Jan Adkins

Eyewitness Books: Boat Written by Eric Kentley

I'm Mighty! By Kate and Jim McMullan

Boat Making Supplies

styrofoam

straws

sticks

empty medicine jars/caps (CVS will provide FREE empty medicine jars with non-childproof caps for school projects)

cardboard

empty water bottles

chopsticks

rulers

empty toilet paper rolls

empty plastic milk cartons

electrical tape

scissors

Sharpie markers

hot glue gun

glue

Additional Supplies

Boat Construction Trial and Error Checklist - *see attached*

Table to place boat making supplies

Water table or baby pool filled with water

Fun Facts Document

See the attached sheet for fun facts about whaling boats.

Lesson Development/Instructional Strategies

Pre-Session Strategies

1. Prior to session one, the teacher should conduct a pre-assessment by asking students to draw and label two solids and indicate if they predict each solid will sink or float.
2. Prior to session one, the whole class should engage in read alouds about boat and maritime history using the titles listed above.
3. Prior to session one, the teacher should gather the materials listed above in the “Boat Making Supplies” section. The materials should be placed on a large table for students to choose from in session two.
4. Prior to Session Three, the teacher should set up a water table or arrange to bring in a baby pool and fill it with water. Many Pre-K and K classrooms have a water table that can be borrowed.

Session One

1. Do-Now: Post a picture of a boat on the board/projector. Ask students to individually write down what they notice, as well as generate any questions they may have. Students will come together as a group and share thoughts/ideas/wonders.
2. In the whole group setting, students will explore online boat diagrams, paying attention to the parts of the boat labeled on the diagram.
3. Students will be presented with the compelling question: How is a boat designed.
4. As a group, students will be given an explanation of the boat construction task. Then, they will visit *The Boat Making Supply Table* and have the opportunity to explore all of the supplies on the table-keeping in mind the compelling question.
5. Students will gather together and briefly present observations from *The Boat Making Supply Table* exploration time.

Session Two

1. Do-Now: Write about one material you want to build your boat with and explain why. Students will share thoughts/ideas in a whole group setting.
2. As a group, the teacher will retell the goal of the boat making task. The teacher will also share the Boat Construction Checklist with students
3. Students will be broken into small group of 2-4 . Together they will discuss the compelling question and begin to select materials for boat construction.
4. Students will construct their boat using the materials of their choice.

5. Small groups will fill in first two columns of Boat Construction Checklist as they select materials and work to construct their boats.
6. The Teacher will go around to each group and ask students why they chose certain materials for their boat. The teacher should record anecdotal notes from her conversations with small groups.
7. The class will come together as a whole and reflect on boat construction/share new learnings/pose questions.

Session Three

1. Do-Now: Write and draw one item that would not work when constructing a boat and tell why.
2. The whole group will gather as a group at the water table or baby pool with their boats in hand.
3. The teacher will go over the expectations of the trial and error session. The teacher will also explain how students will use the third column of the Trial and Error Checklist during this session.
4. Each group will engage in trial and error to see if their boat floats.
5. In the event that a boat doesn't float, the group will have an opportunity in session four to make changes/modifications to their boat-so it floats.
6. Students can use the back of their checklist to jot down observations/ideas for refining their boat.
7. After all boat trials have taken place, the groups will reflect and share observations.

Session Four

1. Do-Now: Write and draw how you could revise, enhance or restore your boat. The group will share ideas for revisions and restorations.
2. Groups will have the opportunity to gather additional materials and revise their boat to make it float or enhance the quality.
3. After all revisions have taken place, the whole group will gather at the water table/baby pool and take part in another trial and error session to test revisions/enhancements. The checklist should continue to be utilized by students.
4. After all boat trials, the group will reflect on the boat revision/enhancement process. How did the changes help with boat construction?

Session Five

1. The teacher will give the group the expectations for presenting/communicating their boat construction conclusions with the class.
2. Each group will present their boat construction conclusions-including any revisions/enhancements/restorations they made.
3. The teacher will use a presentation of knowledge and ideas rubric of their choice to assess this portion of the process.

4. During a Q and A session built into each group presentation, classmates can ask groups questions about their boat construction process.
5. After all groups have shared, the class will revisit the compelling question. Students could provide an oral or written response to the question: How is a boat designed?
6. The teacher should collect student responses and use this data to determine next steps for instruction.

Students Needing Differentiated Instruction:

- ❖ Students struggling with writing can verbally share their thoughts and ideas for the *Do-Nows* and Checklist and have the teacher or other support staff record their responses
- ❖ Students benefiting from more visual supports can have access to models of boats with labeled parts
- ❖ Students will have access to hard copies of the online boat diagram with all parts labeled
- ❖ Students can use notes and their checklist as a guide when they are presenting ideas to classmates
- ❖ Small group instruction/individual conferences will occur as needed through the sessions
- ❖ Students benefiting from enrichment will have the opportunity to research boats from the past and compare them to boats of today
- ❖ Students benefiting from enrichment can use online tools to research how boats benefit our community
- ❖ Students benefiting from enrichment can label the parts of their group's boat and use online tools and books to learn more about the purpose of each boat part