Marine Transportation Activity; Understanding Hull Design

LEARNING AREA: Write/Speak, Read/Listen/View, Mathematical Concepts/Applications, Inquiry/Research, Scientific Concepts & Applications
EDUCATIONAL LEVEL: High School
CONTENT STANDARD: Write/Speak

1. Technical Writing
2. Public Speaking
3. Interpersonal Communication

CONTENT STANDARD: Read, Listen, and View

1. Technical Reading
2. Technical Listening
3. Technical Viewing

CONTENT STANDARD: Mathematical Concepts and Analysis

1. Technical Applications
2. Shape, Space, and Measurement

CONTENT STANDARD: Inquiry and Research

1. History of Science

CONTENT STANDARD: Scientific Concepts and Applications

1. Earth and Space Systems
2. Concepts in Physics

ASSESSMENT TASK: Understanding Hull Design

DESCRIPTION: There are many different hull designs on watercraft. In this Activity your students will, in groups, research hull design, design and construct their own hull, and report their methods and findings to the class.

PRODUCTS/EVIDENCE OF LEARNING:

1. Design/construct a working model
2. Research existing designs
3. Produce scaled drawings
4. Test model's design
5. Orally report findings to class
6. Produce written report of findings to the instructor.

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OVERVIEW: At the completion of this activity the students will have gained knowledge of hull designs through research, trial and error, and working with others. Students will learn how materials can be shaped to produce buoyancy while keeping drag to a minimal level.

The groups of students will be instructed to research hull design using the Internet or text sources. Videos, interviews, and other sources may also be used with instructor's approval. When the groups have decided on a design, a scaled drawing will be produced to aid in construction of their model. Extra credit may be given to groups that choose to use a drafting program to complete their drawing. After the drawing receives the instructor's approval the students may go ahead and construct their model out of the materials made available by the instructor. (An easily malleable metal such as aluminum would be a fine choice, but other materials could also work depending on the tools you can provide the students with.)

After the model is constructed it must be tested. An old stock tank or any other large water holding container will work well. Check to see if the model floats and for stability. Next add weight to the model and check to see if it floats and for stability. If the model does not float or is not stable the group will have to start over. Make sure that the group records what happens to their model as it is tested. Now it is time to test for drag. To do this flowing water is needed. A wide rain gutter works nicely. Once the water is flowing in the gutter attach a scale (a spring scale or a digital fisherman's scale are both affordable choices) to the front of the model and record the weight. The greater the weight means that the drag is greater as well.

At the completion of testing, each group will prepare a presentation to the class that should include the following: How they came up with their design, how well did it work, problems encountered and how they were solved. A written report will also be submitted to the instructor that includes the same information and also a list of resources used to come up with their design.

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TEACHER CHECKLIST:

_____Appropriate tools for constructing models out of chosen material
_____Scale
_____Large tank
_____Gutter
_____Running water
_____Weights
_____Internet access

STUDENT CHECKLIST:

_____Group of three
_____Safety glasses
_____Scaled drawing of model
_____Test for buoyancy/stability
_____Test to see if model can hold weight
_____Test for drag
_____Record results
_____Present findings to class
_____Prepare a written report including references used for finding hull design for the instructor.