Elementary

Answer Key for Investigating Force (second–third grade)

This handout provides sample responses to support discussions following video observations on how children explore force and motion and how educators use the M[5] Early STEAM Approach to support children's investigations.

Video:
Investigating Force (second–third grade)

Investigating Force (second–third grade) – Audio Descriptive Version

Slide 14: Discuss: Children Exploring Force and Motion

What do children notice about the characteristics of the rollers and how they move?

Possible Responses

- Children notice:
  - Texture: Some rollers are bumpy, and others are smooth.
  - Speed: Some rollers move faster than others.
  - Direction: Some rollers move in a straight line, and others turn as they move down the ramp.

In what ways do children experience different physical science concepts (for example, speed, direction, distance, force, friction)?

Possible Responses

- Friction: Children experience friction when they investigate the different ramp surfaces. The bumpy surfaces cause friction, which slows the rollers down.
- Speed: Children experiment with ways to change the speed of the rollers. For example, they manipulate the ramp surface texture, the slope of the ramp, and the weight of the roller.

What inquiry skills (for example, asking questions, predicting, observing, testing ideas, documenting, communicating) do children use when investigating these concepts?

Possible Responses

- Asking questions: Children document their questions on the notice/wonder charts as they move through the different stations. They might wonder why some rollers move more slowly or why some rollers turn.
- Making observations: Children observe the speed and direction with which the rollers move. They document their observations on their notice/wonder charts.
- Making predictions: Children make predictions about how fast the rollers will move down the ramps. For example, they predict that adding more weight will cause the roller to move faster.
- Investigating: Children test the effects of different variables—surface texture, slope, and weight. They manipulate those variables and notice the effects.
- Documenting: Children document their observations and questions on their notice/wonder charts through writing.
- Communicating: Children communicate their ideas by writing them on their notice/wonder charts. They also communicate verbally with each other as they investigate. Finally, the educator supports children in communicating their ideas in a whole group setting by facilitating a discussion.

Slide 17: Discuss: Supporting Children In Investigating Force and Motion

Mutual Learning

In what ways is the educator responsive to children's abilities, interests, or lived experiences?

Possible Responses

- The educator observes and responds to the ways children interact with the rollers. She moves around the room and provides support that is responsive to the way children are exploring. When facilitating a whole group discussion, the educator recalls experiences that the children encountered and helps them recall certain words they used to describe different variables (for example, she encourages one group to discuss the texture of one of the ramps).
- The educator makes connections to children's lives by discussing children's experiences on a slide.
- The educator might learn more about children's lived experiences related to ramps by encouraging families to identify, discuss, and share the different ramps they might find around their homes, neighborhoods, and community spaces.

Meaningful Investigations

In what ways does the educator offer meaningful investigations?

Possible Responses

- The educator offers inquiry-based and playful experiences for children to explore force and motion.
- She provides guidance by offering a central question to investigate (for example, "How does weight affect an object's speed?") and then supports children in investigating in different ways.
- The educator uses prompts to support children's investigations. For example, she asks, "Are there different ways you can place them [the weights] to see how that affects your movement?"

Materials and Learning Environment

In what ways does the educator provide materials and a learning environment that supports children in exploring force and motion?

Possible Responses

- The educator uses open-ended materials that support children in exploring force and motion. For example, the educator provides a variety of rollers with different sizes and textures.
- The educator designs each station to allow children to explore the ways different variables affect motion in a focused but open-ended way.

Mindful Vocabulary and Discourse

In what ways does the educator support children's science vocabulary and engagement in discourse about force and motion?

Possible Responses

- The educator uses a notice/wonder chart to encourage children to communicate their ideas about force and motion.
- The educator introduces children to vocabulary that is relevant to their experiences: slope, texture, and friction. When explaining the word "friction," she makes connections to the ways children experienced friction when exploring the ramps. She also encourages children to rub their hands together as a way to embody the concept of friction.

Multiple Representations

In what ways does the educator provide different ways for children to explore and express their ideas about force and motion?

Possible Responses

- The educator encourages children to express their ideas about force and motion in different ways: through writing, communicating with a partner, and communicating with a larger group.
- The educator offers different stations for children to explore the ways different variables (weight, ramp texture, and ramp height) affect the way objects move.
- The educator offers children an embodied experience to understand the concept of friction (for example, rubbing their hands together).