Teaching Motion with the Air Puck

Objective:
When the force of a push or a pull acts on an object how is the motion of the object affected. Can you identify three different ways an objects motion can be made to change when a force acts on an object?
You will need an "Air puck" and a level surface such a smooth floor or large tabletop.

1. Turn the Air Puck on and set on the smooth level surface. Next, give the puck a gentle push with your hand and observe its motion during the push and after the push. During the force of the push, did the puck speed up, slow down, or move at a constant speed?

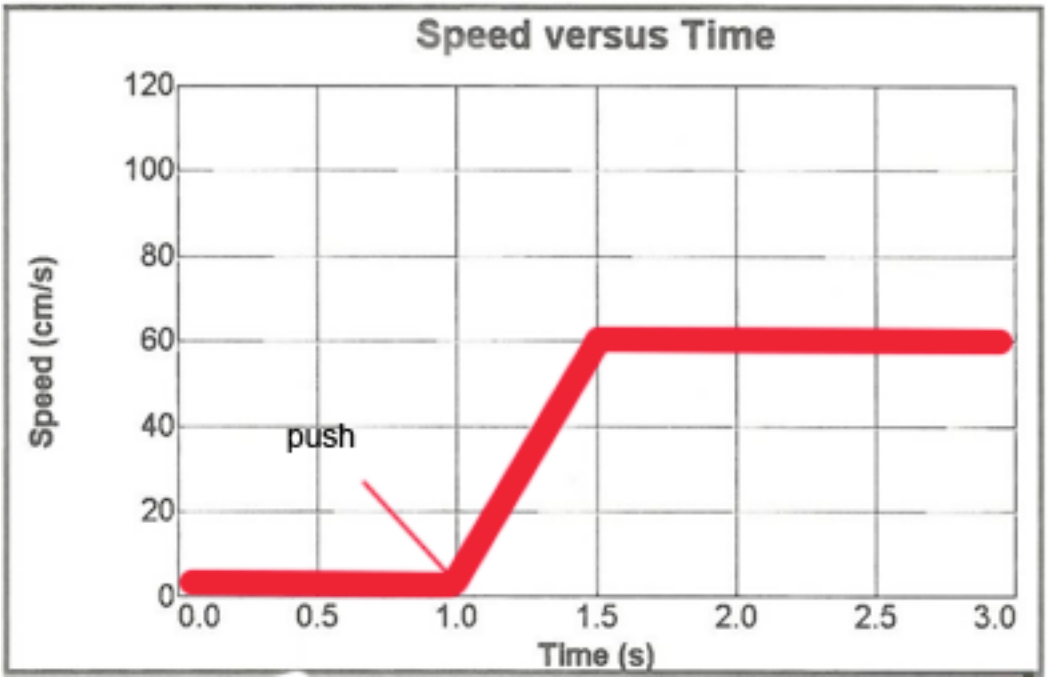
   Speeds up

2. After the push (force), does the puck quickly slow down, speed up, change direction or curve, or move in a straight line at a mostly constant speed?

   Moves in a straight line at a mostly constant speed

   Sketch the speed time graph for the motion of the puck and label the time before the tap, during the backward tap and after the tap.

