

# Spaghetti anyone? Building with Pasta Activity

## Grade 1

**Unit:** Measurement

**Time:** 120 minutes/ 4 days

**Subjects:** Math/Engineering and Technology

## CCS

**1. MD.1:** Order three objects by length; compare the lengths of two objects indirectly using a third object.

**1. MD.2:** Express the length of an object as a whole number of length units by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps.

## NGSS

**1-LS1-1** Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

**K-2-ETS1-1:** Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved by developing a new or improved object or tool.

**K-2-ETS1-2:** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

**K-2 ETS1-3:** Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

Source:

<https://www.jpl.nasa.gov/edu/teach/activity/spaghetti-anyone/>  
<https://video.ibm.com/recorded/13400346> Possible extension with earthquakes.

This activity will engage students in science and mathematics and also engineering in the classroom and design process. Using spaghetti and marshmallows, students can experiment with STEM with their hands while experimenting with different structures. Students will have to determine which structure can handle the most significant amount of load. Students can connect with earthquakes and how they can support and structure without falling. Students can make a NASA connection to the discoveries of earthquakes in MARS. Nasa Insight Lander detected a marsquake at least five times as large as the next largest ever recorded on the Red Planet. First graders will discuss Mars as our next living planet and compare and contrast it with our planet Earth. What do you think about Mars being our next home for humanity? Students can turn and talk about it.

**Objective:**

Students will build the tallest freestanding structure; they can support a marshmallow for 15 seconds.

This activity is appropriate for first graders because it has hands-on learning and peer collaboration. It is very entertaining

and interactive for First Graders. They will have to work with a small group and use the design process to identify and solve the problem. Students will brainstorm their ideas and share their possible solutions with their friends. Students will use an appropriate vocabulary and TPR or hand signals for agreeing or disagreeing while providing feedback to their peers. Thumbs up (agree), Thumbs down (disagree).

ELL students or students that need support will have visuals with pictures of each of the materials and procedures for the activity. Also, students will be in groups with students that can help ELL students with the science and math concepts.

### **Engage:**

The spaghetti structure challenge engages students in problem-solving strategies and structural design processes in science and engineering. Llewellyn (2014) states, “Problem-solving enables students to assume ownership and responsibility of the task. Problem-solving is a form of both active and discovery learning—a combination of hands-on and minds-on education” (p. 173). In this example, we described the task to students as a challenge rather than a competition to emphasize the 3 “Cs”— cooperation, communication, and creativity.

### **Students will practice math cognates by singing a bilingual song:**

Cognados, cognados aprovechamos los cognados, como se dice en español? cognados, cognados, how do you say it in English? Cognates, cognates, cuidado, cuidado no todo es cognado.

## **Math Cognates and vocabulary**

Add- agregar

Compare-comparar

Difference- diferencia

equal-Igual

Equation- ecuacion

Foot-Pie

Inch-Pulgada

Pattern- Patron

Sum-suma

Total-total

### **Materials:**

- uncooked thick spaghetti
- marshmallows
- 100 cm (1 m) of masking tape
- scissors (to cut spaghetti)
- science journal
- pencil
- metric ruler or meter stick

### **Essential questions:**

What shapes can you identify with this activity?

What challenges did you have during the activity?

What do engineers do to build a strong structure?

### **Explore**

Can you make a strong tower using only right angles between your pieces of spaghetti?

- Try to make your tower stronger by adding or replacing parts

with different materials.

- See if you can bridge a gap with the spaghetti and marshmallows.

## **Explain**

One of the students will present the project's purpose and discuss the steps to find a solution and how to collaborate with their peers. Students will explain the different jobs each student is going to have:

- Architect,
- Material helper
- Designer
- Engineer

Students will discuss how to build the prototype and the steps to do for this project and talk about a growth mindset vs a fixed mindset.

9-29-2018

#googlekci

# JO BOALER

EVERYTHING  
*changes*  
WHEN WE  
*believe!*



THERE IS NO LIMIT TO WHAT PEOPLE CAN DO - IT IS SELF DOUBT THAT **STOP** PEOPLE GOING FORWARD...  
ERICSSON, 2015

## 1. BRAIN GROWTH

### FIXED MINDSET

"SMART" "BRIGHT" "GIFTED" "CLEVER"  
→ KEEPS GIRLS/WOMEN OUT OF STEM ←

VS.

