



SCIENCE Learning

December Holiday Science Investigations

Note: These lessons are focused on the December holidays. These have been prepared for December 4, 11, 18

Zippy's Zip Line December 4

Background Information: Zippy the Elf is stuck on a shelf. Create a zip line and trolley that will carry the elf safely down from the shelf to the floor. Zip lines work by attaching a trolley to a steel cable that is usually covered with a vinyl coating. Gravity moves the rider quickly down the zip line toward the end. The rider's body speeds up until he reaches his maximum velocity, or speed.

Air resistance creates friction and slows the rider down a little, which means he could have gone even faster! The speed at which a rider can zip down the line is usually between 30 and 90 miles an hour.

What you will need:

- Fishing line/unwaxed dental floss
- Plastic cups
- Plastic straws
- Single hole punch
- Washers
- Painter's tape
- Small figure to represent Zippy



What you will do:

1. Ask the children if they have ever seen socks hanging from a mantle. Explain a mantle is some structure that is on a fire place.
2. Share with them that Zippy the Elf is stuck on a mantle. It is too high for him to jump without getting hurt.
3. Explain their task is to build a zip line which will take Zippy from the mantle to the floor, of course avoiding the fireplace.
4. Ask them these questions:
 - a. How does the length or position of the zip line affect the speed?
 - b. Do you think knitting yarn could be used for the zip line? Why or why not?
 - c. Change the number and positions of the washers. How does this affect the trolley's balance? Try it again. (The trolley is the car Zippy will be riding in)
 - d. Use a stopwatch to record the time of each zip line run.
5. Divide youth into groups of 3-4, distribute the supplies and ask if there are any questions. Respond to those
6. While youth are working, circulate and ask and respond to questions.



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Debrief:

- What did you learn about zip lines?
- What advice would you give to someone who wants to try building a zip line?
- In your own words, how you build the zip line for Zippy the Elf.



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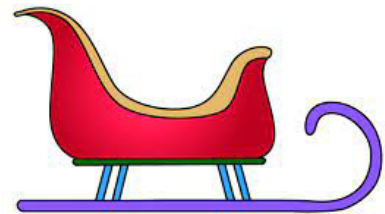
Speedy Sleds December 11

Background Information: Sleds are used to go downhill on the snow. The main forces involved in sledding are gravity and friction. (Does this remind you of the zip line?) The force of gravity pulls in the downward direction, which is what pulls the sled down the hill. The heavier the rider, the faster the sled goes!

Friction is the force that slows you down while sledding. Smooth surfaces, like snow or ice, produce less friction than rough surfaces, like grass or pavement. Snow and ice cause very little friction. The task is for each group to create a sled that can travel down a “hill” (a titled book or cardboard ramp) the fastest.

What you will need:

- Wax paper
- Plastic bags or plastic wrap
- Felt squares
- Pennies
- Elf carton
- Books



What you will do:

1. Bring youth together and ask what they know about sleds. Ask if anyone has ever been on a sled. Invite them to share the experience.
2. Explain they are going to create a sled which will travel down a hill. Ask what they think they could do to create a hill or ramp.
3. Share with them the items they will have to work with. Share that the pennies will be the “people” on the sled. Ask them how they think they might use each of the items.
4. Here are some discussion questions to share with the youth:
 - a. What forces caused the sled to move? To stop? What does adding weight do to the sled?
 - b. Is there another material you would like to try that was not available? What is it? Why do you think it would work better?
 - c. Test your sled. Have the sled run the course more than one time. Make adjustments to make the sled go faster.
 - d. How would you like to decorate your sled?



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- e. Use a stop watch to time your sled.
5. Divide youth into groups of 3-4 and distribute the supplies
6. Check to see if there are any questions.
7. Circulate while the youth are working on the project. Ask and respond to questions.
8. When youth are finished, have them share with their peers.

Debrief

- What did you learn from this investigation?
- What advice would you give to someone just starting this investigation?
- In your own words, describe how you built your sled.



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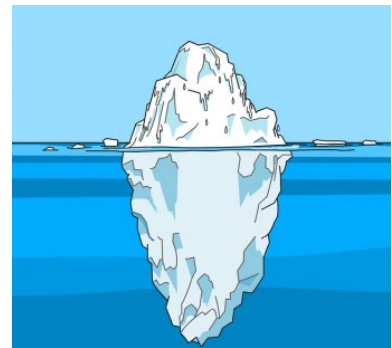
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Polar Bear Relay December 18

Background Information: The project for today is building a floating “iceberg” that will hold as many bears as possible. Icebergs float for three reasons. First, they are less dense than water. An amount of ice weighs less than the same amount of water. Second, icebergs are made from fresh water. The ocean is made of salt water. The saltier water is, the better things float in it. Finally, icebergs are made of more than just water. They have a lot of air bubbles too. That is one reason icebergs look white instead of clear. Air is less dense than water. Trapped air bubbles in the ice help keep the iceberg afloat.

What you will need:

- Straws
- Aluminum foil
- Wax paper
- Painter’s tape
- Bucket of water
- Counting bears
- Craft sticks
- String



What you will do:

1. Bring youth together and ask what they know about icebergs. Ask them where you would find icebergs.
2. Ask them what they know about polar bears—where they live, if they hibernate, what they eat, etc.
3. Share with youth the challenge is to build an iceberg which will float and hold as many bears as possible.
4. Discuss the supplies that are available to them. Talk about how you might use each of these supplies to create an iceberg,
5. Ask them to share their ideas about how to build the iceberg.
6. Discuss the following questions.
 - Scientists have found that arctic icebergs are melting at a faster rate now than 30 years ago. How do you think the will affect the polar bears?



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- Draw your design and try it out. Redraw your design making changes in the materials you use. Did it work better? Why or why not?
 - Polar bears want to travel. Try to change your design so the iceberg can move like a boat.
 - How many polar bears can you fit on the iceberg you made before they fall off or it sinks? How might you change your iceberg so it can hold more bears.
7. Ask youth if they have any questions. If yes, answer them or at least discuss until they come up with their own answers.
 8. Divide youth into groups of 3-4 and distribute the supplies
 9. While youth are working, circulate and ask and respond to questions.
 10. When youth are finished, have them share with one another.

Debrief

- What did you learn from this investigation?
- What advice would you give to someone just starting this experiment?
- How were you challenged?