Book Lift

Grade Level: K, 1, 2, 3

Duration: 15 - 30, 5 for Science Fair

Classification: Classroom, Science Fair, STEM Spark

Subject(s): Physics

Categories (STEM): Science

Keywords: Air pressure, Balance, Force, Compression

Introduction

- Summary: Students will use a tower of books to test the power of compressed air

Online Resources: https://www.youtube.com/watch?v=KVcd2CtwQzw

Materials

Material	Quantity	Reusable?
Gallon-sized freezer strength bags, not zip lock style	1 per 2-3 students	No
Textbooks*	Size pending, 5-6 per 2-3 students	Yes
Kitchen Scale (if available)	1 per classroom	Yes
Straws	1 per student	No

*Activity works best in a library or classroom with encyclopedias to use

Directions

- Break students into groups of 2-3
    - To reduce germ spreading only allow **one student** to handle the bag
- Seal it tight and lay flat on the floor or low table
- Slowly work together to stack the books on top of the bag, keep track of how many the team is able to balance before the bag pops
- If possible, have each team measure the weight of the books used and compare results
- Discuss the strength and applications of air pressure

Activity Extension

- Put the end of a straw into the bag and seal it so no air will come out
- Have the students stack 1-2 books on top of the bag on a flat surface
- Let students try blowing up the bag to raise the books
    - Remember to switch straws out between students

Discussion Questions

- What did you observe as you tried to lift the books? Explain.
- Do you think the "compressed air" exerted pressure on the books? How do you know this?
- How does compressed air affect your bike tires? Basketball?
- Why do balloons pop when you put too much air in them?

What is happening?

- As the air in the bag increases, it becomes more compressed and has a larger force.
- When the weight of the books is greater than the compression force, the bag will pop.

Applications:

- Majors
  - Mechanical Engineering: utilize fluid pressure in product designs
  - Physics: analyze forces and their impact of the world
  - Aerospace Engineering: understanding how to equalize pressure inflight
- Jobs
  - Pilot, Doctors (pulmonary), HVAC Specialists
- Hobbies
  - Scuba Diving
- Real world applications
  - Hydraulics
  - Car brakes