

Gr. 7 - Understanding Structures and Mechanisms

Form and Function

Hovercraft

Specific Expectations:

1.1 Evaluate the importance for individuals, society, the economy, and the environment of factors that should be considered in designing and building structures and devices to meet specific needs.

2.1 Follow established safety procedures for using tools and handling materials.

2.2 Design, construct, and use physical models to investigate the effects of various forces on structures.

2.3 Investigate the factors that determine the ability of a structure to support a load.

3.5 Describe the role of symmetry in structures.

3.6 Identify and describe the factors that can cause a structure to fail.

Big Idea (for lesson):

Students explore a ways to overcome friction and fluid drag by looking at, designing, and building hovercrafts.

Accommodations:

- Increase time
- Visual Aids
- Manipulatives
- Chunking
- Step-by-Step
- Scaffolding
- Copy of Notes
- Student Grouping

Differentiated Instruction:

- Content: Use demo to show the content as you offer verbal descriptions.
- Process: Have students work in pairs and support each other if physical impediments exist.
- Product: Students may submit their final product in pairs, and communicate their findings either verbally, visually, or through written means.
- Other: _____

Bloom's Taxonomy:

- Knowledge
- Comprehension
- Application
- Analysis
- Synthesis
- Evaluation

Multiple Intelligence:

- Verbal/Linguistic
- Logical/Mathematical
- Visual/Spatial
- Bodily/Kinesthetic
- Naturalist
- Musical/Rhythmic
- Interpersonal
- Intrapersonal

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Delivering The Lesson:

Portion & Timing	Grouping:			Introduction:	Materials
Minds On: 10 mins	W <input checked="" type="checkbox"/>	S <input type="checkbox"/>	I <input type="checkbox"/>	<p>Teacher asks class some introductory questions:</p> <ul style="list-style-type: none"> -How can two surfaces have no friction between them? (<i>Answer: if they aren't touching.</i>) -Can you think of a some mechanism that eliminates friction during its motion by creating space between itself and other surfaces? (<i>Answer: Hovercrafts!</i>) <p>Show the LEGO hovercraft, and demonstrate its abilities on different surfaces.</p>	-Demo
Action: 20 mins	W <input checked="" type="checkbox"/>	S <input checked="" type="checkbox"/>	I <input checked="" type="checkbox"/>	<p>Have students build their own hovercraft according to the instructions on the handout.</p> <p>Compare performances of hovercrafts and consider the differences in design: How did more or less holes affect the hovercraft's performance?</p> <p>Teacher can circulate and ask questions of the different groups:</p> <ul style="list-style-type: none"> -What are the advantages of multiple holes? (<i>Answer: Air escapes more quickly, so hovercraft is lifted higher and glides better.</i>) -What are the advantages of only one hole? (<i>Answer: Air escapes more slowly, so the balloon supply lasts longer.</i>) 	-Hovercraft – Handout -Balloons, sticky tack, CDs, snappy cap, tape, toothpick.
Consolidate: 10 mins	W <input checked="" type="checkbox"/>	S <input checked="" type="checkbox"/>	I <input type="checkbox"/>	<p>Teacher prompts some open discussion with the following questions:</p> <ul style="list-style-type: none"> -Are any ways they could have improved their design? (<i>How about a way to keep air flowing because the balloon runs out quickly?</i>) -What changes could be made for a hovercraft to carry heavy cargo? -Teacher can show the class a video of the Hovercraft ferries that crossed the 	Hoverspeed- Hovercraft- Arriving-in- Calais.mp4

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				English Channel until 2000. -For homework, ask students to brainstorm and create a blueprint of a new hovercraft design that can lift heavy loads.	
Extension! Several Days/1 Period	W <input checked="" type="checkbox"/>	S <input type="checkbox"/>	I <input type="checkbox"/>	Building Project: Work as a class to make your own, RIDEABLE hovercraft! The following websites outline the procedure very easily. 1. http://www.sciencebuddies.org/science-fair-projects/project_ideas/Aero_p036.shtml#summary 2. http://spaceflight.nasa.gov/brainbite/rocketscience/hovercraft/ 3. Important Hovercraft Safety Guidelines are at the bottom of the following website http://www.sciencebuddies.org/science-fair-projects/project_ideas/Aero_p036.shtml#procedure	-Requires adult supervision always. -Safety goggles -Power Tools -For materials list, refer to websites. -Refer to "Important Hovercraft Safety Guidelines".
				Research Project: -Who was Christopher Cockerell? -How did he make his first model of a hovercraft? -How have the uses of hovercrafts changed over the years?	