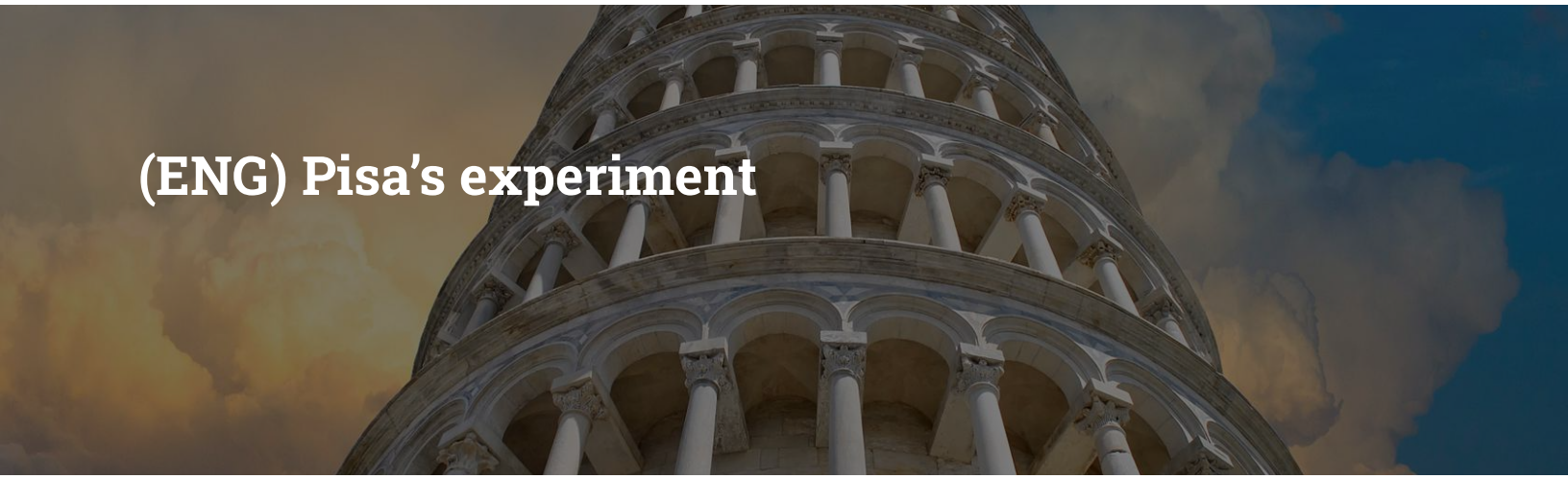

(ENG) Pisa’s experiment

Introduction

Step 1 - Motivational Stage

Step 2 - Investigational Stage

Step 3 - Consolidation Stage

Introduction

#In-class activity #Inquiry-based learning #Simulation #Teamwork #Literature #Artwork #Theatre

In this activity, pupils will prepare a short video. The video will display the famous – but rather none really ever occurred - experiment of Galileo at the Leaning Tower of Pisa.

In 1608, Galileo Galilei wanted to investigate the motion of falling objects. Exactly 79 years later, Isaac Newton published perhaps the most important book in the history of Physics, *the Philosophiae Naturalis*

Principia Mathematica. In this book, Newton demonstrates the 3 laws of motion, providing the explanatory mathematical framework for Galileo's experiment.

Learning Objectives

- [ ] Distinguish between the concepts of mass and weight and be able to perform calculations involving mass and weight
- [ ] State Newton's second law of motion, to express the relationship between acceleration, mass & force
- [ ] Use Newton's second law equation as a guide to think about the relationship between force, mass, and acceleration

ACTIVITY DETAILS

Activity Details

Connection of the activity with Art

Video art

Link to local, national School Curriculum

Accelerated motion and Newton's second law/Free fall

Equipment required

- Internet resources
- Basic class equipment
- Additional materials can be brought by the student's group to support their performing idea

Duration of activity

45 minutes

Sources

1. Experiments

https://sciencing.com/second-law-motion-experiments-6952612.html
https://www.youtube.com/watch?v=lJXEQvlpmJY
https://www.indypl.org/blog/for-kids/science-experiment-newtons-second-law-of-motion
https://spark.iop.org/investigating-newtons-second-law-motion#:~:text=Pass%20a%20piece%20of%20string,trolley%20nearly%20reaches%20the%20pulley.

1. Historical evidences

https://www.goodreads.com/book/show/64410.Galileo
https://www.britannica.com/biography/Isaac-Newton

Step 1 - Motivational Stage

Just prior to Newton's time Galileo had worked with the idea of acceleration. Galileo could only guess about time since precise clocks had not been invented. This is why he rolled metal balls down smooth ramps.

In order to measure distance he was using the known meters, and to replace time metrics, he was using small bells. Placing those bells in a certain position of the ramp, he gained a meter of time and distance.

He noticed that there was a relationship between the height that the ball was released, the distance that the ball was covering and the velocity (given the distance and the time interval from the bells) the ball was gaining, and all those were irrelevant from the object's mass.

Step 2 - Investigational Stage

Your pupils will challenge Aristotle's idea regarding the nature of falling! Aristotle stated that heavy objects seek their natural place faster than light ones, in other words, that heavy objects fall faster. This claim was believed for more than 1900 years.

Remember that Galileo questioned the theory that was prevailing in scientific thinking – up to that day.

STUDENTS' TASKS

1

Task 1 - Intro

Nowadays, we know that the Pisa's experiment is just a fiction, therefore, ask your student to replicate an experiment to demonstrate Newton's second law. It might be similar to Galileo's experiment, or you can find some other (see resources 1).

2

Task 2 - Design

It's up to you to demonstrate the well-known equation of Gravity

B=mg

Ask your pupils to form groups of 3-4 pupils and discuss their idea(s).

3

Task 3 - Implementation

Then, transform it to a scenario for a short performance. The dialogues, scenery and materials it's up to you. You can refer to the historical context, the evolution of scientific thinking (see resources 2), the technological progress that led to re-evaluation of well-known theories (as the Aristotelian ones) or just a

simple example of everyday life or even an experiment that confirms or agrees with the second law of motion.

Step 3 - Consolidation Stage

You should provide feedback on the performances of the groups of pupils, on the bases of

- Recognize free fall law components
- Articulate that the acceleration of an object is directly proportional to the net force and/or inversely proportional to the mass
- Basic equation application and/or use of diagrams

- Determine a relationship between arbitrary combinations of mass, weight, and gravitational acceleration using dimensional analysis

End of the activity

EXIT