

Cloudy with a Chance of Science!

Week 3

Day 4: Gotta Plan?

Teacher/Parent Background:

When scientists and engineers are faced with a challenging question or problem, they follow steps to best address their task. In engineering fields, engineers use the Engineering Design Process to propose solutions to problems in order to make the world a better place. Engineers start by clearly defining the problem, imagining possible solutions and designing a plan before they create their solutions.

Overview:

In this activity, students will utilize the steps of the Engineering Design Process in order to design a plan for their challenge: *How can we design a house that can withstand the effects of a monsoon?*

Related Standards:

- Collect, analyze, and interpret data to explain weather and climate patterns.
- Define problem(s) and design solution(s) to minimize the effects of natural hazards.

Key Terms:

- Severe weather: a dangerous weather event that puts people, animals and buildings at risk.
- Engineering Design Process: a set of steps engineers use to propose solutions to problems
- Constraints: limitations or restrictions

Materials List:

- Parental/adult supervision
- Possible house/roof building materials:
 - Cardboard pieces
 - Aluminum foil
 - Construction paper
 - Popsicle sticks

- Foam
- Fabric
- Clay/Playdough
- Notecards
- Pen/pencil
- *Student Resources - Pages 5-7*
 - *Challenge Details*
 - *Step 2: Imagine*
 - *Step 3: Plan*

Activity Description:

- Ask students to revisit the “Ask” step and discuss other “need to knows”. Possible student responses may include:
 - I need to know...
 - Which monsoon conditions are we testing?
 - What materials do we have to build the house?
 - How should the house be built?
 - How much time will we have to build the house?
 - Others have...
 - Used brick, wood, stone, metal, etc. to build strong houses.
 - Used slanted roofs or gutters to move rain off of the top of houses.
 - Experienced and fixed leaks inside houses if the roof wasn't built strong enough.
- To answer the remaining “need to knows”, review the *Challenge Details* with students. Encourage students to ask clarifying questions about the challenge details.
- Provide time for students to become familiar with the possible house/roof materials.
 - Prompt them to feel and bend the possible house and roof building materials for flexibility/rigidity, structure/support, texture, absorbency considerations, and other various properties.
 - **Note:** The amounts/types of materials will depend on the availability of materials. Limit quantities as you see fit.
- Then, direct students to revisit their remaining “need to knows”. Possible student responses/questions may include:
 - How much time will we have to build/test the house?
 - Now that the challenge has been clearly defined and we have accomplished the “Ask” step, you will have today to imagine and plan for your solution. Tomorrow, you will build, test and improve your solution.
- Guide and actively assist students through the “Imagine” step of the Engineering Design Process by reviewing *Step 2: Imagine*. Key details/directions include:

- Now that the problem has been clearly explained/defined...
 - brainstorm more than one possible solution to the problem.
 - keep in mind the materials/design requirements, as they should be incorporated into your designs.
 - draw and label diagrams of your designs, write-out words/phrases to help you brainstorm!
 - pick your best solution to share with others.
 - **Note:** Depending on the learning environment, the adult/parent may be the only other person in the “class”. Act as a sounding board for the student, allowing him/her to share their best solution ideas.
- Next, guide and actively assist students through the “Plan” step of the Engineering Design Process by reviewing *Step 3: Plan*. Key details/directions include:
 - Work together to decide on one best solution to be built by the whole team. This solution should include ideas from the team; not just one member’s ideas!
 - keep in mind the materials/design requirements, as they should be incorporated into your solution.
 - **Note:** Depending on the learning environment, the adult/parent may be the only other person in the “class”. Act as a design team member by listening to their ideas and sharing additional thoughts/your ideas. You will both work as a team to design a plan.
 - Draw and label a design of your solution and create a materials list with types and amounts of materials needed.
 - **Note:** The types/amounts of materials will depend on the availability of materials. Limit quantities as you see fit.

Closure:

- Ask students to think about tomorrow’s activities. Engage in a discussion:
 - Thinking about what engineers do, what steps will be taking tomorrow to propose your best solution to the challenge?
 - What are you most looking forward to?

Extensions:

Continue the Investigation!

