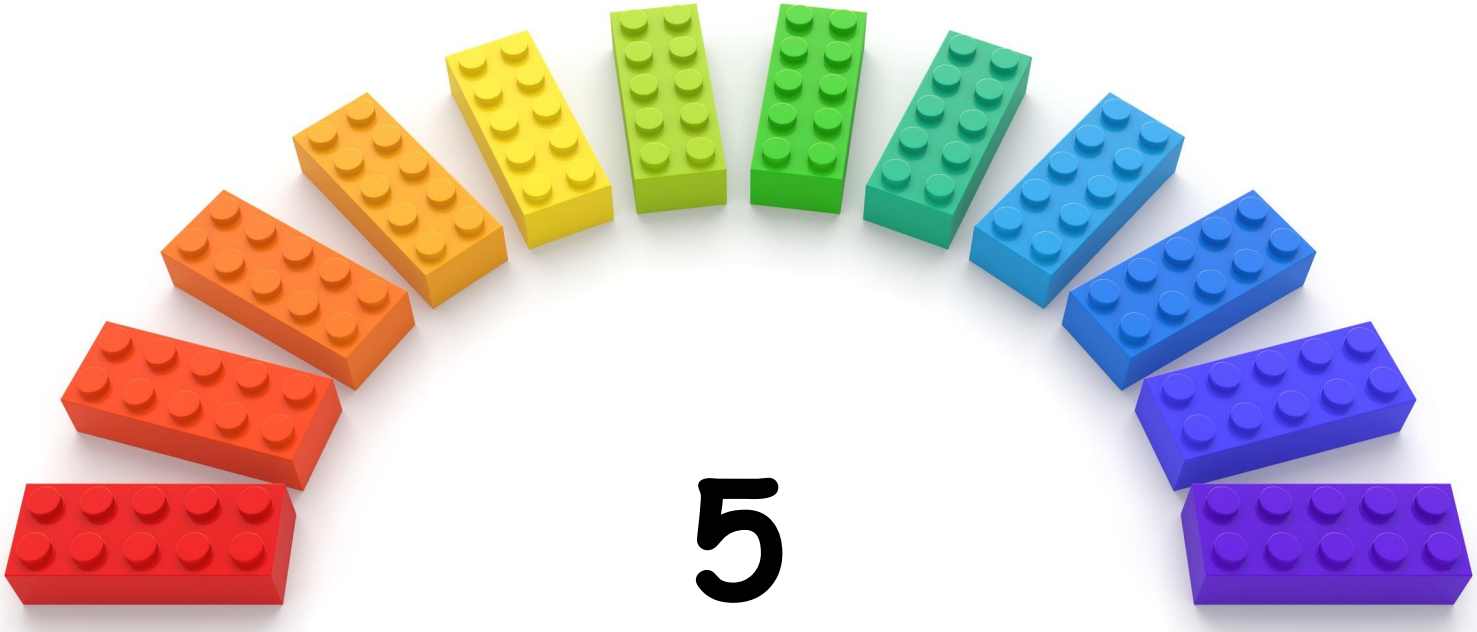

5 SUPER FUN LEGO STEM ACTIVITIES FOR KIDS

By: Betty Boiron
Mombrite

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It is my sincere hope that you enjoy this product and find it helpful! If you have any questions regarding this product, please do not hesitate to contact me.

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Disclaimer

Please use discretion when doing the activities with children and only do activities that you feel are safe for your kids. Children under 3 should not participate in any activities that involve small pieces.

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Balloon-Powered LEGO Cars

MATERIALS

- LEGO bricks
- LEGO wheels
- Balloons

INSTRUCTIONS

1. Have your child create and build his/her own LEGO car.
2. Show your child how you can build a hole to stick the balloon through.
3. Blow up the balloon and hold the end shut while you place the cars on the ground.
4. Let the LEGO cars go and see which car can travel the farthest!

Balloon-Powered LEGO Cars

SCIENCE BEHIND THE BALLOON-POWERED LEGO CARS

While you can do this activity just for fun, there is an opportunity to teach your child the physics of force and motion!

Newton's first law states that "every object will remain at rest or in uniform motion in a straight line unless compelled to change its state by the action of an external force."

Show your child how the LEGO car by itself will not do anything. It's not until you release the air from the balloon and apply external force on the car that it starts to move.

EXPERIMENTS:

- Blow up the balloon bigger. Does the car go faster? Farther?
- Add some more LEGO bricks to the car. How does the extra weight impact how far the car can travel?
- Try racing the cars on a different surface (i.e. carpet vs. wood floor).
- Place the balloon higher up or lower down on the LEGO car. How does the placement of the balloon impact how the car moves?

LEGO Zip Line

MATERIALS

- LEGO bricks
- LEGO minifigure
- Piece of thick string

INSTRUCTIONS

1. Build your cage – this should be a structure that can hold the LEGO minifigure with a hole on the top where the zip line will go through.
2. Put the LEGO minifigure in the cage.
3. Tie one end of the string to a doorknob, back of a chair, or any place that is stationary and higher up.
4. Thread the string through the hole.
5. Pull the string so that it's taut and hold the loose end tightly and on a decline.
6. Push the cage all the way to the highest point of the string.
7. Let go of the cage watch it slide down the zip line!

