

Teacher Guide: Exploring Potential and Kinetic Energy

Grade Level: 2-3

Duration: 20-25 minutes

Location: Classroom

Introduction

Why do some arcade games require precise timing while others rely on rapid button-mashing? What is the advantage of understanding how forces like friction, momentum, and gravity affect gameplay? And why do certain objects in a game react differently when struck, even when hit with the same amount of force? Using an elementary-based physics approach, students and teachers will explore practical applications of motion and forces through the interactive experience of arcade gaming.

Arcade games are accessible to players of all skill levels because they provide instant feedback (such as earning points or completing levels) while also challenging players to refine their skills over time. The physics behind game mechanics—including momentum, impulse, collision forces, and energy transfer—illustrates key concepts from math and science that are easily relatable to young learners.

By examining the forces at play in arcade games—such as the impact of a flipper on a pinball, the trajectory of a skee-ball, or the reaction of an air hockey puck—Chuck E. Cheese provides a fun and academically enriching addition to STEM/STEAM learning, increasing cross-curricular opportunities and engagement.

This addition to the educational curriculum was designed to meet the growing demand for STEM/STEAM instruction in elementary education... Through this program, educators can introduce science terminology and literacy skills while reinforcing physics concepts in a fun, engaging way. Students will encounter cross-curricular learning opportunities, and blend play with academics.

This guide ensures a structured yet interactive approach to teaching energy concepts in a way that excites and prepares students for hands-on learning at Chuck E. Cheese!

Objectives

Students will:

- Build background knowledge on potential and kinetic energy.
- Recognize examples of energy transformations in everyday activities.
- Prepare to identify energy transitions in Chuck E. Cheese games.

Materials

- Small ball (e.g., tennis ball or foam ball)
- Toy car (or similar rolling object)
- Ramp (books, cardboard, or similar materials to create an incline)

Lesson Plan

Lesson Objective:

Introduce students to different types of energy, specifically potential and kinetic energy, through a hands-on and engaging activity. Prepare students to recognize and analyze how energy works in everyday scenarios, sparking curiosity for their upcoming STEAM trip to Chuck E. Cheese.

1. Introduction: What is Energy? (5 minutes)

Energy is what makes things go! It's like the fuel that helps things move, work, or change. Imagine you're riding a bike — you need energy to pedal and keep going. Energy can come from different places. You might get energy from food, like how you feel stronger after eating a snack. Things like the sun give energy to plants, and even the battery in your toy car gives it energy to zoom around.

So, energy is what helps everything do what it's supposed to do!

Hook:

- Hold up a ball and a small ramp.
- Place the ball at the top of the ramp but don't release it.
- Ask students:
 - "What do you think will happen if I let go of this ball?"
 - "Why do you think the ball is staying still right now?"


- Encourage students to share their ideas.

Teaser Explanation:

- Energy makes things move, stop, or change.
- There are two types of energy:
 - Energy that is **waiting** to move (**potential energy**).
 - Energy that is **moving** (**kinetic energy**).

Real-Life Examples:

- A swing at the highest point (waiting to move) vs. when it's coming back down (moving fast).
- Holding a basketball before throwing it (waiting to move) vs. after it is thrown towards the basket (moving fast).
- **Discussion Prompt:** "What other things in your daily life might have energy that's waiting versus energy that's moving?"

 *Did you know? You use energy when you run, jump, or even just sit and think! Your body gets energy from the food you eat, like fruits and vegetables!*

2. Exploration: Energy in Action (10-12 minutes)

Activity 1: Ramp Experiment

- **Step 1: Test Different Heights**

Start the ball or toy car at different points of height on the ramp.

- **Ask:**
 - "What do you think will happen when the object is pushed from higher on the ramp versus lower?"

- **Step 2: Add a Push**

Give the ball or toy car a gentle push from the top of the ramp, then reset and do a harder push.

- **Ask:**
 - "How does the ball's speed or distance change when you push it softly versus when you push it harder?"
 - "What do you think is happening to the energy when I push harder?"
- **Group Discussion Prompt:**
 - "What makes the ball go faster or farther? How does where it starts or how hard it's pushed make a difference?"

💡 *Did you know? When you hit a baseball with a bat, the force from the bat makes the ball go flying! The harder you hit, the farther the ball goes!*

3. Building Excitement: Get Ready for Chuck E. Cheese! (5-8 minutes)

Discussion:

- "Did you know that energy is part of the most fun things we do—like playing arcade games?"
- "At Chuck E. Cheese, you'll see energy in real life:
 - Rolling balls when playing Skee-Ball
 - Tossing basketballs on the Hoops game
 - Going down slides in the Ninja Run course

How do you think energy makes those games work?"

Prediction Prompt:

- "How do you think changing how hard or soft we throw the Skee-Ball will change where the ball ends up in the game at Chuck E. Cheese?"

Extension Activity:

- "Imagine you could invent a new game for Chuck E. Cheese. What kind of game would it be? How could you use energy to make it work?"

4. Wrap-Up and Anticipation Building (2-3 minutes)

Reflection Questions:

- "What's one thing you learned today about how energy works?"
- "What's something you're curious to see or try when we go on our field trip?"

Closing Statement:

"Energy isn't just a science concept—it's something we experience every day! It makes things exciting and fun. I can't wait for you to see it in action during our visit to Chuck E. Cheese."

Additional Notes for Teachers:

- **Adaptations for Different Learners:** Encourage movement-based participation for kinesthetic learners, visual aids for visual learners, and verbal discussion for auditory learners.
- **Assessment Opportunities:** Students write or draw one new thing they learned about energy.

Vocabulary:

Term	Definition
Energy	The ability to do work or cause change.
Potential Energy	Stored energy that an object has because of its position.
Kinetic Energy	The energy of motion
Force	A push or pull that can change the motion of an object
Motion	A change in position of an object
Gravity	The force that pulls objects toward the center of the Earth
Friction	A force that slows down or stops motion when two objects rub against each other.

