

UWindsor Engineering OUTREACH



University
of Windsor
Faculty of Engineering

Learn about Friction and Forces by Designing your own Downhill Skier: Grades K to 2

YOUR MISSION

In this activity, you will learn about forces and friction by creating your own skier out of the materials around you and using the engineering design process to race your skier down the ramp as fast as possible to see how well your skier did!



WHAT'S GOING ON

Engineers are problem solvers and they come up with solutions to problems to better the lives of everyone around them. They do this by coming up with designs, products, technologies, innovations, procedures and systems to make the world a better place.

Engineering is always changing the way the world works. You may have seen skiing before on TV when skiers have the chance to win a gold, silver or bronze medal in skiing when competing in the Winter Olympics. Or you may have even gone skiing yourself before! Downhill skiing is also known as alpine skiing.

Did you know that the skiing equipment skiers use when they are going down the slopes are designed and developed by engineers to make everything comfortable and feel right when skiers are going down the slopes?

This includes things such as the actual skis, ski boots, goggles, a helmet and ski poles, and even pieces of clothing such as ski gloves or a ski jacket. They also design the ski lifts to help you get back to the top safely and quickly so you can go down the hill again!

Mechanical and Materials engineers work to help create all this by thinking what materials would be best for them so skiers are safe and have as much fun as possible when skiing!



KEY TERMS

- **Force:** A push or pull on an object.
- **Friction:** A force that holds back (resists) the movement of a sliding object.
- **Gravity:** A force that pulls everything to the center of the earth.
- **Acceleration:** Increasing the rate of speed (also called speeding up).

You will be doing all these things in this activity. When you have designed your skier, the **acceleration** is when your skier is actually speeding up from going from the top to the bottom. The **force** is pulling the skier down. For your skier, you will not push them down, you are going to let them go down naturally, this is called gravity. Friction is anything that gets in the way of your skier having a smooth ride down and also causes them to slow down (such as pieces of materials you used in your design that aren't smooth which causes your skier to not slide down the ramp as well as it should).

MATERIALS NEEDED

Ask your parent or teacher to help you gather materials. Other craft items can also be used!

- Stopwatch (you can also use the stopwatch on a phone)
- Ski ramp (can be a smooth wood or plastic board)
- Popsicle sticks
- Plastic straws
- Pipe cleaners
- Plastic wrap
- Tape
- Aluminum foil
- Paper and pencil



WHAT YOU NEED TO DO

1. Find something that you can use as the ski ramp. The ski ramp should be as smooth as possible (plastic or something that is smooth that the skier can go down works the best). Lean it from the wall, a table, chair or something similar down to the floor to be the ski slope. (Hint – ask a parent or teacher to help you with this so it's in a good spot.)
2. Using a paper and pencil, design the skier. Be as creative as possible but keep in mind the materials you have to work with! Engineers always think about what they are going to do before they actually start designing.
3. Using your paper design, begin crafting the actual skier, using your gathered materials.
4. Once your skier is ready to race, use a stopwatch to track how fast they go down from the top to the bottom of the ramp.
5. Change around the skis using the different materials and test how the time changes.





FURTHER REFLECTIONS

1. Consider what happens with wind when a person is skiing. This is called wind resistance and is the force an object needs to overcome to move through the air. If wind resistance were higher or lower what would happen to the skier?
2. Will the speed of the skier change when using different types of ramps. Why or why not? Try different ramps to see what differences you see.
3. Try to think of other activities that involve forces. Skiing involves friction forces. What kind of force would pull a skydiver towards the earth? Can you think of any other examples of forces?

ENGINEERING DESIGN PROCESS

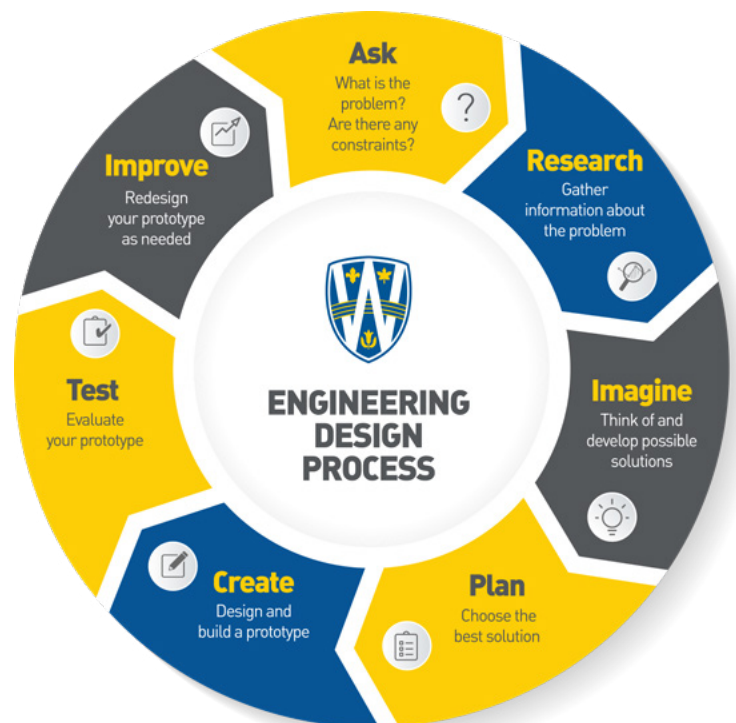
All engineers use the Engineering Design Process to plan, build, test and reflect on their designs and when coming up with solutions to a problem. The steps for the Engineering Design Process are listed below. Use the Engineering Design Process to test and improve your design.

First, think of the problem.

How can you fix it? Think of as many ideas as you can that you think will solve this problem.

It might be helpful to first sketch out your ideas on a piece of paper. Make as many different designs as you can!

Test and compare all of your solutions. Which one solves the problem and works the best?





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CURRICULUM UNIT CONNECTIONS

Grades K-2 - Understanding Structures and Mechanisms – Movement; Understanding Matter and Energy - Forces Causing Movement

SHARE YOUR DESIGNS WITH US!

Tag us on our UWindsor Engineering Social Media Pages and show us your designs!

Twitter: @UWindsorENG

Facebook: @UWindsorEngineering

Hashtag: #UWindsorENG

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