LEGO Zip Line

SCIENCE BEHIND THE LEGO ZIP LINE

Gravity: Why do the minifigure and the cage go downward on the zip line instead of sliding upward? Gravity is the force that pulls objects toward the center of the Earth. In this case, gravity is pulling the LEGO pieces to the ground.

Friction: Why do some cages slide down smoother than others? Friction occurs when one object rubs against another. Friction works against and acts in the opposite direction of motion.

Slope: How can you make the same cage design slide down the zip line faster or slower? The slope describes how steep a straight line is, and you can change the slope of the zip line by moving the end of the string that's touching the ground.

Speed: How fast does the cage move down the zip line? Speed is the measure of how fast something is moving or the distance that an object moves in a certain amount of time.

Weight: Do heavier cages slide down the zip line faster? Weight is the force gravity applies to an object and has an impact on speed.

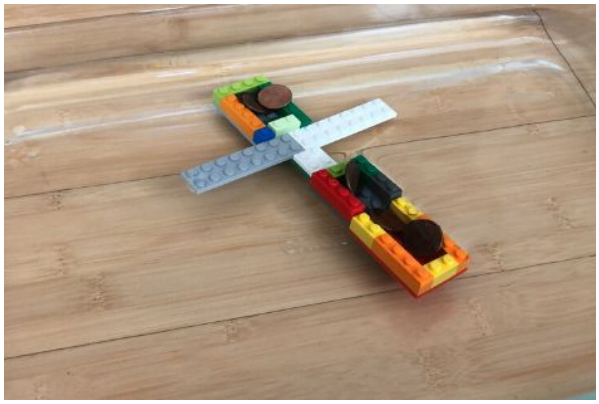
LEGO Zip Line

EXPERIMENTS:

- Make the zip line steeper. Did the cage go faster or slower?
- Do the opposite and make the zip line longer and hold it at a gradual slope. Did the cage go faster or slower?
- Add on a few more LEGO blocks to the bottom of the cage to make it heavier. How did the increased weight affect the speed at which the cage slid down the zip line?
- Design a cage that is very wide. How did that affect the cage when it traveled down the zip line?
- Use a round piece of LEGO instead of a flat piece for the hole. Did the cage slide down smoother?
- Change the tension by making the string more or less taut. How does that affect the cage?

Penny LEGO Boat Challenge

MATERIALS



- LEGO bricks
- Pennies
- Clear empty container

INSTRUCTIONS

1. Have your child design a LEGO boat that floats.
2. Fill the container about ¾ way up with water.
3. Place the boat in the water.
4. Slowly place pennies in the boat one by one. Count aloud as you do this.
5. Continue to put pennies in the boat until the boat sinks to the bottom of the container.
6. Repeat steps #3-5 with another boat.
7. The boat that holds the most pennies and stays afloat win!

Penny LEGO Boat Challenge

SCIENCE BEHIND THE PENNY LEGO BOAT CHALLENGE

There are two opposing forces in this experiment.

The first force is gravity. Gravity is pulling the LEGO boat and the pennies downward.

The opposing force is buoyancy. When an object is placed in the water, the object pushes the water aside. This is called displacement. Buoyancy is the power of a fluid(water) to exert an upward force (displacement) on an object placed on it (the boat).

The LEGO boat will continue to flat as long as the force of buoyancy is greater than the force of gravity. However, as you put more and more pennies in the boat, the boat becomes too heavy and gravity wins! The boat will sink far enough to leak water and eventually sink to the bottom of the container.

EXPERIMENTS:

- A wide boat vs. a narrow boat
- A tall boat vs. a shallow boat
- A long boat vs. a short boat
- A heavy boat vs. a light boat
- Place pennies on just one side of side of the boat. Did it tilt and sink?
- Place equal numbers of pennies on both sides of the boat. Did the boat hold more pennies before it sunk?

"Play is often talked about as if it were a relief from serious learning. But for children play is serious learning. Play is really the work of childhood." - Mr. Rogers

LEGO Volcano

MATERIALS

- LEGO bricks
- LEGO baseplate
- Plastic cup
- Vinegar
- Baking soda
- Dish soap
- Red or orange food coloring

INSTRUCTIONS

1. Place the plastic cup near the center of the baseplate.
2. Start building around the plastic cup with LEGO bricks.
3. Continue building until you form a volcano (it doesn't have to be perfect!).
4. Pour 3-4 tablespoons of baking soda, 1 tablespoon of dish soap, and 5 drops of food coloring in the plastic cup.
5. Add about ¼ cup of water and mix to form a slurry.
6. Move the volcano outdoors where there is sand, pebble, or dirt. If you can't go outdoors, then I recommend putting the volcano on a baking sheet to catch all the "lava."
7. Slowly pour vinegar into the plastic cup, and then watch the volcano erupt!

