“In the Construction Zone” Module 12, Adventure 2

Prompt:

When constructing a building, it is important to think about the landscape, climate, and weather where the building is. For areas that are known to have earthquakes, engineering buildings that can stay standing through an earthquake is very important.

However, when designing and constructing a building, there are limited supplies. Construction projects have a budget, a certain amount of money that can be spent. We challenge you to engineer a building that can withstand an earthquake and stays within a budget.

Materials:

- A piece of cardboard, at least 12 inches x 12 inches / 30 centimeters x 30 centimeters
- Scissors
- Explorer Notebook or a piece of paper
- Craft sticks*
- Playdough or clay*
- Toothpicks*
- Straws (paper or plastic)*
- Paper*
- Index cards*
- Rubber bands*
- Paper clips*
- Yarn or string (12 inches / 20 centimeters each piece)*
- Cups (paper, plastic, or yogurt containers)*
- Tape*

- *Optional: Markers, crayons, or colored pencils*

Note for grown-up's: If you do not have some of the starred supplies, find similar types of materials and set a price for the material before your explorer begins.

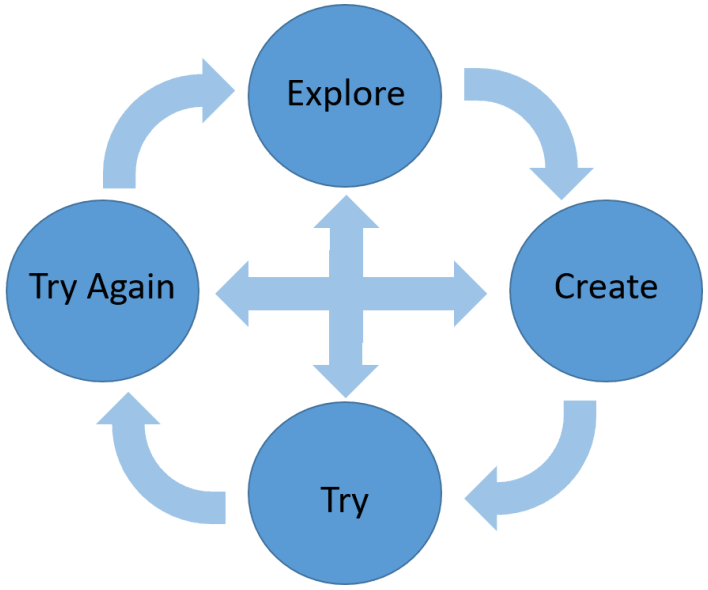
Instructions:

1. Look at the materials you have and plan out your design for a building that can stay standing in an earthquake.
2. You have $2,000 for your building, you cannot go over $2,000! Here are the costs for each material:

Item (1)	Cost/Item
Toothpicks (10)	$50
Rubber bands	$50
Yarn or string (12 inches / 20 centimeters)	$50
Paper clips (10)	$100
Craft sticks	$100
Straws (paper or plastic)	$200
Index card	$200
Paper (half sheet)	$250
Tape (12 inches / 20 centimeters)	$250
Cup	$250
Playdough or clay (4 inch cube / 10 centimeter cube)	$500

3. Plan out your design for your home or building. The following are things to keep in mind as you design:
    a. You have a budget of $2,000.
    b. You will be using the piece of cardboard as the ground, so what you make needs to fit on it.

4. Pick the first set of materials you want to use. Add up the cost of the materials and make sure you are in budget!
    a. You can exchange materials you have not used - but remember to keep track of changes in your budget.
5. Construct your home or building.
6. Test out your design by slowly shaking the piece of cardboard under it side to side. See how your design does. Then shake it faster each time. How strong of an earthquake before it falls?
7. Look to see what parts of your design can be improved after you test. Make some improvements and test again.
    a. Remember, engineers often have to try and try again, going back to explore more materials and improve their designs from what they learn as they test.



For explorers using an Explorer Notebook:

1. Plan out your design in your notebook.
2. Keep track of your materials and your budget. Don't go over $2,000!

Check out the last page for a page design idea. You can use this or set up your page however you want!

Resources:

1. For some inspiration, watch the Boston Children's Museum video, "Visit the Japanese House with Professor Lippit." From 8:50-9:25, Professor Lippt talks

about the joinery used to connect the wooden beams in the house, which helps protect the house in an earthquake.
2. Do some research online with your grown-up to learn about other homes and buildings around the world that are made to be earthquake resistant.

Extensions:

The following are optional steps you can take if you want to extend this adventure:

1. After testing your design, your funders decide they have a little extra money they can give you. You now have an extra $500! Gather more materials to improve your design. Test it again and see how it does!
2. For an added challenge, make a home or building that is not attached to the piece of cardboard.
3. Decorate your home or building.
4. Go to the “In the Construction Zone” topic on Flipgrid and share your creation!

Explorer Notebook

You can use this to help you set up your Explorer Notebook!

Engineering an Earthquake Resistant Structure
Module 12, Adventure 2

Sketch of my design:

My Materials and Budget:

Material Name	**Number Used**	**Cost**
Add up all your materials. Is it $2,000 or less?		