# Scope Phenomenon

Name: _____ Date: _____

## Whack!

1. What examples of energy did you notice in the video as the child played the game?

_____

_____

2. How did you know that those energies were being used?

_____

_____

_____

_____

3. In what ways do you use each of these energies in your everyday life?

_____

_____

_____

_____

4. What would happen if the child in the video increased the speed of the whack? What would happen if the child decreased the speed? How is this related to the mechanical energy that the child used?

_____

_____

_____

_____

Explore

Name: _____ Date: _____

# Energy Stations

## Data and Observations Recording Tables

### Station 1: Ramp It Up

| | Height on the Ramp | Distance the Car Traveled |
|---|---|---|
| **Trial 1** | | |
| **Trial 2** | | |
| **Trial 3** | | |

### Station 2: Shed Some Light

| | Observations |
|---|---|
| **Prism without Flashlight Shining on It** | |
| **Prism with Flashlight Shining on It** | |

# Explore

## Station 3: Sound Waves

| | Observations |
|---|---|
| **Paper Towel Tube** | |
| **Hand** | |

## Station 4: Turn Up the Heat Energy

| | Observations |
|---|---|
| **Hot Water** | |
| **Ice Water** | |

# Explore

Name: _____ Date: _____

## Energy Stations

### Claim-Evidence-Reasoning

**Prompt**

Think like a scientist, and describe how energy was present in one of the systems from the Energy Stations today.

**Claim:**

_____

_____

_____

**Evidence:**

_____

_____

_____

**Reasoning:**

_____

_____

_____

# Explore

## Energy Stations

### Rubric for Writing a Scientific Explanation

| Points Awarded | 2 | 1 | 0 |
|---|---|---|---|
| **Claim** | The student answered the question, and it was accurate based on data. | The student answered the question but was inaccurate. | The student made no claim or did not answer the question. |
| **Evidence** | The student cited accurate data and observations from one of the stations. | The student cited inaccurate data and observations from one of the stations. | The student cited examples but did not use observations and data from one of the stations. |
| **Reasoning** | The student cited the scientifically accurate reason using correct vocabulary and connected this to the claim. The student accurately showed that they understood the cause-and-effect or stimulus-response. | The student cited a reason, but it was inaccurate or did not support the claim. The student's reasoning did not use scientific terminology or used it inaccurately. | The student did not provide reasoning, or the student just restated the claim. |

# Explore

## Energy Station Cards

### Station 1: Ramp It Up

1. Use the toy car for each trial.
2. Set up a ramp using the materials provided at the station. Once you have set up the ramp, do not adjust the steepness for any of the trials.
3. Measure out three different heights on the ramp as starting points: low, medium, and high.
4. Release (do not push) the car from each of the three heights.
5. After each trial, carefully measure the distance the car traveled after it left the ramp.
6. Record your observations on your Student Handout.

### Station 2: Shed Some Light

1. Hold the prism in one hand close to the wall. Note what you see.
2. Turn on the flashlight, making sure it is not pointed toward anyone's face.
3. Hold the prism in one hand close to the wall, and shine the flashlight on it.
4. Move the flashlight around to shine on different parts of the prism.
5. Observe the wall behind the prism and flashlight.
6. Record your observations on your Student Handout.

# Explore

## Station 3: Sound Waves

1. Cover the clear container with plastic wrap securely.
2. Put the rice on top of the plastic in the middle of the clear container.
3. Hold the cereal box and paper towel tube next to the clear container.
4. Hit the box with the tube while watching the rice.
5. Now, hit the box with your hand while watching the rice.
6. Record your observations on your Student Handout.

## Station 4: Turn Up the Heat Energy

1. Fill one clear container with hot water and one clear container with ice water.
2. Take the bottle with the balloon and place it in the container of ice water.
3. Then, move the bottle to the container of hot water.
4. Record your observations on your Student Handout.
5. Move the bottle back to the ice water.
6. Record your observations on your Student Handout.

# Explore

Name: _____ Date: _____

## Pop Fly
### Entry Document

Hello, baseball fans!

Your local Little League team is having a problem catching fly pop-ups when they are out in the field. To improve their fielding, our players need to practice catching fly balls, but we do not have a pop-fly launcher.

We are asking your class to design and build a working prototype of a pop-fly launcher for us out of recycled and repurposed materials that will later be made into an actual launcher for use by the team.

Your prototype should be able to throw a large marshmallow through the air to a height of at least one meter and a distance of one meter. You will be given 45 minutes and a budget of $30 to complete the prototype.

