Gr. 3 - Understanding Matter & Energy

Forces Causing Movement

Terrific Torque

Specific Expectations:

2.1 Follow established safety procedures during science and technology investigations.

2.2 Investigate forces that cause an object to start moving, stop moving, or change direction.

2.3 Conduct experiments to determine the effects of increasing or decreasing the amount of force applied to an object.

3.1 Identify a force as a push or a pull that causes an object to move.

3.2 Identify different kinds of forces.

3.3 Describe how different forces applied to an object at rest can cause the object to start, stop, attract, repel, or change direction.

3.4 Explain how forces are exerted through direct contact or through interaction at a distance.

Big Idea (for lesson):

Students investigate different materials to design and build a testable top that spins as long as possible.

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
- ☒ Comprehension
- ☒ Application
- ☒ Analysis
- ☒ Synthesis
- ☒ Evaluation

Multiple Intelligence:

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

Delivering The Lesson:

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Portion & Timing	Grouping:			Introduction:	Materials
Minds On: **10 mins**	W ☒	S ☐	I ☐	Teacher can do a demonstration to introduce everyday structures for the lesson. For this, using some sort of small structure that can "power itself" is ideal, so that students can observe and try to explain how each part contributes to the motion of the whole object. Two options are described under "Materials". Ask students how the air seems to move, why the blades of the helicopter turn/why the hovercraft CD floats, and how they think it was put together. Ask students if air can exert a force on an object? (*Answer: yes, an everyday example of this is wind*.) Ask students to describe the forces being exerted in the demonstration. (*Answer: the balloon is squeezing air out of itself, pushing it up (or down, for the hovercraft) against the blades of the helicopter causing them to turn because they are angled (against the floor, causing it to lift up and glide).*)	Balloon Powered Helicopter (WBPH-400) Or Hovercraft according to the Widget Workshop Handout.
Action: **20 mins**	W ☒	S ☒	I ☒	Have students build their own tops according to the instructions on the handout. Teacher can circulate and ask questions of the different groups: -What force makes the top spin? (*Answer: the force of one's hand or by pulling the string.*) -Is this force a push or a pull? (*Answer: by hand it's a push, by string it's a pull*.) -Why do you think the top slows down and falls? (*Answer: it loses energy*.) -What forces cause this loss of energy? (*Answer: friction with the ground, maybe some air resistance if it's windy.*) -Does the top only spin? Does it move around as well? Why do you think that is? (*Answer: if your hand/string was pulled in a certain direction, the top might have felt some of*	Terrific Torque Handout (Materials listed)

				that force as well. Some grooves/etches/etc. in the table would affect its motion as well.)	
Consolidate: 10 mins	W ☒	S ☒	I ☐	Once students are finished their experimenting, have them sit as a whole class and discuss how forces are at work to make this top spin. Talk about how the torque applied by hand and by the string gave the top a different length of spin. Have students list off some everyday examples of spinning objects, and as a whole describe the forces and how torque is working in each scenario.	