Advanced DataSnap™ Projectile Experience Curriculum

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The DataSnap™ Projectile Experience modernizes the classic catapult activity, bringing standards-driven content to life with easily accessible projectile motion data. Students learn, explore, create, and validate predictive data models that describe a catapult's performance.

Author

Daaiyah White is a seasoned educator, curriculum writer, and STEM subject matter expert with more than a decade of teaching experience. Known for her innovative instructional approach and ability to make complex concepts accessible, she supports both students and educators through engaging, standards-aligned content and professional learning experiences.

Daaiyah currently serves as an Instructional Coach for STEM with Amplify, partnering with the School District of Philadelphia to support high-impact implementation of K–8 instructional materials. She also leads InnovEd Solutions, an education consulting business focused on designing effective, technology-integrated learning experiences. Outside of work, Daaiyah enjoys traveling, mentoring students, and exploring creative ways to connect STEM to real-world learning.

Curriculum Structure

The *Advanced DataSnap™ Projectile Experience Curriculum* is composed of the following lessons. Approximate lesson times are included.

Lesson	Title	Approximate Time
One	Making Your Catapult Data-Smart	50-120 minutes
Two	Pull-Back Angle – Force and Work	50-80 minutes
Three	Elastic Bands and Energy	50-80 minutes
Four	Launch Arm Length and Velocity	50 minutes
Five	Launch Angle and Newton's Laws	50-80 minutes
Six	Strategapult Competition	40-70 minutes
	Total	**4-8 hours**

Lesson Structure

Each lesson begins with a Lesson Overview, Lesson Objectives, and a Lesson at a Glance table, which lists lesson activities, materials required, suggested preparation steps, and approximate class time.

Lesson Components

Pre-Assessment: These are quick primers to get students focused and ready to engage. They are short-response questions that elicit prior-knowledge thinking and can serve as a good whole-class opening discussion or a quick LMS check-in.

Content and Learning Guide Slide Presentation: This curriculum is designed to give teachers the flexibility to implement instruction in ways that best meet their classroom needs. The slide presentations can support teacher-led, whole-class instruction, or they may be used by student teams for independent or collaborative learning. Many educators choose to upload the slides to their LMS, allowing for easy student access and flexible pacing.

Student Engineering Workbook: As students follow the guided lessons in the slide presentations they should complete the corresponding sections of their Student Engineering Workbook.

Post-Assessment: Similar to the pre-assessment, these are short-response questions that can be used as an exit ticket or implemented in whatever way best supports your instructional goals.

Lesson 1: Making Your Catapult Data-Smart

Lesson Overview

Students will be introduced to their team's Catapult, the concepts of energy transfer, distance versus displacement, and vertical versus horizontal motion. After following detailed Catapult-building instructions, teams will be introduced to the DataSnap Motion Sensor. Once connected to the DataSnap app, they will conduct a simple set of data-gathering launch trials.

Lesson Objectives

After completing this lesson, participants will:

- Understand simple catapult and projectile motion concepts
- Construct their Catapult
- Conduct 3 data-gathering trials
- Access and view data with the DataSnap Motion Sensor

Lesson at a Glance

Activity	Materials	Preparation	Approximate Class Time
Pre-Assessment	• Making Your Catapult Data-Smart Pre-Assessment	1. Print/photocopy the Making Your Catapult Data-Smart Pre-Assessment (one per student) or load it into your LMS.	5 min
Content and Learning Guide	• Lesson 1 slide presentation • 1 Projectile Kit per team • 1 DataSnap Motion Sensor and/or test projectile • 1 sheet of paper per team • 1 elastic band	1. Share the slides with students. 2. Gather kits and materials.	40-110 minutes
Student Workbook	• Student Engineering Workbook • Student Engineering Workbook – Answer Key	1. Share workbooks with students. 2. Access the answer key.	
Post-Assessment	• Making Your Catapult Data-Smart Post-Assessment • Making Your Catapult Data-Smart Post-Assessment – Answer Key	1. Print/photocopy Making Your Catapult Data-Smart Post-Assessment (one per student) or load into your LMS. 2. Access the answer key.	5 minutes

Lesson One – Making Your Catapult Data-Smart

50-120 minutes

Materials:

