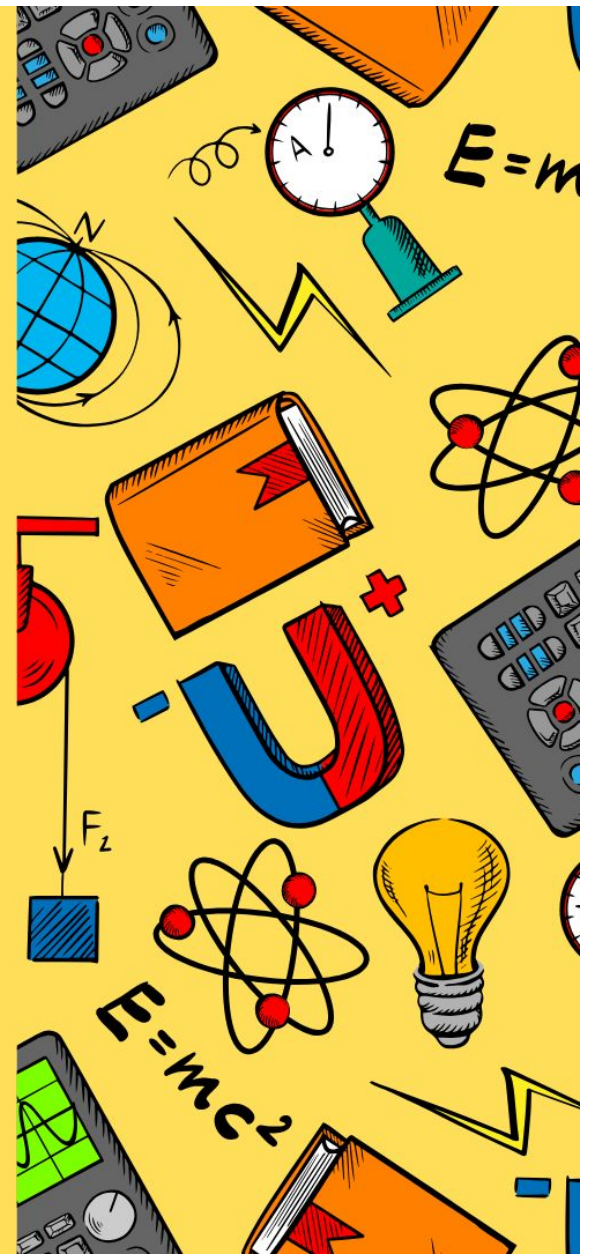




STEM BUILDING CHALLENGE

An open ended activity





Stranded on Mars

The Stranded on Mars activity is one that I have used as a general ice breaker or to connect to other content. It can be done in a very open ended way or be adapted to specific goals and concepts. Below are some ideas for implementing, evaluating, or adapting it. This activity is great in class but also works well for a STEM camp or STEM night.

What's in the bag?

This part is easy! I grab plastic grocery bags or paper gift bags and fill them with a mix of recyclables or "trash" from the classroom or home. I usually include a combination of the following:

- 2-3 empty toilet paper rolls or paper towel rolls
- 2-3 pages of newspaper
- 2-3 pages of card stock or printer paper
- 1-2 empty drink cans or bottles
- 1-2 paper plates
- 2-3 pieces of plastic cutlery (spoons or forks or knives)
- A square of aluminum foil (enough to cover a plate; this is how they make the disc)
- Pipe cleaners or string or wooden craft sticks

I also give each team about a foot of masking tape, or sometimes more depending on the age of the students.

- 1) To prepare for the activity, set up the bags. You'll need one bag per team, and it's up to you whether all groups have the same materials or not. I usually provide exactly the same materials to all so that we can compare the choices made by different teams.
- 2) Next, you'll need a way to provide the directions to the groups. You might attach a handout to each bag or project the handout to the class. I like to project the handout to the class so that we can all plan for a rubric together (if we are assessing this).
- 3) Prepare a rubric. This can be done with the students or ahead of time depending on how important the rubric process is to your goals or your classroom climate. I usually talk through the bullet points provided and

guide students in wording each into a part of our rubric. Sample rubrics that have resulted from that are on the following pages.

