



Learning About Levers and Fulcrums With *Star Wars*® DroidWorks®

Curriculum Connection: "All students should develop an understanding of motions and forces." National Science Education Standards

Lesson Plan (Grades 5-8):

Show a picture of a playground and ask students to name the simple machines in the picture. Review what simple machines are and ask the students why these are considered machines. Discuss their similarities and differences.

Mention to your class that a playground see-saw can be an example of a fulcrum and lever. Introduce the concept of levers. Ask your students to name other simple machines that can be classified as levers. Ask them to describe how they have seen levers and fulcrums used.

Bring safety scissors, nutcracker and tweezers to introduce the three classes of levers (based on location of fulcrum). After that, conduct an exercise, closely supervised by you, or another teacher, that uses machines readily available at the school like a shovel, wheelbarrow or hand-truck. For example, a hand-truck or wheelbarrow can be used by the students to move items not easily carried by hand. NOTE: You and your students should not move any heavy or large items that could cause discomfort. You might ask the custodian at your school for help in doing this and acquiring applicable objects.

This exercise demonstrates proper location of a fulcrum and the idea of mechanical advantage.

Divide the class into groups of four or less students. Give each group a hardcover book, two unsharpened pencils and scotch tape. Each group has to tape a pencil on the table and the other pencil will be used to lift the book. Have all the groups experience placing the fulcrum at three different locations (front of lever, middle of lever, and back of lever) to better understand the idea of mechanical advantage. Have each group select which of the three appears to be most efficient and attempt to explain why the others are less efficient. This will introduce the idea of mechanical advantage, and prepare students to complete *Training Mission 7* in ***Star Wars Droidworks***.

Have students complete *Training Mission 7* with a partner. Ask one student in the pair to record the decisions the group makes in maneuvering the droid to complete the mission.

After students have completed the mission, discuss the following:

- What did you need to consider in building your droid for this mission?
- Did you need to try building more than one droid before you could successfully complete the mission?
- What did you learn from your first try(ies) that helped you improve your design?
- Did you use the help of another droid to complete the mission? Describe how you were able to work together.

Here's an optional set of activities, to provide more experience with levers:

If a see-saw is available on your school's playground, have students use their books, bags or other school materials as load and give them the task of lifting an object of unknown mass up to a given level with the least amount of effort.

Ask the groups of students to experiment with weights and lever arm lengths. Ask if they can come up with an estimate of how the force relates to the length of the resistance arm, using their observations.

Use a scale to keep track of the force required of lifting the load to the required height. Encourage the class to look at other options and estimate which arrangement might be the most efficient.

Talk about the building of the pyramids or movement of the Huge Stone carvings on Easter Island. Describing the size and mass of the stone blocks and how instrumental levers were in placing them. This could open the door to an exciting discussion.

Homework assignment:

Ask your students to complete the EarthQuest questions in the InDex section on Levers and Fulcrums. Where appropriate, have them draw diagrams or sketch illustrations to demonstrate the ideas.

(Thanks to educator Eric Thiel for helping brainstorm teaching ideas for our products.)

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