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ACTIVITY 52: TWO-STAGE BALLOON ROCKETS!

Goal: To understand that the first stage of a two-stage rocket gives the initial thrust, then the thrust of the second stage keeps the rocket in motion.

Skills: Observing, inferring, predicting, controlling variables, generalizing.

Materials:
- 2 round sturdy balloons (about 18" inflated)
- Twine or fishing line long enough to stretch across the room
- Paper cups for hot and cold drinks, 8 oz.
- 2 pieces of 2"-wide masking tape, 3" to 4" long
- Drinking straw, cut in half
- Scissors

Preparation:
1. Cut the bottom off the paper cup.
2. Thread the twine through the two half sections of the straw and leave both sections at one end of the twine.
3. Have two students stretch the twine across the room and hold each end so it's taut.
4. Blow up Balloon 1, stretching the neck of the balloon through the hollow cup.
5. Hold the balloon neck closed against the inside bottom of the open edge of the cup.
6. Hold the neck of Balloon 1 against the cup while you insert Balloon 2 about 2/3 of the way into the back end of the cup. Ask a student to inflate Balloon 2 until it feels secure in the cup. (Balloon 2 will be smaller than Balloon 1.) Inflated Balloon 2 should hold Balloon 1 in position, keeping Balloon 1's neck closed against the side of the cup.
7. Still holding the neck of Balloon 2 closed, have a student position one section of straw on top of each balloon and tape the balloons and straws together.

Preparation Time: 10 minutes

Lesson Time: 25–30 minutes

— Procedure and Questioning Strategy —

1. What do you predict will happen first when the balloons are released?
   Air will be released from the smaller balloon (the first stage of the rocket) and the balloon rocket will travel along the string.
2. What do you predict will happen next?
Air will come out of the larger balloon (the second stage of the rocket) and the balloon will keep traveling along the string.

3. Why will the first stage of the rocket balloon need to deflate before the second stage can take over?
The smaller balloon keeps the mouth of the larger balloon closed.

4. What do you think will happen to the first stage of the balloon rocket when it deflates?
It will separate from the second stage.

Release the balloons.

5. What happened?
The first stage gave the first push to the balloon rocket, then it separated from the second stage of the balloon rocket. The second stage then kept the balloon rocket moving forward.

6. What do you think would happen if we used larger balloons and larger cups?
The balloon rocket would go faster and farther.

7. What reason can you think of for the rocket going faster and farther?
More air would come out of the balloon, giving the balloon more force to go forward.

8. What do you think might happen if we used fishing line instead of twine?
The balloon rocket might go faster and farther.

9. For what reason?
The fishing line isn’t as thick as twine and it’s smoother, so it wouldn’t catch on the straw.

— Practical Application —

1. Why do rockets have stages?
To reduce weight.

2. How would a two-stage rocket reduce the rocket’s weight?
When the first stage separated and dropped off, the rest of the rocket would be lighter in weight.

3. How would this affect the rocket’s flight?
It would be able to go faster and farther with less weight.