- 1 Projectile Kit per team
- 1 elastic band
- 1 DataSnap Motion Sensor and/or test projectile
- 1 sheet of paper per team
- Making Your Catapult Data-Smart Pre-Assessment
- Lesson 1 slide presentation
- Student Engineering Workbook
- Student Engineering Workbook – Answer Key
- Making Your Catapult Data-Smart Post-Assessment
- Making Your Catapult Data-Smart Post-Assessment – Answer Key

Facilitation Steps:

1. Provide students with the pre-assessment to complete. Use it in the way that best supports your instruction; many teachers use it to guide team or whole-class discussion.
2. Students should have access to the Lesson 1 slide presentation. These can be uploaded to your LMS for individual or group work, or you can work through the slides collectively as a whole class.
3. As students work through the slides, they should complete the corresponding Lesson 1 questions in their Student Engineering Workbook.
4. Each team will need one Projectile Kit, which includes the Catapult's components, hardware, and tools.
5. **Preparing the Safe Flight Zone:**
    a. Launch from the floor.
    b. Make sure there is 25 or more feet of open space for the projectile to fly.
    c. Check the ceiling to ensure there are no low-hanging projectors, sprinkler heads, or other obstructions.
    d. Select one team member to stand at the end of the Launch Zone to stop the sensor.
6. The DataSnap App can be accessed at datasnap.crexo.com.
7. Note on Elastic Bands: These will stretch over time. Replace with a new band if performance is altered by band losing its elasticity.
8. Once students finish viewing the Lesson 1 slides and completing the corresponding workbook questions, provide time for them to check their work using the answer key. This can be done in a variety of ways, including:
    a. Post the printed answer key in the room for students to compare answers with.
    b. Go over the answers as a class.
    c. Have students exchange workbooks and complete a peer check.
9. Teams are encouraged to share and compare data as part of the Test and Evaluate step of the Engineering Design Process. This is a good opportunity to post or display a whole-class data table that each team can contribute to.

    A data table can make discussion and wrap-up more effective by incorporating real data points, along with helping you identify teams that may have struggled during the lesson.
10. Provide students with the post-assessment to complete. Use it in the way that best supports your instruction; many teachers have students self- or peer-grade, while others prefer to digitize the assessment through their LMS.

Name: ______________________________ Class: _____________________________

Making Your Catapult
Data-Smart Pre-Assessment

1. What do you think causes a projectile (like a basketball or paper ball) to fly through the air after being launched?

2. Imagine you are launching a paper ball with a rubber band. What types of energy are involved before and after the launch?
   a. Elastic potential energy
   b. Kinetic energy
   c. Thermal energy
   d. Both a and b

3. When a projectile is launched, it follows a curved path. What do you think affects how far and how high it goes? Select all that apply.
   a. The angle of launch
   b. The amount of force used
   c. The weight of the projectile
   d. The color of the projectile

4. What is the difference between how far something travels and where it ends up? Try to explain the difference between “distance” and “displacement” in your own words.

5. Why might it be useful to separate horizontal and vertical motion when analyzing a projectile’s flight?

Name: ______________________________ Class: ____________________________

Making Your Catapult Data-Smart Post-Assessment

Instructions: Complete the following questions. Choose one answer per question.

1. Which type of energy is stored when you pull back the Catapult arm before launch?
    a. Kinetic energy
    b. Thermal energy
    c. Elastic potential energy
    d. Gravitational energy

2. What best describes the path a projectile follows after being launched from a Catapult?
    a. Straight line
    b. Zigzag pattern
    c. Parabolic curve
    d. Circular arc

3. Which of the following is true about the difference between distance and displacement?
    a. Distance is always shorter than displacement
    b. Displacement measures the total path traveled
    c. Distance measures the curved path; displacement is the straight-line from start to end
    d. They are always equal for projectile motion

4. Why is it important to separate horizontal and vertical components of motion when analyzing a projectile?
    a. It helps you ignore air resistance
    b. It allows you to calculate the projectile's weight
    c. It helps you understand how far and how high the projectile travels
    d. It makes the projectile fly farther

5. What can the DataSnap Motion Sensor help you measure during a launch?
    a. The weight of the projectile
    b. The color of the projectile
    c. The time of flight, distance, and displacement
    d. The temperature of the launch zone