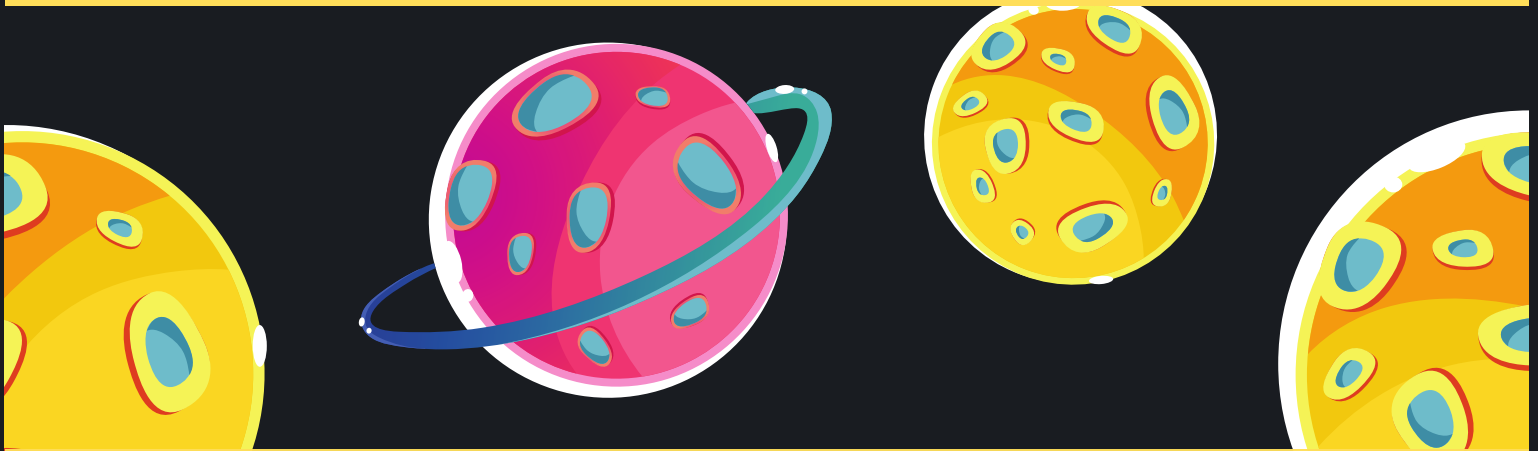
- 4) Provide students with the scenario and a time frame. If you are using this as a quick building activity, then 15 minutes is often plenty of time to work. If you are building in additional content connections, however, then expand the time frame appropriately.
- 5) Conduct a follow up discussion. The following questions can be helpful:
 - a) What was an example of where you changed your plan along the way? Why?
 - b) Take a look around the room. What similarities do you see in the structures? Differences?
 - c) Which structures do you think are tallest? Sturdiest?
 - d) Which of our structures could realistically be helpful on the surface of Mars? Why?
- 6) Evaluate the structures together using the rubric. Allow each group to share briefly about their strategy and to provide their estimates for heights. Provide some tools to get the actual heights of the towers.
- 7) Connect this task to other content. For example, you could:
 - a) Discuss how groups may have used non-standard units or proportionality to make an estimate of their towers,
 - b) Explore how the atmosphere of Mars might make the towers be redesigned,
 - c) Contrast the atmosphere of Mars with that of other planets or the moon,
 - d) Connect to literature or movie references and allow students to do some creative writing about their experience as a team stranded on Mars,
 - e) Read and discuss stories of real-life astronauts or other explorers, or
 - f) Collect all heights and create an appropriate data representation of the tower heights in the class or group.

Sample Rubric - Stranded on Mars!

The following is a sample beginning for a rubric. Using a simple rubric can help introduce students to their use, but a more specific and well-developed rubric could be used if this task were to be assigned to a grade or to assess particular content. This rubric uses a simple 0, 1, or 2 scale with some of the attributes being that the participants built appropriately. Of course, the scores can be scaled differently to weigh the different components to represent your goals.

Aspect of the Tower	Criteria	Score Received
Tower is free-standing	0 - Tower is not free-standing or fails to stand at the end of the given time 1 - Tower is free-standing but fails to remain standing at the end of the given time 2 - Tower is free-standing and remains standing at the end of the given time	
Uses appropriate materials	0 - Tower uses materials that are not allowed 2 - Tower uses only the provided materials	
Tower holds a foil disc as required	0 - Tower fails to hold a foil disc 1 - Tower holds a foil disc but not at the required angle 2 - Tower holds a foil disc within the required angle window	
Tower estimate of height	0 - Group provides an estimate that is more than 10 cm away from the actual height 1 - Group provides an estimate that is between 5 and 10 cm away from the actual height 2 - Group provides an estimate that is within 5 cm of the actual height	
Tower height	0 - Tower is in the smallest third of the class 1 - Tower is in the middle third of the class 2 - Tower is in the upper third of the class	

STRANDED ON MARS



Your team has just crash landed on Mars and may be stranded - unless you can build a radio tower to call for help!

Before your craft exploded, you were able to collect the materials in this bag. Can you create a freestanding radio tower using ONLY the materials provided? Your tower must:

- stand on its own and cannot be attached to the ceiling, tables, chairs, floor, or other items that are not part of its structure),
- hold a foil disc on top that tilts at an angle of between 60 and 80 degrees from its base, and
- be the tallest in the classroom for you to be saved!

Once you have created your tower, your team should develop an estimate of its height in the given units without using a measuring tool. Be creative in how you reason through this!

Good luck!

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