   Measured Speed-Time Graph for Air Puck



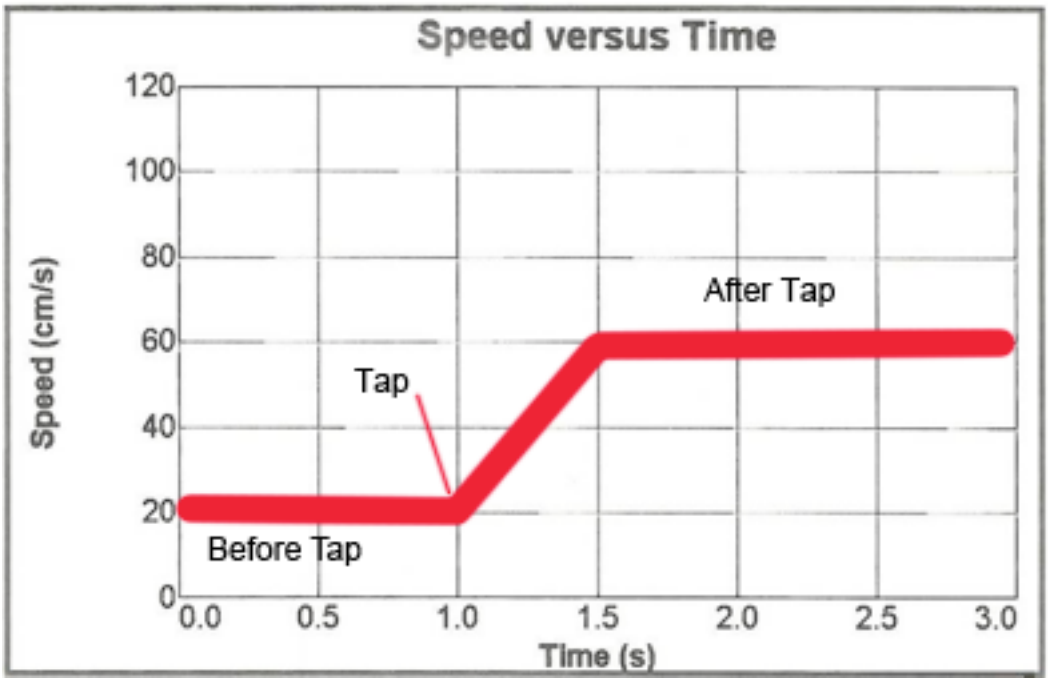
3. After the initial push and when the hand is no longer touching the puck, is there still a force pushing or acting on the puck while it moves? If so what is providing this force? (Remember that inertia is a tendency not a force and friction caused by gravity is zero.)

   No, due to inertia, objects in motion tend to stay in motion.

4. Stop the puck and return it to its initial position. This time you will give the puck a push with a ruler or small flat stick. After the push and while the puck is moving, give the puck and gentle push or tap with the ruler from behind and in the same direction of its motion. Describe the effects of this push in terms of the puck's speed and direction?

   Direction Same, speed increases

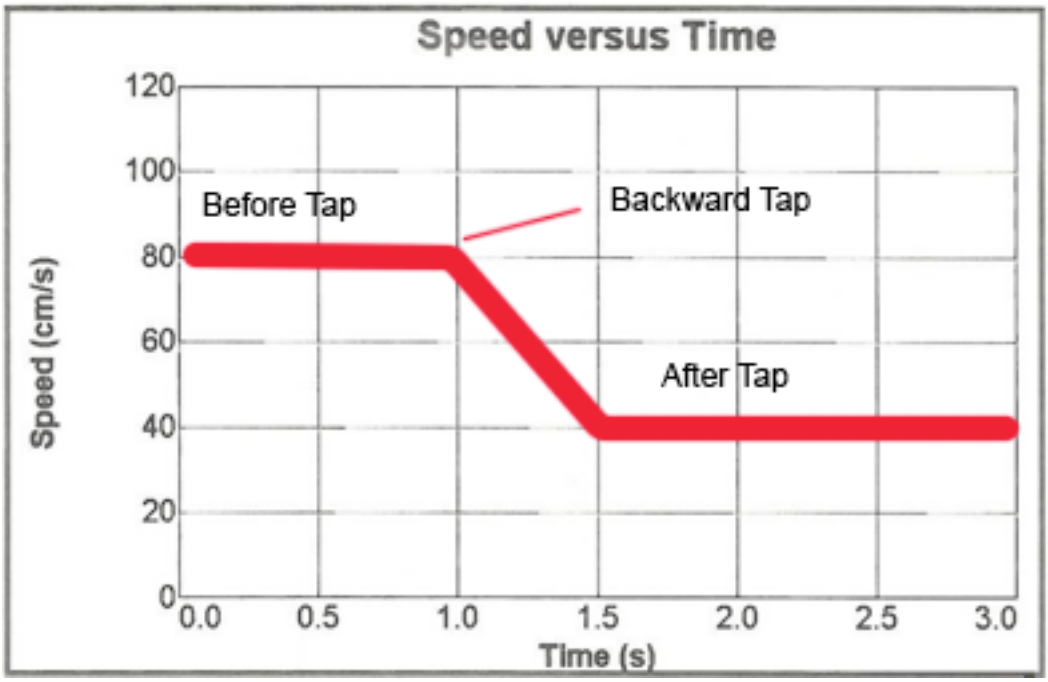
   Sketch the speed time graph for the motion of the puck and label the time before the tap, during the forward tap and after the tap



5. Repeat step 4 but, this time, as the puck is moving, give the puck a very gentle tap in opposite direction of motion. Describe the effects of this push in terms of the puck's speed and direction?

