

Lesson Plan

Assessment	AFL, questions
Cross-curricular	

Big Ideas

- Pulleys and gears change the speed, direction, and motion of, and force exerted on, moving objects. Sound is created by vibrations
- Pulleys and gears make it possible for a small input force to generate a large output force

Learning Goals

- Why elevators are crucial for modern buildings
- How elevators work and how pulleys and gears are needed to move them
- History of sky scrapers and elevators

Specific Expectations:

- 1.1** assess the impact of pulley systems and gear systems on daily life
- 2.4** use appropriate science and technology vocabulary, including pulley, gear, force, and speed, in oral and written communication
- 3.1** describe the purposes of pulley systems and gear systems (*e.g., to facilitate changes in direction, speed, or force*)
- 3.6** identify pulley systems (*e.g., clotheslines, flagpoles, cranes, elevators, farm machinery*) and gear systems (*e.g., bicycles, hand drills, can openers*) that are used in daily life, and explain the purpose and basic operation of each

Description:

This is the **first** lesson in a set of five on the topic of elevators. We start by assuming that students are familiar with the basics of pulleys and gears: What they are, how they work and what some of their benefits are. We did not feel it necessary to include the basic background in these lessons, as many great resources on this topic already exist. These lessons, rather, aim to provide an arc for a creative, educational, and fun activity for students.

Materials/Resources:

- Cardboard to build towers
- Masking or duck tape
- Scissors

Safety Notes

Introduction

A task sheet is attached that includes all the elevator-building activities of this unit.

The History of Elevators – ‘Making an Elevator Part 1 Visuals’

- For the next few days we will talk about elevators and build some ourselves. Why do you think we need elevators?
- Would we be able to build really tall buildings without the use of elevators?
 - Slide 2-4: Images of some really tall buildings.
 - These buildings would be way too tall to be accessible to most people without an elevator.
- Elevators have been around for a long time.
 - Slide 5-7: Historical elevators
- So, how come they weren't used much to go up tall buildings before the modern age? SAFETY. What if the elevator cable broke? This used to happen fairly frequently in old elevators that just went up and down a couple of floors. We have to talk about a really important inventor!
- Elisha Otis
 - Slide 8: Talk a bit about his life before he invented the elevator brake. His story is inspiring as he faced many challenges and persevered to achieve a lot of success and invent some really useful and creative things!
 - NOTE: See links in the consolidation/extension section for good information on Elisha Otis
 - Slide 9: Otis demonstrating his new brake at the World's Fair.
 - Slide 10: How the elevator brake works.
 - Slide 11, 12: After the invention of the brake elevators really took off!

Why Pulleys and Gears?

- So why would pulleys and gears be useful in building elevators? (Discuss)
 - Pretty much any motor pulling up an elevator would have gears built in!
 - They can make the work load easier
 - It would be foolish not to use a pulley of some sort!
 - Elevators usually have a counter weight. We need pulleys to connect it with the elevator.
 - Draw diagram on board or show using a model. Similar to the image shown here: <http://www.madehow.com/Volume-2/Elevator.html>
 - Has anyone ever seen the counter weight of an elevator?
 - Video about how elevators work. Here is a good example: <https://www.youtube.com/watch?v=CeOkIEyUw0I>
 - Handout ‘How the Elevator Works’: Draw a diagram of how an elevator works

Action

Build a tower

- NOTE: If time runs out you can just as easily build the tower at the beginning of the next lesson.

- Over the next few classes we will build our own elevators and pull them up. In order to do that we need a tower to go up! We will finish this lesson by having some fun building a tower.
 - **Instructions:**
 - The tower either needs to be hollow and be able to fit an elevator (smaller box) inside the tower, or it must have an arm coming off of it at the top where you can attach the pulley to pull the elevator up and down on the outside of the tower.
 - Use cardboard and tape to build the tower.
 - Work in groups of a few students.
 - The tower can be as tall as you want as long as you can SAFELY reach the top (no standing on chairs).
 - Make sure the tower is STABLE.
 - Doesn't topple over
 - Can support the weight of an elevator that you'll be attaching.
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Consolidation/Extension

Links:

- Elisha Otis on Wikipedia: https://en.wikipedia.org/wiki/Elisha_Otis
- Elisha Otis biography: <http://www.theelevatormuseum.org/e/E-5.htm>
- Otis – A visual timeline has a lot of information and could be given to students to explore on their own: <http://www.otisworldwide.com/d31-timeline.html>