

Olympic Engineer: Designing Luge Equipment



Adventure Description:

In this adventure, students will think like engineers and design a sled that athletes can use during Luge, a winter Olympic sport.

Activity

Teacher Note: this lesson requires about 5 minutes of prep. See [Handout: Teacher Prep](#) for instructions.

Step 1: Background Information on Luge (5 minutes)

- Ask students if they have ever heard of a winter sport called Luge. Show [Handout: Learning about Luge](#).
- Explain to students that luge is a sport that involves athletes riding a specialized sled down an icy track. Luge is an event in the Winter Olympic Games.
- Tip: Look up videos on Youtube to show students what a luge time trial looks like. We suggest searching the terms “Olympic Luge” to get the best videos.
- Discuss how engineers design equipment for different Olympic sports. For example, engineers design snowboards that are used during the winter Olympics. They might also design a special camera to track athletes’ long jumps during training for the summer Olympics.
- Discuss how engineers design equipment so that the luge athletes can maximize speed down the track. Discuss the following:
 - Everything from the sled to the clothes the athletes wear has to be aerodynamic so that the wind doesn’t slow the athletes down as they race down the track.
 - Engineers also choose the best materials to build the equipment from. They need to choose materials that will build a sturdy sled that also meets the weight requirements. If a luge sled is too heavy, it is not allowed to race.

Step 2: Activity Set Up (5 minutes)

- Explain to students that they will design and build a prototype of a sled that Olympic athletes can use during Luge. Explain that you (the teacher) have build a luge track for the competition. The goal is to design the sled that will travel down the track the fastest.
- Provide students with [Handout: Steps to Build a Sled](#). Discuss the steps as a class.
- Divide students into groups of 4 students.

Step 3: Designing a Sled (15+ minutes)

- Have students complete step 2 on the handout. Students will sketch what their sled will look like.
- Optional: have students conduct research on a computer, tablet, or smartphone about the materials used in sled construction. While students are researching, ask them the following questions:

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- What materials are luge sleds usually made of?
- Why are those materials used?
- How does the design of a luge sled help minimize wind resistance?
- While students are working, ask them the following questions:
 - How will you design your sled to create the least wind resistance?
 - How will the weight be distributed on your sled? (Will one end be heavier than the other?)
 - Will the weight distribution have any impact on how well your sled travels down the track?

Step 4: Building a Sled (20+ minutes)

- Have students complete step 3 on the handout. Provide students with a variety of art supplies and building materials to build their sled. Suggested supplies include:
 - Cardboard and other clean recyclables
 - Pipe cleaners
 - Straws
 - Cardstock

Step 5: Testing the Sleds (15+ minutes)

- Teacher Note: This step can be skipped or done on a different day if you are short on time.
- Explain to students that they will now complete step 3 on the handout. Each group will place their sled on a ramp that you (the teacher) previously built. Groups will time how long it takes for their sled to reach the end of the ramp.
- Ask students why it is important for all groups to use the same ramp during testing. Discuss how all groups need to use the same ramp so we can compare data. If different groups used different ramps, we would not be able to tell what sled traveled the fastest.
- Next, explain that you (the teacher) will time all trials. Ask students why one person should time all trials. Discuss the following:
 - If multiple people timed trials, they might have different ideas about when to start and stop the timer. (Do you stop the timer when the front of the sled crossed the finish line, or when the whole thing does?)
 - Explain that using one timer reduces variability so that the data from different trials can be compared.
- Place the ramp you created on a table at the front of the the room. Have the first group place their sled behind the starting line. Instruct students to release their sled down the ramp WITHOUT pushing it. They should not apply additional force to their sled.
- Start the timer when the sled is released. The timer should stop as soon as the front of the sled crosses the finish line.
- Record group's time on [Handout: Class Data Table](#).

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- Teacher Note: We suggest making a copy of the data table handout and putting it into a shared google doc that students can edit. You can also display the table on a Smartboard or print out a hard copy and display it under a document camera.
- Repeat with other groups.

Step 6: Calculating Speed of Sled

- Explain to students that they will now complete step 4. Each group will calculate their sled's speed.
- In order to perform their calculations, students will need the length of the ramp in inches. You can measure the ramp you create before class or you can have students measure it during class. We suggest displaying the length of the ramp on the board so students can reference it.
- Once groups have calculated their speed, have students add their speed to the [Handout: Class Data Table](#).

Step 7: Conclusion and Discussion

- Display the completed data table for the whole class to see.
- Compare group results and discuss the following:
 - Why did certain sleds have a faster speed? (weight, materials used, etc.)
 - What would groups do differently if they had the opportunity to design a second sled?

Materials List

Provided online:

- Handout: Teacher Prep
- Handout: Learning about Luge
- Handout: Steps to Build a Sled
- Handout: Class Data Table

Not provided (Each group needs):

- Cardboard and other clean recyclables
- Pipe cleaners
- Straws
- Cardstock
- Art Supplies
- Optional: Calculator

Not provided (Each class needs):

- Luge Ramp (Table and 2x4 or similar)
- Wax paper
- Timer
- Measuring Tape

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