

Gr. 3 – Understanding Structures & Mechanisms

Strong and Stable Structures

Strong Shapes/Which is Strongest?

Specific Expectations:

- 2.1 Follow established safety procedures during science and technology investigations.
- 2.2 Investigate, through experimentation, how various materials and construction techniques can be used to add strength to structures.
- 2.3 Investigate, through experimentation, the effects of pushing, pulling, and other forces on the shape and stability of simple structures.
- 2.4 Use technological problem-solving skills, and knowledge acquired from previous investigations, to design and build a strong and stable structure that serves a purpose.
- 2.5 Use appropriate science and technology vocabulary, including *compression*, *tension*, *strut*, *ties*, *strength*, and *stability*, in oral and written communication.
- 3.1 Define a structure as a supporting framework, with a definite size, shape, and purpose, that holds a load.
- 3.3 Identify the strength of a structure as its ability to support a load.
- 3.4 Identify the stability of a structure as its ability to maintain balance and stay fixed in one spot.
- 3.7 Describe ways to improve a structure's strength and stability.

Big Idea (for lesson):

Students will build and experiment with different shapes to discover that the triangle is the strongest shape, and will incorporate this finding into building a 3-dimensional structure that can support some weight.

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 show their final product in pairs, and communicate their findings either verbally, visually, or through written means.
- Other: _____

Bloom's Taxonomy:

- Knowledge

Multiple Intelligence:

- Verbal/Linguistic

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- Comprehension
- Application
- Analysis
- Synthesis
- Evaluation

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

Delivering The Lesson:

Portion & Timing	Grouping:			Introduction:	Materials
Minds On: 5 mins	W <input checked="" type="checkbox"/>	S <input type="checkbox"/>	I <input type="checkbox"/>	<p>Teacher can do a demonstration to introduce the notion of a “strong shape”, regardless of how heavy or stable the object is itself:</p> <ul style="list-style-type: none"> -Fold the paper lengthwise several times, making an accordion shape. -Use 2 books as supporters, and place the paper across them like a bridge. -Ask students what will happen if you place the other 2 books on top of the paper? -Place the load on the bridge, and notice that the paper is able to support a weight much heavier than itself. <p>(Source: http://www.mathsinthecity.com/sites/most-stable-shape-triangle)</p> <p>Ask students the following questions:</p> <ul style="list-style-type: none"> -Would the paper have supported the books if it weren’t folded? (<i>Answer: No</i>) -What did the folds do for the paper? (<i>Answer: it made the paper stronger.</i>) <p>Tell students to keep the following question in mind (and write it up on the board for reference): Why did the folds change how strong the paper was?</p>	<p>1 piece of paper at least 8.5x14” (preferably cardstock)</p> <p>4 books (about an inch thick, ideally)</p>
Action: 30 mins	W <input checked="" type="checkbox"/>	S <input checked="" type="checkbox"/>	I <input checked="" type="checkbox"/>	<p>Have students complete the shapes and structures activities according to the instructions on the handout.</p> <p>Teacher can circulate and ask questions of the different groups:</p> <ul style="list-style-type: none"> -What shapes do you notice are strongest? (<i>Answer: Triangle</i>) -How do you know it is strong? (<i>Answer: It will</i> 	<p>Strong Shapes & Which is Strongest? Handout (Materials listed)</p>

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				<p><i>not collapse if pushed one way or the other.)</i></p> <p>-How can you make the other shapes stronger? <i>(Answer: by adding diagonal beams and trusses to make triangular shapes.)</i></p> <p>-How can you take advantage of triangular shapes in your structure? <i>(Answer: add diagonal beams where possible, try to stick with triangular supports.)</i></p>	
<p>Consolidate: 5 mins</p>	<p>W <input checked="" type="checkbox"/></p>	<p>S <input checked="" type="checkbox"/></p>	<p>I <input type="checkbox"/></p>	<p>Have students circulate and look at one another's structures.</p> <p>As a group, have students give ideas of what worked well for them and make a list of good designs to keep in mind when trying to build a strong structure. Include a discussion of different materials and their advantages (ie: lightness, flexibility, strength...)</p> <p>Leave them overnight, if possible, and observe which are still standing the next morning.</p>	<p>Chart Paper Markers</p>