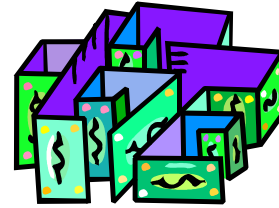


Marble Maze



Grade Level Targeted: 5 – 8

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Goals/Standards:

NCOS Goals:

- Grade 5 Goal 4: Learner will conduct investigations and use appropriate technologies to build an understanding of motion in technological design.
- Grade 6 Goal 1: Learner will design and conduct investigations to demonstrate an understanding of scientific inquiry.
Goal 2: Learner will demonstrate an understanding of technological design.
- Grade 7 Goal 1: Learner will design and conduct investigations to demonstrate an understanding of scientific inquiry.
Goal 2: Learner will demonstrate an understanding of technological design.
- Grade 8 Goal 1: Learner will design and conduct investigations to demonstrate an understanding of scientific inquiry.
Goal 2: Learner will demonstrate an understanding of technological design.

National Science Standards B, E, & G

Engineering Connection: Civil Engineering and Mechanical Engineering

Objective:

Student will design and construct a cardboard maze through which a marble must travel without falling through the holes.

Materials: Cardboard, glue guns, masking tape, pencils or markers, rulers, grid paper, (drills and/or Exacto knives for teacher use only), and standard sized marbles.

Setting up the Activity (for the facilitator):

Divide students into groups of 2-3.

Provide each work station with scraps of cardboard, a glue gun, pencils or markers, ruler, a roll of masking tape, grid paper, and a standard-sized marble.

Set up a separate work station with Exacto knives and/or drills *for teacher use only*. Make sure you place something on top the table to prevent it from being cut.

If possible, it would be helpful to have a couple of labyrinth games available for students to examine and try (see resources.) Otherwise, you will need to provide pictures of ones.

Remind students of the proper use of glue guns. Also, explain to them that they are *not* to use the Exacto knives or drills. They are to mark the locations where they want holes and then take their project to the teacher table for the holes to be made.

****The success of this project can't be judged by the finished products, and students may encounter frustration and failure. However, the success can be judged by the fact that the students were involved, creative, and most importantly, had fun.**

Provide them with the following instructions and requirements:

- The labyrinth is to be made of only cardboard and be between 12 and 16 inches square.
- You should use grid paper of the same size to design the layout before you begin.
- You will need to create a lip around the outside of the labyrinth to keep the marble from falling off the side.
- Your labyrinth should have a “start” opening and a “finish” opening on the lip.
- The maze should have at least 15 marble-sized holes around which a marble must maneuver from start to finish.
- You should create a path for the marble to travel by gluing pieces of cardboard at various places on the board.
- All holes must be exposed on at least two sides.
- The marble will be moved through the maze by tilting the board in different directions, guiding the marble along.
- You will not be able to touch the marble at any time along its trip through the labyrinth.

Introduction (for youth):

How many of you have played a game called a labyrinth? Were you ever able to make a marble go all of the way through the maze without falling through one of the holes? What if you could design your own labyrinth? Could you design one that would be challenging and yet possible to complete?

Talking it Over: When activity is completed, you should lead a discussion, using the questions below. Since there are no right or wrong answers to these questions, answers will vary according to the experiences of each group.)

a. Share What You Did:

1. How did you begin your labyrinth? How did you decide where to place the holes?
2. Was there a pattern that developed in the way your design came together?
3. How did you readjust your design as you progressed?

b. Process What's Important:

4. How important was the planning of the design on the grid paper before you began to build the labyrinth?
5. What were some flaws in design that you discovered while constructing the maze?
6. What other materials might be helpful in creating the maze?
7. If you were to design this again, what would you do differently? How?

c. Generalize to Your Life:

8. How could you compare moving through the labyrinth to a day in your own life? What are some of the obstacles you might encounter or “holes” that you might fall through?
9. What strategies could we learn from the maze about how to avoid the pitfalls that face us daily?

d. Apply What You Learned:

10. How did your mistakes help you learn?
11. What do you think that scientists might be trying to learn when putting mice in mazes and watching their behavior?

More Challenges:

1. Have students write the story of “My Trip Through the Labyrinth” as told from the point of view of the marble.
2. Ask students to use their grid paper to estimate the percentage of surface area that is covered by holes.
3. Have students try to move their marble through the labyrinth a dozen times and graph their own progress, showing how much farther they were able to go with practice.
4. Take students to a local corn maze. These are quite prevalent now.

Background Information (for facilitator):

Labyrinths date back some 3000 years. These early mazes were not puzzles, but had only one entrance that led to a central area. They were used primarily for walking, meditating, or ceremonial processions, although each country used them for a variety of reasons.

During the Renaissance in Italy, puzzle mazes were first constructed as entertainment for Kings, Queens and other royalty.

By 1900, mazes were beginning to appear in parks for the amusement of the general public. Many began to use labyrinth designs in their gardens. Carnival fun houses contained glass and mirrored mazes through which ticket holders must maneuver.

Today mazes can be found throughout the world, and may be constructed of hedges, brick, dirt, wood, water, or stone. Many are built in cornfields and serve as a source of entertainment.

Resources: <http://www2.towerhobbies.com/cgi-bin/wti0001p?&I=LXECL5&P=FR>
<http://www.labyrinthina.com/path.htm>
http://www.mcli.dist.maricopa.edu/smc/labyrinth/how_draw.html
<http://www.bmts.com/~labyrinth/page3.html>
http://www.mazemaker.com/history_mazes.htm

Glossary:

Labyrinth: A complex system of paths and tunnels in which it is easy to get lost.
Maze: Same definition as labyrinth.
Navigate: To direct or guide carefully and safely.
Pitfalls: An unapparent source of trouble or danger; a hidden hazard.
Maneuver: To guide skillfully.