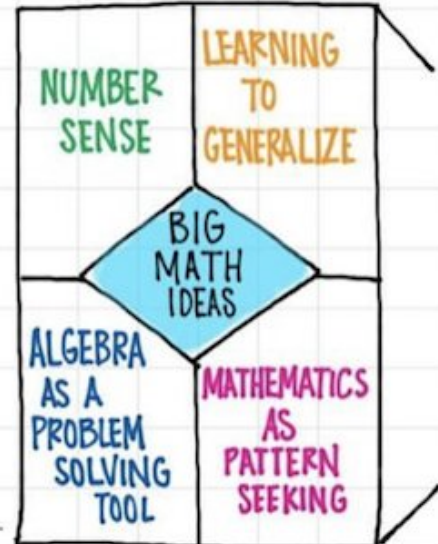
### GROWTH MINDSET

## 2. CELEBRATE MISTAKES + STRUGGLES



## 3. CREATIVITY, VISUALIZING, & FLEXIBLE THINKING

\* PRESENT IN DIFFERENT WAYS → MAKE CONNECTIONS!



MULTIPLICITY

.. MORE NUMBER TALK / CORNER .. PROBLEM OF THE MONTH?

FOR MY STUDENTS



IN OCT...

Students will review Jo Boaler's mathematical mindset poster and see if they have a growth or fixed mindset. Students can collaborate to help their friends to have a growth mindset that will

help them to solve this problem by collaborating.

## **Elaborate**

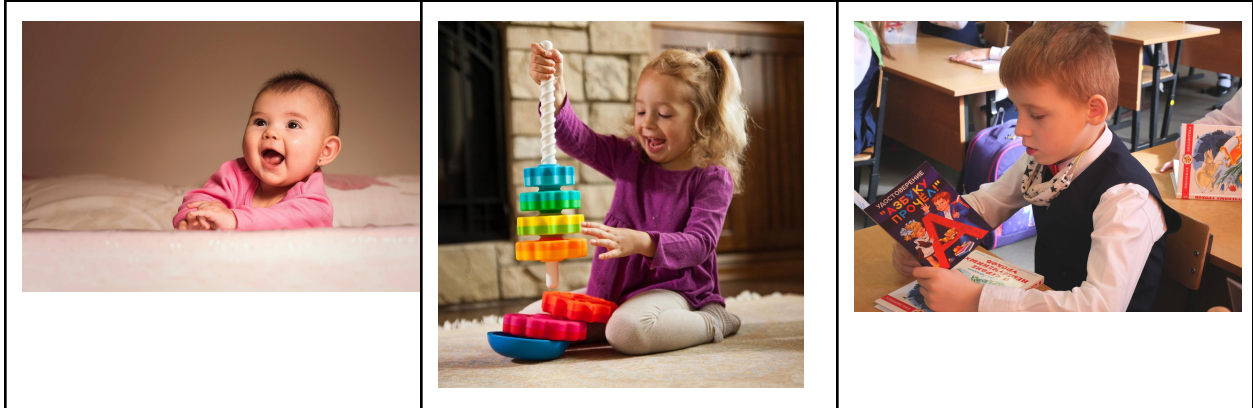
1. Start building your structure
2. \e by pushing a piece of spaghetti deep inside a marshmallow.
3. Keep adding spaghetti and marshmallows to build a structure however you want. But remember that triangle shapes are solid.
4. Test your structure's strength by balancing objects on top of it.
5. Try making structures with different shapes, and see which is most robust.

## **Evaluate**

Have each group present their prototype and have students provide feedback by writing on sticky notes what they will do differently and why. Students will get instant feedback on what works and what doesn't work. Students will play by being engineers and redesigning their prototypes using their classmates' feedback.

## Self-assessment checklist

Did I work as a first grader? Mark an X on the picture that identifies you the most.



Students will create a thinking map with a beginning, middle, and end explaining the process to work together on building this structure.

|        |
|--------|
| First  |
| Middle |
| End    |

I cannot wait to implement this unit plan with my first graders. I have learned so much in this endeavor class that I cannot wait to share my new knowledge with my colleagues. I feel fortunate to have had the opportunity to grow as an educator through these courses and excellent professors sharing their knowledge with us. Thanks! Katharine