

Lesson Plan Activity Instructions

The Gravity of Émilie du Châtelet

In this classroom activity, students will experiment with the gravity of different size objects, like Émilie du Châtelet did.

Materials

- Two items of the same light weight, and two of the same heavier weight (such as balls, erasers, blocks, or toys)
- Yard stick
- A bin of wet sand (if sand is inaccessible, flour or malleable clay should suffice)
- Materials to put below the wet sandbox for cleanup, such as newspaper, paper, towels, or paper towels

Set Up

- Teachers will set up a box/container with wet sand in a clear area of the room. Newspaper/towels will be placed underneath the bin in case of spillover. If sand is unavailable, any variation of flour or malleable clay will work as well.

Part I

Depth of impressions with objects of the same weight at different heights

- Teachers will first provide students with two objects of the same mass to drop in the wet sand, such as balls, blocks, or erasers. With the teacher's supervision, students will experiment dropping the two objects of the same weight at one foot versus three feet with the meter stick. Students must first raise their hand to predict which they think will leave a deeper impression and why. Next, students will act as volunteers to drop the objects with the teachers supervision. The teacher should hold the yard stick, measuring heights, and confirming which impression is deeper.
- This should result in the ball dropped at a greater height leaving a deeper imprint than the lower height ball. Students should learn that this is because gravity made the higher ball fall faster.
- In Emilie's experiment, she dropped heavy balls into clay from different heights, measuring their velocities as compared to the depth of the impressions that they made in an adaptation from Willem Gravesandes's experiment. She found that the impression depth created by the balls is a square factor of the velocity in which the balls fell. This means that objects at a greater height have more time for their velocity to accelerate, resulting in their making deeper imprints.

Part II

Depth of impressions with objects of different weight at the same height

- Next, teachers will lead another demonstration to look at the imprint depth left from two objects of different weights at the same height of two feet.
- This should result in the heavier/more massive object leaving a deeper imprint than the lighter one.

Part III

Exploratory: students may choose

- Teachers will encourage the students to explore more about the gravity experiments on their own. After the main demonstrations are finished, students are free to pick any classroom objects (within reason) to drop into the bin. Students will raise their hands to pick any two small classroom objects to drop into the bin and decide what heights they want to drop them from.
- After called on, a short discussion will take place on which object between two chosen ones will make a deeper impression. Students will then be able to go up to the box and drop the objects with the teacher's supervision.
- The teacher will assist in running the demonstration smoothly, holding the yard stick, measuring heights, and calling which object made the deeper instruction. If student predictions were incorrect, the teacher will open a discussion to the students of why and explain when needed.