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Physics Science in Motion

Elective 4: Utilizing Simulations

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### Force Interactive Frictionless Situations

This lesson over Newton's Second Law of Motion, *Physics Simulation: Newton's Second Law*, can be used either as an introduction to the law or as a formative assessment to help identify the students strengths and weaknesses over the topic.

This is a simulation activity that investigates the variables that affect the acceleration of an object without the presence of friction. The students will collect velocity-time information to determine the acceleration of the box as it travels across a flat surface. The insight the students might gain from doing this simulation is to gain an understanding of how the Applied forces on the box and the mass of the box changes the net force that is acting upon it .

### Teaching Ideas and Suggestions:

- The Physics Classroom has provided a couple of PDFs illustrating how the Interactive might be used with a classroom of students, for this lesson I choose *Activity 1-Physics Simulation: Newton's Second Law*
- If using this as an introduction to Newton's Second Law of Motion I would make sure the students have the needed background knowledge before we start the simulation.
- If using this as a formative assessment lesson I would give the students the expectations for the lesson and then circulate the room giving suggestions where needed, but mostly just gaining a sense of the students' understanding.
- Before starting the lesson I would let the students have five to ten minutes to explore with the online simulation, so they gain a better understanding of how everything works.

- After completing the simulation, I will also have the students write a Claim, Evidence, and Reasoning paragraph. Attached is a form that I have students use. [CER form](#)
- The Interactive does not directly report the acceleration of the box. A velocity-time graph is drawn, Coordinates for points on the line can be determined by clicking/tapping on the open circles that are on the line. Coordinate values display in a small field. These coordinates can be used to determine the slope of the line and the acceleration of the object.
- The pros for using this computer simulation in teaching Newton's Second Law of Motion are that it is difficult to have a true frictionless surface in a classroom. Another pro for this year is that the students can complete this activity online, which allows them to complete a lab if they are participating in distance learning.
- The only con for using this simulator is that some students do better with true hand-on type activities and that the simulation does not represent real life situations, with for some students might be a hard concept to comprehend, but if this is being used at a high school level, then that should not be an issue.

Examples of Student Work:

<https://documentcloud.adobe.com/link/review?uri=urn:aaid:scds:US:0fe247f6-73c9-4bd9-87f0-d5a7cd75203e>

#### Work Cited

"Physics Simulation: Newton's Second Law." *The Physics Classroom*,  
[www.physicsclassroom.com/Physics-Interactives/Newtons-Laws/Force](http://www.physicsclassroom.com/Physics-Interactives/Newtons-Laws/Force).