Mathematics: The Language of STEM
M and M challenge

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CONTENT AND TASK DECISIONS

Grade Level(s): 6th and pre-algebra

Description of the Task: Students will use M & M's to estimate, find proportions and ratios.

Indiana Mathematics Content Standards:
6.NS.10: Use reasoning involving rates and ratios to model real-world and other mathematical problems (e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations).
6.NS.8: Interpret, model, and use ratios to show the relative sizes of two quantities. Describe how a ratio shows the relationship between two quantities. Use the following notations: a/b, a to b, a:b.

Indiana Mathematics Process Standards:
PS.2: Reason abstractly and quantitatively. Mathematically proficient students make sense of quantities and their relationships in problem situations.
PS.4: Model with mathematics. Mathematically proficient students apply the mathematics they know to solve problems.
PS.6: Attend to precision. Mathematically proficient students communicate precisely to others. They use clear definitions, including correct mathematical language, in discussion with others and in their own reasoning.

Mathematics Content Goals:
- Students will be able to create, compare and manipulate proportions and ratios.
- Students will use their estimation skills.

Language Objectives:
- Students will explain how to compare and find proportions and ratios verbally to math partners and in written form for the teacher.
- Students will verbally describe how estimation works and how it can help us with every day math.

Materials: Teacher created worksheets and M & M's. The amount needed will depend on the number of groups in the room. Each group will need a small bag and a one- pound bag.

THE LESSON

Before:
- **Activate prior knowledge:**
  - Students will be seated into small groups to enable discussion.
  - The teacher will ask who has eaten M &M's before today? (Most, if not all the class will say they have) The teacher will then ask if they have ever noticed the colors in the bag. (Again, most will say yes)

- The teacher will pose the questions: I wonder how many M & M's are in the small bag? I wonder how many of each color? Who can tell me how I could answer these questions without opening a bag? What math skills can I use?
- Allow the small groups to discuss these questions and then have a time to share possible solutions.

- **Be sure the problem is understood:**
  - During this time of discussion, the teacher will walk the room listening to each group. She/He should notice students using words such as "taking a guess", "estimating".
- **Establish clear expectations:**
  - Students will understand:
    1. The small bag will be examined first.
    2. Using estimation skills, a count of M & M's and the colors of each will be recorded on the worksheet provided.
    3. Then an **actual** count will be recorded on the sheet provided.
    4. As a class, group numbers will be recorded so that all students can visually compare the small group conclusions. (This could be shown on the board, document camera, etc)
    5. This will then be repeated using the one-pound bag.
    6. Finally, activities will take place using the established data. (Finding ratios, and setting up proportions.

During:

- **Let go:**
  - Students will begin to estimate and record their numbers. This will be done on the chart provided.
  - Following the estimating and the class data collection, students will then repeat the task, but will actually count the M & M's and group the colors.
  - This will also be collected as class data.
  - The final activities will be more open ended. The groups will be asked to decide which set of data is most reliable. They will be asked to make a choice and use mathematical evidence to support their reasoning. Students will also be asked to create several examples of how to use this information and create examples of proportions and ratio problems. Students will also need to figure out the best way to present this new information/discovery.
- **Listen actively:**
  - The teacher needs to be aware of any questions or thoughts that seem to trouble students.
  - The teacher also needs to be aware of group conversations so positive verbal reinforcement can be given.
- **Provide appropriate support:**
  - The teacher will help facilitate the collection of data on the "group" graphs.
  - After this information has been collected the teacher will continue to monitor students and the choices being made.
- **Provide worthwhile extensions**:
  - Students could use the collected data to create graphs.
  - Students could use the collected data to find percents.

After:

- **Promote a mathematical community of learners:**
  - Each group will present their examples of proportions and ratios via the document

camera and will explain their logic.

- **Listen actively without evaluation:**
  - The teacher will simply listen.
  - The teacher can respond with a "I notice that you…." Followed by a question that will guide students to a more detailed response.
- **Make connections:**
  - The teacher will ask students to turn and talk with their groups and make connections between the presentations.
  - The teacher can ask, "Why would the M & M company care about our findings? Do you think someone has a job doing this?"

ASSESSMENT

Observe: The teacher will monitor conversation and interactions of students. Listening for ideas and concepts relevant to the task. This allows teachers to understand or get a feel for the depth of

Ask: Explain how and why someone might need to know this type of math. Using a short assessment form (possibly an exit ticket) ---students need to write out their answer. Then as a more detailed assessment option, students could provide an example of how ratios, estimation, and or proportions are used in real world math.

M&M Count and Crunch

1. Estimate the quantity of each color and the total number of candies in your bag. Record your results in the left chart below. (Students should work in groups of two or three, but no more than 9 groups)

2. Open your bag and count the actual number of each color. Record this in the right chart below.

Estimations

Color	Number
Red	
Brown	
Yellow	
Green	
Orange	
Blue	
Total pieces	

Actual Data

Color	Number
Red	
Brown	
Yellow	
Green	
Orange	
Blue	
Total pieces	

Record the M & M data from all the groups in the class. (Actual data only)

Group	Red	Brown	Yellow	Green	Orange	Blue
#1						
#2						
#3						
#4						
#5						
#6						
#7						
#8						
#9						
Total pieces						

3. Repeat this process using a 1-pound bag of M & M's. Record your data for both an estimate and the actual count.

Estimations

Color	Number
Red	
Brown	
Yellow	
Green	
Orange	
Blue	
Total pieces	

Actual Data

Color	Number
Red	
Brown	
Yellow	
Green	
Orange	
Blue	
Total pieces	

Record the M & M data from all the groups in the class. (Actual data only)

Group	Red	Brown	Yellow	Green	Orange	Blue
#1						
#2						
#3						
#4						
#5						
#6						
#7						
#8						
#9						
Total pieces						

4. Which data was the most reliable? The group bag actual count or the whole class actual count? Why do you think this?

5. Using the data above can you find a way to create a proportion? A ratio? Be able to explain your thinking and discover the best way for presenting the information you find. Will a chart help you? OR…will you just need to write an equation?