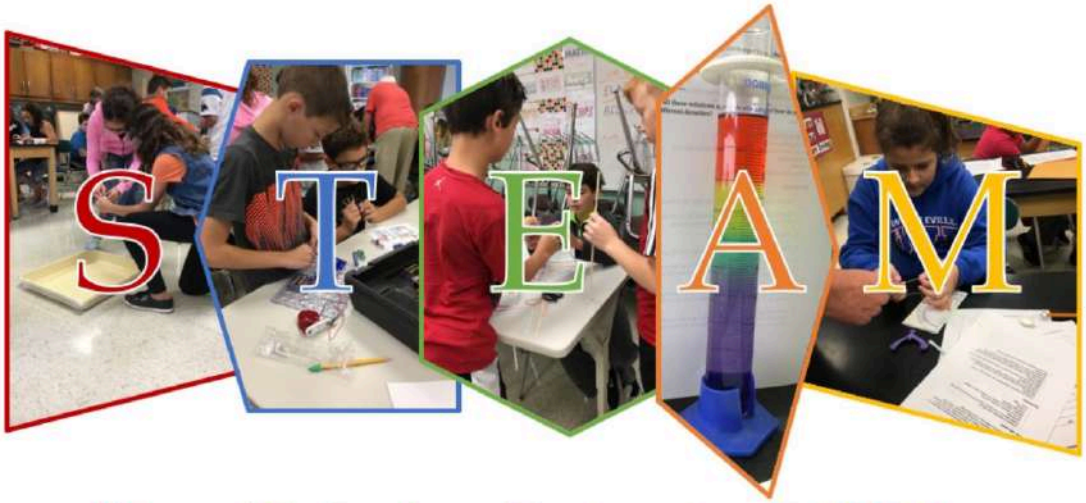

Science Technology Engineering Art Math

Create Discover Explore

The Center for Developing Excellence STEAM Academy

We emphasize the FUN in teaching the FUNdamentals!

Hydraulic Marble Maze

Cost – in Dollars (not counting basic lab supplies and technology equipment if necessary):

$ -- 0-25

$$ -- 25-50

$$$ -- 50-100

$$$$ -- OVER 100

Objectives: Students will…

- Use their critical thinking skills and teamwork to construct a hydraulic marble maze out of cardboard.
- Understand how scale works in designing their mazes.
- Use their creative art skills to produce a unique product.
- Experience that engineering can be fun.

Time Required: 2 to 3 – 45 to 60 min class period

Materials (For class of 20 students working in groups of 2):

- 10 cardboard boxes (https://www.amazon.com/gp/product/B01BGFXY28/ref=ppx_yo_dt_b_asin_title_o09_s00?ie=UTF8&psc=1)
- Hydraulic syringes (https://www.amazon.com/Covidien-8881907102-Monoject-Polypropylene-Capacity/dp/B01BQA7GOK/ref=sr_1_1?keywords=covidien+monoject+10ml+8881907102&qid=1564320783&s=gateway&sr=8-1)
- Vinyl tubing (https://www.amazon.com/gp/product/B07QHSFCGC/ref=ppx_yo_dt_b_asin_title_o00_s00?ie=UTF8&psc=1)
- 1 ¼ inch hole saw (https://www.amazon.com/gp/product/B0052EC44Y/ref=ppx_yo_dt_b_asin_title_o06_s00?ie=UTF8&psc=1)
- Electric drill
- 10 glue guns with glue sticks
- 10 – 1 inch metal ball bearings (https://www.amazon.com/gp/product/B007B2AA0K/ref=ppx_yo_dt_b_asin_title_o06_s00?ie=UTF8&psc=1)
- 10 scissors
- 10 sheets graph paper
- Razor cutter or heavy duty paper cutter
- 10 sets of colored markers
- 10 Solo cups
- 10 meter sticks
- Supply of water

Procedure:

Before class begins:

- Cut the tops off 10 of the boxes and by using a razor or paper cutter
- Create cardboard strips (1 ½ inch wide) from the tops for the students to use as the mazes' walls
- Cut the vinyl tubing into 1 foot sections (you will need 40 pieces)

Note: You may want to have one to two class periods for design and construction and a third class period for the competition.

During Class:

- Divide the class into teams of two.
- Give each team a set of pistons (4), 4 -12 inch pieces of vinyl tubing, one set of colored markers, glue gun with glue sticks, 1 inch ball bearing, 1 cup of water, 5 strips of cardboard, scissors, one cardboard box with cover cut off, meter stick, one sheet of graph paper.
- Have the students draw a grid on the base of their cardboard box 1 inch by 1 inch using their meter stick.
- Explain to the students that they must build maze using the bottom of the box as a floor for the structure and the cardboard strips for the walls. Have students use pencils to draw the outline of their structure to scale on graph paper before they begin constructing the cardboard maze.

Note: The walls of the maze should be drawn so they are at least two inches apart on the final cardboard structure.

- Once the students have designed their maze on graph paper, have them transfer their design (to scale) onto the bottom of the cardboard box.
- Using their glue guns, have the students attach the walls to the bottom of the maze.
- Tell the students they may use their markers to add color to their design, they may also decide to add a few "hole traps" to their mazes.

Note: The teacher should drill the holes for the students.

- Show the students how to attach their pistons to the corners of the box and fill their pistons with water from their cups.
- Once the mazes are completed, have the students switch mazes with a different team and have a timed competition as to who can complete the mazes the fastest. If time permits, have the teams switch a second time and repeat the competition.

Assessment:

- Creative use of design
- Teamwork
- Problem solving skills

Video: https://www.youtube.com/watch?v=DKyIKy1MhPc&feature=youtu.be

Social Media: Want more great STEAM ideas and lessons, Like our Facebook page (https://www.facebook.com/TPSCDE) for new releases. All of our curriculum is free of charge with no strings attached. The Center for Developing Excellence/STEAM Academy

is on a mission to bring back the FUN to teaching the FUNdamentals! You may also want to watch a video that our students put together from this summer's Academy (https://www.youtube.com/watch?v=Up3hAAEu-ZE&t=1540s). Our website is cdestem.com.