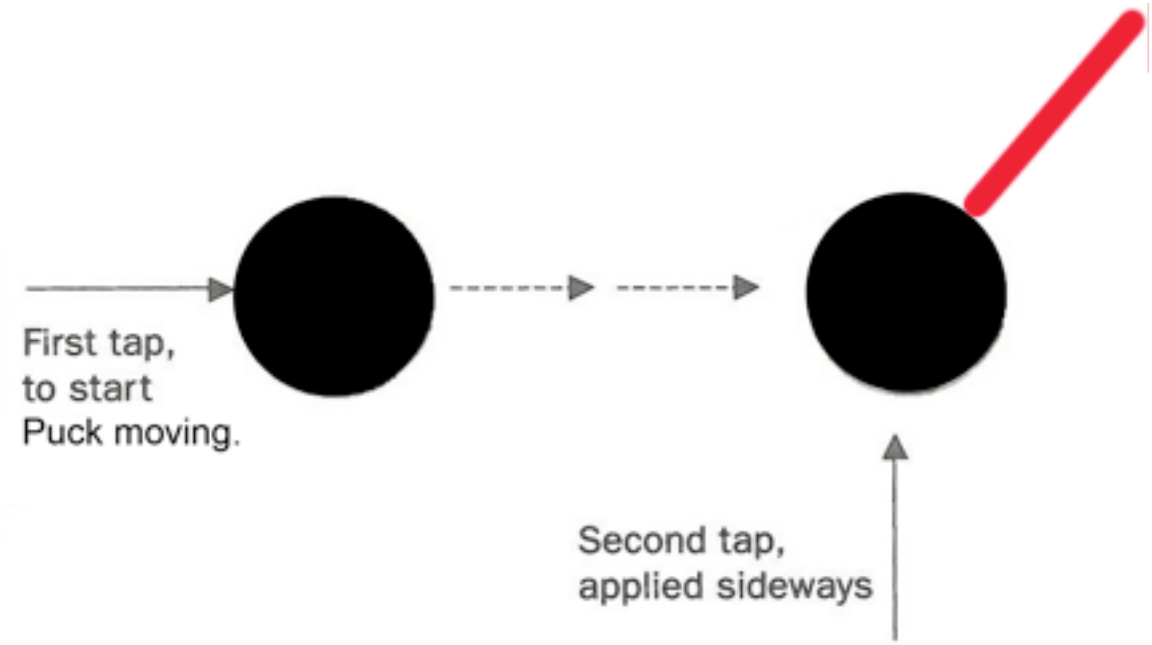
   Direction Same, speed decreases

   Sketch the speed time graph for the motion of the puck and label the time before the tap, during the backward tap and after the tap.



6. So far, we have examined the effect of a force on a moving object in the same direction as its motion and in the opposite direction of its motion. Now, we will examine the effect of a force acting perpendicular to an objects motion. Start the puck moving by giving it a sharp tap with the ruler. While it is moving, give it a second tap, but perpendicular or at right angles to its motion. Observe the direction and speed of the puck after this second tap.

Sketch the path of the puck after the sideways tap on the diagram above.



Summarizing the Big Ideas:

1. If an object is moving with near zero friction, is a force required to keep it moving? What evidence can you state to support your answer?

   No, the puck kept moving on its own

2. Describe the effect in terms of speed and direction on an object in motion when a single force acts on the object in the same direction as its motion.

   Speed up, direction stays same

3. Describe the effect in terms of speed and direction on an object in motion when a single force acts on the object in the opposite direction as its motion.

   Slows down, direction stays the same

4. Describe the effect in terms of speed and direction on an object in motion when a single force acts on the object in the direction perpendicular to its motion.

   Speed same, direction changes