Your team will present your prototype to an audience. You must create a design sketch showing your prototype and where the energy and energy transfer forces are located. Also, identify the type of force that is causing the marshmallow to fly into the air.

To be considered by the league you must show how your pop-fly launcher works. Members of the league will decide which team's design is the one that best meets their criteria and stays within budget.

Best wishes and happy engineering!

Your Little League

# Explore

## Expert Roles

**Budget Manager**
The budget manager's job will be to keep the team within the $30 budget. You will keep track of the materials the team buys and report how much your prototype cost to build when you do your team presentation.

**Data Manager**
As the team data manager, you will be responsible for measuring the distance and height of each of the tests you do for your prototype. You will need to create a data table and make several trials to be sure your data is accurate.

**Materials Engineer**
As the materials engineer, it is your job to select and get the materials you want to use from the supply table. You need to guide your team in making the decisions to build a prototype that will meet the criteria.

**Project Manager and Team Leader**
As the project manager and team leader, you are responsible for seeing the project through to completion. You will design the sketch and help build the launcher with your team. You will need to keep the rubric in hand and constantly refer back to it to make sure that your team is meeting the criteria.

# Explore

Name: _____ Date: _____

## Pop Fly
### Expert Mini-Workshop

**Budget Manager**

As the budget manager, you are responsible for managing the team's budget and spending no more than $30 for all the materials your team decides to use.

Work closely with the materials engineer in selecting the materials you will use for the pop-fly launcher.

Help your team to make decisions about the presentation of your launcher and make sure that all the criteria have been met.

You will also need to tell how much your team spent for the launcher in your presentation. You and your team members will present your final product along with the reasoning for your decisions. The cost of the items is as follows:

| | |
|---|---|
| Cardboard piece | $10.00 each |
| Pencils | $10.00 each |
| Paint stirrers | $5.00 each |
| Plastic spoons | $10.00 each |
| Rubber bands | $1.00 each |
| Brads | $1.00 each |
| Tape – 10 cm piece | $0.25 each |
| String – 30 cm piece | $1.00 each |
| Plastic bag | $5.00 each |
| Plastic cup | $5.00 each |
| Marshmallow (1 free) | $0.25 each |

# Explore

Name: _____ Date: _____

# Pop Fly

## Expert Mini-Workshop

### Data Manager

Your job as data manager will be to measure how far and how high your pop-fly launcher is able to shoot marshmallows. Be sure once the launcher is built that you try to measure exactly each time. Make a data table in your lab journal to keep track of your data.

As an engineer, you want to be accurate in your measurements, so you may want to tape down your meterstick and hold the launcher in the same place each time. It might be a good idea to have the team practice launching it and the person with the best launch should be the one to present.

When you measure, be sure to measure in metric and use a meterstick. Test the launcher three times after each change in design to be sure to get a good measurement.

When your group presents their launcher, your job will be to provide the data to show how far it is able to shoot.

# Explore

Name: _____ Date: _____

# Pop Fly
## Expert Mini-Workshop

### Materials Engineer

As the materials engineer, your role is to ensure that your team develops a design blueprint for the pop-fly launcher. The sketch needs to be drawn on chart paper. All parts should be identified and labeled.

Refer to the rubric and the Entry Document to determine if the team's solution meets the criteria for the launcher—shoot a marshmallow 1 meter in the air for a distance of 1 meter.

You will be the only person who can go to the supply table to get materials. Your team may look at the items on the supply table but only you can bring them back to your table.

Work with the budget manager to be sure you stay within the $30 budget. If you go over, your design will not be counted.

Materials available to you include:

- 1 piece of chart paper
- 3 colors of marker
- ruler or meterstick for drawing straight lines

Materials from the supply table can include:

Cardboard piece
Pencil
Paint stirrer
Rubber band
Brad
Tape
String
Plastic bag
Plastic cup
Plastic spoon
Marshmallow

Explore

Name: _____ Date: _____

# Pop Fly

## Expert Mini-Workshop

### Team Leader and Team Rubric

As the team leader, you are to guide your team in the completion of the sketch of the pop-fly launcher and in making the prototype out of the materials available to you.

Your initial sketches can be small, but the final design should be large and on chart paper. The materials engineer should work with you on the sketches. Make sure you use arrows to show where the energy and energy transfer forces are working.

Be sure everyone on the team gets to help build and test the launcher. Work at being a great team that listens to and helps each other.

