**K-PS2-2 Motion and Stability: Forces and Interactions**

Students who demonstrate understanding can:

K-PS2-2. Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.* [Clarification Statement: Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn.]

[Assessment Boundary: Assessment does not include friction as a mechanism for change in speed.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

<table>
<thead>
<tr>
<th>Science and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analyzing and Interpreting Data</strong></td>
<td><strong>PS2.A: Forces and Motion</strong></td>
<td><strong>Cause and Effect</strong></td>
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<td>Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.</td>
<td>• Pushes and pulls can have different strengths and directions.</td>
<td>• Simple tests can be designed to gather evidence to support or refute student ideas about causes.</td>
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<td>• Analyze data from tests of an object or tool to determine if it works as intended.</td>
<td>• Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it.</td>
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<td><strong>ETS1.A: Defining Engineering Problems</strong></td>
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<td>• A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions. (secondary)</td>
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**Observable features of the student performance by the end of the grade:**

1. **Organizing data**
   a. With guidance, students organize given information using graphical or visual displays (e.g., pictures, pictographs, drawings, written observations, tables, charts). The given information students organize includes:
      i. The relative speed or direction of the object before a push or pull is applied (i.e., qualitative measures and expressions of speed and direction; e.g., faster, slower, descriptions* of “which way”).
      ii. The relative speed or direction of the object after a push or pull is applied.
      iii. How the relative strength of a push or pull affects the speed or direction of an object (i.e., qualitative measures or expressions of strength; e.g., harder, softer).

2. **Identifying relationships**
   a. Using their organization of the given information, students describe* relative changes in the speed or direction of the object caused by pushes or pulls from the design solution.

3. **Interpreting data**
   a. Students describe* the goal of the design solution.
   b. Students describe* their ideas about how the push or pull from the design solution causes the change in the object’s motion.
   c. Based on the relationships they observed in the data, students describe* whether the push or pull from the design solution causes the intended change in speed or direction of motion of the object.