Gr. 7 - Understanding Structures & Mechanisms

Form and Function

Hoopglider/Boomerang

Specific Expectations:

2.1 Follow established safety procedures for using tools and materials.

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

3.1 Classify structures as solid structures, frame structures, or shell structures.

3.3 Identify the magnitude, direction, point of application, and plane of application, and plane of application of the forces applied to a structure.

3.4 Distinguish between external forces and internal forces acting on a structure.

3.5 Describe the role of symmetry in structures.

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

Big Idea (for lesson):

Students investigate what materials and designs make effective and sturdy hoopgliders and boomerangs, and look at the forces at play when these structures are at work.

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: 5 mins	W ☒	S ☐	I ☐	Teacher begins by doing a Predict, Observe, Explain demo with students showing Bernoulli's Principle: -Hold a strip of paper close to their lips and blow across the top. -Paper responds by moving up, towards the stream of moving air, which is often unexpected. Ask students the following questions: -Where is air moving faster, above or below the paper? (*Answer: above.)* -Based on your observations, does slower-moving or faster-moving air exert more pressure? (*Answer: slower-moving air, so it was able to push the sheet up.*) -How does this relate to aircraft design? (*Answer: Engineers use this property to give lift to airplanes and other crafts*.)	Narrow strip of light paper
Action: 30 mins	W ☐	S ☒	I ☒	Have students build their own hoop gliders and boomerangs according to the instructions on the handout. Compare performances of the structures and consider the differences in design. Try to have students make 3 different varieties of hoop gliders and boomerangs. Teacher can circulate and ask questions of the different groups: -How would your structure hold up when exposed to natural forces? -Does symmetry play a role? Does balance? -What kind of structures are the models? What about the real versions? (*Answer: Frame structures versus shell structures.*)	Hoopglider & Boomerang Handout (Materials listed)
Consolidate: 5 mins	W ☒	S ☐	I ☐	Teacher asks class to pick their best design for both the hoopglider and boomerang. Students engage in a community talking circle and share what went well, what didn't and what materials they wish they had as materials for this project.	