Catapult CORIculum

This classic engineering design project is an opportunity for students to explore the forces of motion and the lever simple machine. The Cori Catapult kit is designed to seed curiosity, build grit, improve spatial skills, and sharpen problem solving abilities.
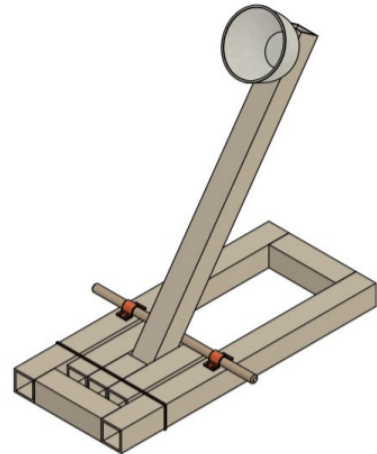

Objective:
Students will go through the Cori Design Process to launch a projectile the farthest and/or the most accurate using targets.

Grades Levels: 2nd - 6th Grade
Lesson Duration: 3-4 hours
Build Time: 45 - 75min

Additional Materials Recommended	
- Hot glue gun - Gluesticks - Scissors - Ruler - Pencil - Measuring tape (optional)	- Art supplies (optional) - Decorate your catapult - Targets - green army soldiers, action figures, dolls, paper, etc. - Projectile - ping pong balls, hacky sacks, bag of beans, erasers, etc.

| Vocabulary To Explore	Definition
Projectile	an object propelled through the air, especially one thrown as a weapon.
Force	strength or energy as an attribute of physical action or movement.

Accuracy	the degree to which the result of a measurement, calculation, or specification conforms to the correct value or a standard.
Tension	apply a force to (something) which tends to stretch it.
Fulcrum	the support about which a lever turns

Cori Design Process Lesson Plan

The Cori Design Process provides our learners the experience of what engineers, architects, scientists, and makers do everyday. At Cori, we thrive on structuring design challenges and projects that intentionally nurture skills (i.e. critical thinking) and build creative confidence.

For a shorter learning experience (60 - 90min), use the following Cori Catapult Coach's Corner card found HERE.

For a multi-day learning experience, please follow the lesson plan below.
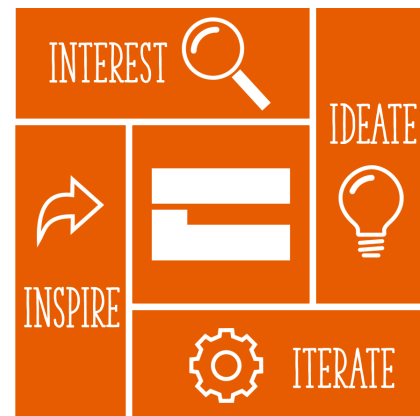
Catapult Challenge Storyline

You are in the midst of a month-long battle against the evil Green Knights of Outlandia. Your troops are tired and weary from trying to penetrate the castle for many days. Finally the reinforcement Cori materials arrive to give you the arsenal to attack the fortress. There are 3 layers to this castle, and your Cori catapults need to be designed to penetrate the castle. You have been assigned to the catapult team and must use your handy Cori materials to build a catapult. How can you help defeat the Green Knights of Outlandia with your Cori Catapults?

Phase 1: Interest (20-30min)

1. Hook your students with a Cori Catapult design challenge that will push your designers to create the best catapult in the class. Teachers can also create a minimum benchmark for each criteria for evaluating the finished projects. Create a catapult competition that focuses on one or more of the following criteria:
   a. Travels the furthest (distance)
   b. Travels the most accurately
   c. Launch the heaviest item a predetermined distance
2. Share videos of catapults from famous movies. On YouTube, type in the following movie titles with the word catapults to show them in action:
   a. The Sandlot

       b.   The Chronicles of Narnia: Prince Caspian
       c.   Willow
       d.   Night at the Museum
       e.   Richie Rich
       f.   Return of the Jedi

3. (Optional) Give your students research time with one or more of the following guiding prompts:
    a. What were the most effective catapult designs in ancient civilizations?
    b. What were examples of projectiles used in the early uses of catapults?
    c. What simple machines are used in the catapult designs?
    d. What modern day engineering inventions have been influenced by the ancient catapults?
4. Share the design challenge parameters from the Cori suggested materials list and instructions provided..

Phase 2: Ideate (30min)

1. Explain that there are instructions available to create the base Catapult.
2. However, encourage students to tweak the base and add new elements to the design to make it uniquely their own. ***It will be important to maintain the core launch arm with pivot and shaft components.***
3. Have your students draw and sketch out their initial designs on paper and have them share with another student or group of students.
4. Group Discussion: Other than a rubber band, what other components may be used to power a projectile launcher?
    a. Ideas: Gravity/mass, Springs, Electromagnets, Hair Ties, and Compressed Air

Phase 3: Iterate (45 - 75min)

1. Make sure students are given proper safety instructions prior to starting.
2. Provide students a creative space to build their catapult and have all the tools/materials readily available.
3. Explain the competition in detail. Show the targets and distances you would like the catapult to reach. Select the projectile object that will be launched. Examples of projectiles can be a ping pong ball, hacky sack, or a bag container with beans in it. This would be a great time to show an example catapult in use.
4. Build TIME! Walk around and offer guidance as needed.
5. Group Discussion: What are ways to launch your projectile even further?
    a. Ideas: Experiment by adding more rubber bands, different kinds of rubber bands, and by changing the launch angle.

6. Have students test out their initial designs. For each launch, have students record distance and/or accuracy.

Phase 4: Inspire (30 - 45min)

1. (Optional) Once you have found your optimal design, decorate your catapult with paint, markers, and/or other art supplies available in your classroom. Make it uniquely your own creative design.
2. (Optional) It is project testing day and a great opportunity to celebrate all the designs from your class. It is also a great time to add other elements to the competition like
   a. Best artistic designs
   b. Most innovative design
   c. Best effort during the four phases
3. (Optional) Have a recording device available to film each catapult in action. We highly recommend using the slow motion capture on your recording device.
4. Set up your targets for recording the final results. Have each student and/or group present their design before launching. Once the catapult is in position, have your students load the projectile onto the catapult. Have your measuring tape to record distance and/or measure distance from target (record where projectile landed).
5. Celebrate your winners and congratulate all the designs. For students who didn't make the baseline requirements you set forth, encourage them to improve their design and test again.
6. Final reflection question: Describe your final results and ask what you would do differently next time if you had an opportunity to start over?

Contact us at support@coricreate.com if you have any questions or comments.

www.coricreate.com