Sample Lesson Plan using TechChains.org

Potential NGSS Standards: K-2-ETS1-3, 3-5-ETS1-2, MS-ETS1-4

Question / Activity	Objectives / *Next Steps*
What are the parts of a bottle cap? Small Groups: Give students a sample bottle and its cap, then ask them to create a model using plastic tubing and pipe cleaners.	• A bottle and its cap have matching grooves. *How does a bottle cap work?*
How does a bottle cap work? Whole Class: Have students share their methods for creating a successful bottle and cap.	• The grooves in the bottle and cap are angled. *Why does a bottle cap work?*
Why does a bottle cap work? Whole Class: Use TechChains.org to work backwards or forwards through the technology chain "inclined plane," "screw," and "bottle cap." Discuss how each technology contributes to the form and function of a bottle cap.	• An inclined plane works by changing the direction of the force required to do work. In a bottle cap, miniature inclined planes exist as screws on the bottle and its cap. *Why are bottle caps designed differently?*
Why are bottle caps designed differently? Small Groups: Have students compare course- and fine-threaded bottles. Then give students a course-grained bolt and nut as well as a fine-grained bolt and nut. Have them identify the number of turns (or revolutions) it takes for the nut to reach the end.	• Different types of bottles use different types of screws. • Using some screws requires a lot more work than others. • Screw type depends on use (size or pressure of contents). *How do you balance mechanical advantage and ease of use?*
How do you balance mechanical advantage and ease of use? Small Groups: Challenge students to redesign their bottle caps, this time making it as easy to use as possible.	• Mechanical advantage compares output force to input force. With careful design, you can balance both forces. *How do you calculate mechanical advantage? ...*