LEGO Volcano

SCIENCE BEHIND THE LEGO VOLCANO

As baking soda (sodium bicarbonate) mixes with vinegar, carbon dioxide and water are created. That's why you can hear the fizzing sounds coming out of the "lava." The addition of the dish soap creates even more bubbles and foam, making the "lava" thicker and more realistic looking.

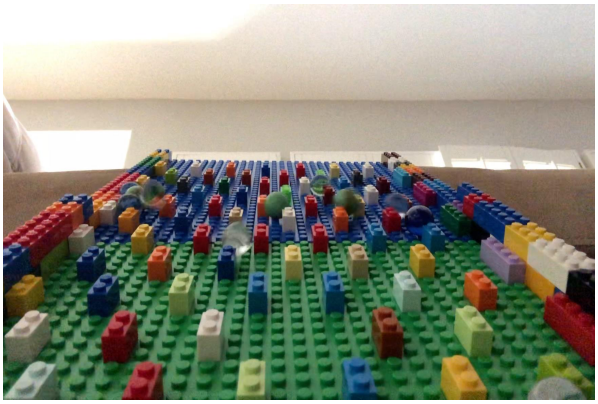
EXPERIMENTS:

- Try adding more or less baking soda in the plastic cup. Did the eruption become more violent or less?
- Try adding more dish soap to the baking soda slurry. Did it make your eruption foamier?
- Try mixing vinegar with dish soap, water, and food coloring in the plastic cup. Then add baking soda to make the eruption. Did the chemical reaction occur right away as it did with pouring the vinegar in the baking soda slurry?
- Try making tracks in your volcano. Did the "lava" follow the flow of your tracks down the volcano?

LEGO Plinko Board

MATERIALS

- LEGO bricks
- LEGO baseplate(s)
- Marbles



INSTRUCTIONS

1. You can choose to use 1 or 2 baseplates. If using two baseplates, place the two boards side by side and connect the two baseplates with two 2x4 LEGO bricks on the two sides.
2. Build the border of the Plinko board (bottom and two sides) with 2x6, 2x4, 2x2, or 2x1 LEGO bricks.
3. Place a 1x6 LEGO brick every 4 studs to divide your slots at the bottom of the board. To clarify, the slots should be 3 studs wide, so there are 3 studs in between two 1x6 LEGO bricks. **There will be one slot that is 4 studs wide.
4. Place 1x2 LEGO bricks so that there are 3 studs between them horizontally and 2 studs vertically.
5. Staggers the columns so you don't have straight lines of bricks.
6. Every other row, you will see that there will be a 1x2 brick with only 1 stud in between the 1x2 brick and the border. Remove those 1x2 bricks, or else the marbles get stuck in the little space.

LEGO Plinko Board

INSTRUCTIONS (CONTINUED)

7. Now you have 5 studs in between the 1x2 brick and the border. Place a 1x4 brick next to the border so there are only 4 studs between the 1x2 and the 1x4 brick. This is to prevent the marbles from falling down in a straight line.
8. For the row right above the slots, place a 1x2 brick instead of a 1x4 brick next to the border, or else your marble won't be able to fall into the bottom right slot.
9. Leave some space on top for you to drop the marbles.
10. Place additional bricks on the bottom border and the sides to ensure the marbles don't fall out of the board.
11. Prop up the LEGO Plinko board in a slant. You will need to play with the angle so that the marbles don't fall out of the Plinko board (too vertical) or get stuck on the 1x2 brick (too horizontal).
12. Place some thick books behind the baseboard if your baseboard tends to bend. You can also use a whiteboard or a baking sheet.
13. Drop marbles from the top of the board and watch the marbles hit the 1x2 LEGO bricks on the way down!

LEGO Plinko Board

MATH BEHIND THE LEGO PLINKO BOARD

The Plinko board might seem like a fun, mindless game, there is actually a lot of math behind it - namely, probability and Bell curve (or normal distribution).

If you drop enough marbles down a Plinko board, you will notice that the middle slot will collect the most marbles, and the slots on the sides have the least.

The theory of probabilities is too difficult for a young child to grasp, but you can explain it this way. When you drop marbles down the Plinko board, they take random walks down the lattice (or the maze of pegs). The marbles dropped down the center have more of a chance to land in the middle slots because they will have to travel farther to go to the side slots. The marbles dropped down the sides also have chances to go to the middle slots because they bounce off the borders, forcing them to go toward the middle.

Therefore, you end up with the middles slots with more marbles and side slots with very little.

LEGO Plinko Board

EXPERIMENTS:

- You don't have to follow my instructions to make the Plinko board! Let your child design his own Plinko board. There are endless ways to do this!
- Use 1x1 bricks instead of 1x2 bricks for the "pegs."
- Drop a lot of marbles down the LEGO Plinko board. How many marbles are in each slot? Did one particular slot have more marble than others?
- The marbles will get stuck on the pegs here and there. Have your child try dropping marbles with the purpose of knocking the stuck marbles so that they continue to travel down the board.

Thank You

Thank you so much for purchasing my ebook. My family and I all really appreciate your support and hope you and your child have lots of fun learning through playing with LEGOs.

If you have any questions or suggestions, feel free to contact me. I will be happy to hear from you!

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