Your job is to also plan the presentation of your product and make sure that all the criteria have been met and your launcher works!

You and your team members will present your final product along with the reasoning for your decisions.

# Explore

## Rubric for a Problem/Project Based Learning Challenge

| Category | Expert (4) | Competent (3) | Beginner (2) | Novice (1) |
|---|---|---|---|---|
| **The problem is clearly identified and the solution addresses the problem** | Clearly identified the problem and the solution was clearly outlined. | Clearly identified the problem and the solution was identified. | Identified the problem but did not completely address the solution. | Did not address the problem or the solution did not solve the identified problem. |
| **Recommendation met criteria as outlined in Entry Document** | Recommendation (Claim) was supported by at least four pieces of valid evidence and linked to geoscience processes. | Recommendation (Claim) was supported by at least two pieces of valid evidence and linked to geoscience processes. | Recommendation was not supported by appropriate or sufficient evidence linked to the geoscience processes. | Presentation did not include a recommendation. |
| **Participation** | Worked well in expert roles and each person was helpful to other members of the team. All participated and were on task. | Worked well as a team and supported each other when needed. All participated equally. | Needed assistance in working as a team and did not equally share the work for the team. | Required teacher direction in being a team and sharing the work to complete the task. |
| **21st Century Skills Collaboration** | Group respected all team members. | Group often shared decision making. | Did not act as a team in decisions. | Group did not get along. |
| **Scientific Content shows depth in understanding and is applicable to the solution of the problem.** | Solution showed understanding of energy and energy transfer forces and patterns of motion. | Solution showed connections between energy and energy transfer forces and patterns of motion. | Solution showed knowledge of energy and energy transfer forces and patterns of motion. | Solution did not show knowledge of energy and energy transfer forces and patterns of motion. |

# Explore

Name: _____ Date: _____

# Pop Fly

## Individual 21st Century Skill Rubric in Problem/Project Based Learning Challenge

| Collaboration | Expert (4) | Competent (3) | Beginner (2) | Novice (1) |
|---|---|---|---|---|
| **Active Team Member** | Encouraged others to share ideas, helped to make them clear, and connected them to the team's work. | Stayed on task and kept track of time for the group. Helped group to finish the tasks. | Cooperated with the team but only did own share of the work. | Had to be reminded of work that needed to be completed. |
| **Feedback** | Gave specific feedback to team to improve the quality of the product. Took pride in work, accepted feedback graciously, and tried to incorporate it. | Provided some feedback to the team about their work. Worked hard to have a good product and tried to accept feedback from others on the team. | Did not provide feedback to the team but was willing to take the feedback offered and tried to use it in the product. | Did not provide feedback and was not willing to incorporate feedback from the team on the product. |
| **Attention to Team Tasks and Responsibilities** | Noticed if a team member did not understand something and took action to help. Was not distracted from the team tasks. | Worked to fulfill responsibilities to the team and did not allow distractions to be off task. | Made some effort to share ideas with the team. Sometimes was off task and needed reminders to join the group. | Did not share ideas with other team members. Often was off task and needed reminding and redirection to stay with group. |
| **Motivator and Provides Assistance to Team** | Stepped in to help the team when another member was absent. Provided encouragement and found solutions to problems. | Offered to help others with their work if they needed it. Worked to solve problems and completed own work. | Sometimes offered to help others. Required motivation and encouragement from others to complete tasks. | Did not help the team solve problems; may have caused problems. Did not offer to help others. |

Name: _____ Date: _____

# Preview and Predict

**Before you read:** Follow the directions and answer the questions in each part of the table below.

| Preview | Predict |
| --- | --- |
| • What is the title of this chapter? | • What do you predict you will learn from reading the text? |
| • Read all the bold headings and picture captions. | • Describe two words you were introduced to and what you have already learned about them. |
| • List all the objects you will be learning about when you read. | • Describe a time when you saw one of these objects being used. How was it helpful? |

Name: _____ Date: _____

# Describe and Draw

**While you read:** Write a description for each type of energy. Then, draw a picture that shows that type of energy in a system to illustrate your description.

| **Describe sound energy.** | **Draw an image.** |
|---|---|
| **Describe heat energy.** | **Draw an image.** |
| **Describe light energy.** | **Draw an image.** |
| **Describe motion.** | **Draw an image.** |

Name: _____ Date: _____

# Energy in a System: Comic Strip

**After you read:** Use each box below to draw and describe one form of energy. Be sure to include sound, light, heat, and motion.