Mathematics: The Language of STEM
Noodle Buildings

CONTENT AND TASK DECISIONS

Grade Level(s): 5th grade

Description of the Task: Students will build three buildings using different noodles as support. When finished, students will report their findings of different kinds of noodles by using (one of) the following data resources: a line plot, bar graph, or a line graph.

Indiana Mathematics Content Standards:
5.DS.1: Formulate questions that can be addressed with data and make predictions about the data. Use observations, surveys, and experiments to collect, represent, and interpret the data using tables (including frequency tables), line plots, bar graphs, and line graphs. Recognize the differences in representing categorical and numerical data.

Indiana Mathematics Process Standards:
PS.4: Model with mathematics.
PS.5: Use appropriate tools strategically

Mathematics Content Goals:
1. Students will work together to figure out how to hold up a textbook using only two Styrofoam blocks and different types of noodles.
2. Students will determine which noodles work best as a pillar.
3. Students will develop a data table to illustrate the differences between all three of their buildings.

Language Objectives:
4. English learners will use the math academic vocabulary: weight, capacity, strength, firmness.
5. English Learners will be able to work with a partner to better fit their needs.
6. English learners will use realia to help them understand the ending project.

Materials:
1. 5 different kinds of noodle packages for students
2. 2 Styrofoam blocks for each group (if four groups you will need a total of eight blocks)
3. A textbook (make sure students have the same book to help with weight accuracy)
4. One notecard per group
5. A picture of the capitol building

THE LESSON

Before:

- **Activate prior knowledge**
  - Bring a picture of the State Capitol Building for the students to see what pillars are and how they make a building look. Put it either up on the overhead or white board mimeo.
  - Say: Students talk to the person next to you about what you see in this picture. What are these called (as you point to the pillars). Have students talk to their partner about the pillars.
  - Give students more talk time and allow them to discuss these following questions as well:
    1. Think of different buildings that have pillars just like you see in the Capitol Building.

2. Why do you think pillars are on used on some buildings? Why?
3. Why are they important to that place?
4. What would happen if we no longer used pillars?
5. What would be the biggest difficulty to that building if we no longer used pillars?

- Explain the importance of having a pillar. Say: Pillars are used for the purposes of wind or earthquake engineering. Pillars play an important role in strengthening the building. Pillars help the building be strong and earthquake resistant.
- Say: What are some other words we use to describe the strength of a building?

- **Be sure the problem is understood**
  - Say: Now that we have talked and discussed different reasons why pillars are important to a building lets form our own building with pillars. In front of the class you find some materials. You will get two Styrofoam blocks. One Styrofoam will be the foundation of your building. The other Styrofoam will be the roof of your building. You will need to build a building strong enough to hold a textbook.
  - Divide students into four-six different groups (depending how many students are in your class).
  - Tell students they will be using as many different types of noodles to do this building and as they work they will need to write down each noodle they use.
  - Say: There are some guidelines before you begin
    1. You have a variety of noodle groups you can choose from. I want you and your team to make three different buildings to hold the textbook. By different I mean use different kinds of noodles and different amount of noodles in all three buildings. No two buildings should be made the same way!
    2. You may use as many noodles as needed from five different groups of noodles, but you will only get six Styrofoam blocks per group.
    3. You will need to write down everything you used for each of the buildings on a chart I will pass out. Everyone in your group will write the data on your charts.
  - Hand out the attached chart.
  - Say: Does anyone have any questions?
- **Establish clear expectations**
  - Say: Remember this is a team effort. All of you will work together to build a strong building.
  - Do you think using different types of noodles will give you a different amount or strength or weakness?
  - If you used the smaller/thinner noodles will they hold as much weight or less weight than the bigger/thicker noodles?
  - What if we tried different types of books or materials to put on the roof of our building? Will our foundation, pillars, and roof hold up?

During:
Have students record their findings by writing these three boxes on top of a notebook paper.

Building #1	Number of noodles used in total	Amount of Noodle #1 used	Amount of Noodle #2 used	Amount of Noodle #3 used	Amount of Noodle #4 used	Amount of Noodle #5 used
Building #2	How many noodles used	Amount of Noodle #1 used	Amount of Noodle #2 used	Amount of Noodle #3 used	Amount of Noodle #4 used	Amount of Noodle #5 used
Building #3	How many noodles used	Amount of Noodle #1 used	Amount of Noodle #2 used	Amount of Noodle #3 used	Amount of Noodle #4 used	Amount of Noodle #5 used

- **Let go**
  - Walk around the room and make sure students are writing down their findings, but do not give more instructions. Have students (especially English Learners) ask each other for assistance before coming to the teacher.
- **Listen actively**
  - Walk around the room and listen to student engagement.
  - Make sure students are working as a team. Each student should be giving some input when working as a team.
- **Provide appropriate support**
  - Answer different student questions with potential questions.
  - Why is it so important for us to try different kinds of noodles?
  - What if we tried other objects in the room instead of the noodles for our pillars? How would that change your building?
  - What are some of the other things you see around the room we could use (crayons, pens, markers)?
- **Provide worthwhile extensions**
  - When groups finish building their three buildings have each student from the group record their data from the chart (above). Students may use a variety of charts to report their results (They may use any of the following data resources: a line plot, bar graph, or a line graph).
  - If time, allow students to use other materials in the room to build a different foundation and see what the difference with this new pillars material does to their building.
- **Student actions**
  - **Promote a mathematical community of learners**
    At the end of the lesson students will present their findings as a group. To prepare the

students to present to the class each student will first talk to a partner about their project. Have students discuss the similarities, differences, and surprises they found out. This activity will allow English Learners to practice their English before they present.

- **Listen actively without evaluation**
  I will help facilitate discussion by asking non-presenting students to ask questions that they may have. I will also ask clarifying questions, rather than asking questions that direct students to an answer.
- **Make connections**
  - What do you notice about the different noodles you used in your buildings?
  - Can we come up with any rules for the number of noodles needed to hold up the textbook?
  - Why are pillars so important when building something? Other than earthquakes what are some other things pillars help with?
  - If we tried making the buildings two stories what would we have to change?
  - How would that change the pillars and the amount of weight it would need to hold up?
- **Summarize main ideas**
  Today was a great day for learning! Class we worked hard to build strong buildings! Does anyone want to share what was their favorite part of the lesson?

ASSESSMENT

Observe:

- Keep a close eye on the discovering stage of the lesson. You can use their recording sheets as evidence of learning.

Ask:

- If we had to change something from this lesson what would it be?
- Why would you change it?
- What is something that was a surprise to you?