- Prompt students to research steps/tips to best prepare for the upcoming monsoon season:
 - What can you do to prepare the inside of your house?
 - What can you do to prepare the outside of your house?

- Can you design a *Monsoon Emergency Checklist* to show others how to be safe before, during and after a monsoon?

Student Resources

Challenge Details

Dear Student,

As a local meteorologist, my team and I are interested in working with you to teach the public about how to stay safe during the upcoming monsoon season! You have been tasked with designing a model house that can withstand the effects of a monsoon. Please closely follow all details outlined below:

- 1. Use the steps of the Engineering Design Process to design the best possible house. This includes:**
 - a. Imagining possible solutions - there are many possible solutions to this one challenge; think big!
 - b. Planning your chosen solution
 - c. Creating and testing your solution
 - d. Improving your solution to make it even better

- 2. You may only use two of the following building materials - one to design the model house and one to design the roof:**
 - a. Cardboard
 - b. Aluminum foil
 - c. Construction paper
 - d. Popsicle sticks
 - e. Foam
 - f. Fabric
 - g. Clay/Playdough
 - h. Notecards

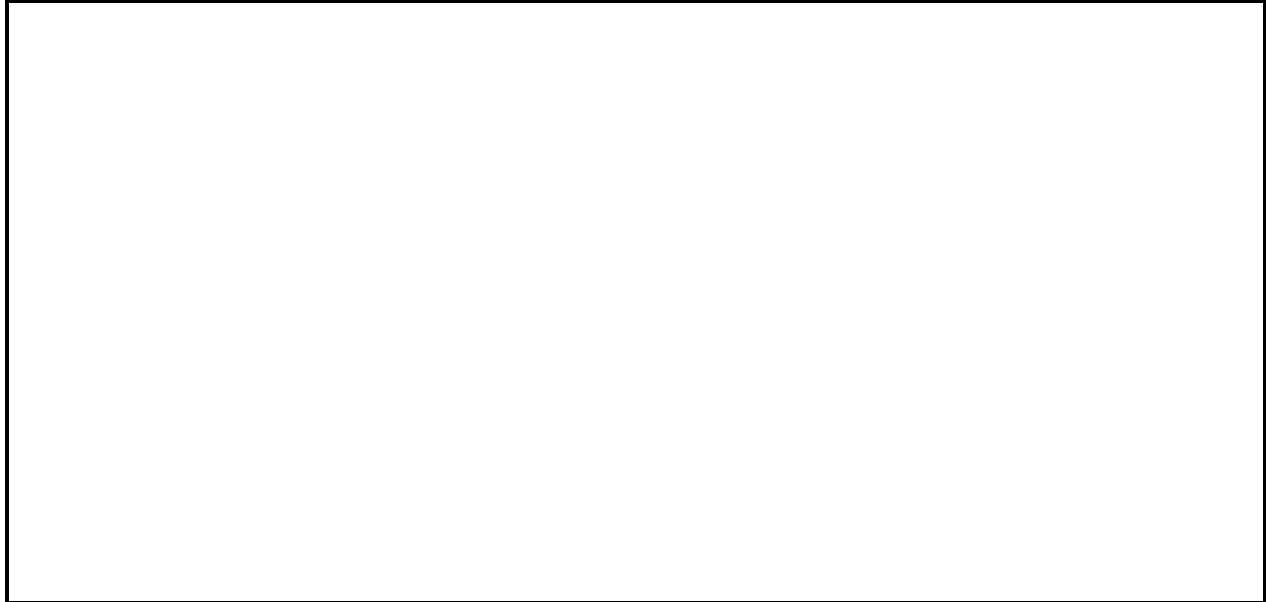
- 3. Your model house and roof must include/stay within the following design requirements:**
 - a. Your model house must have four walls; similar to that of a box.
 - b. Your roof must be peaked and placed on top of your house.
 - c. Your design must be able to withstand monsoon rain and winds!
 - i. Your roof must stay on top of the house without being blown away.
 - ii. You must keep a paper towel dry inside the house.
 - iii. Your roof cannot collapse under water and wind forces.

My team eagerly awaits your design proposal. Best of luck!

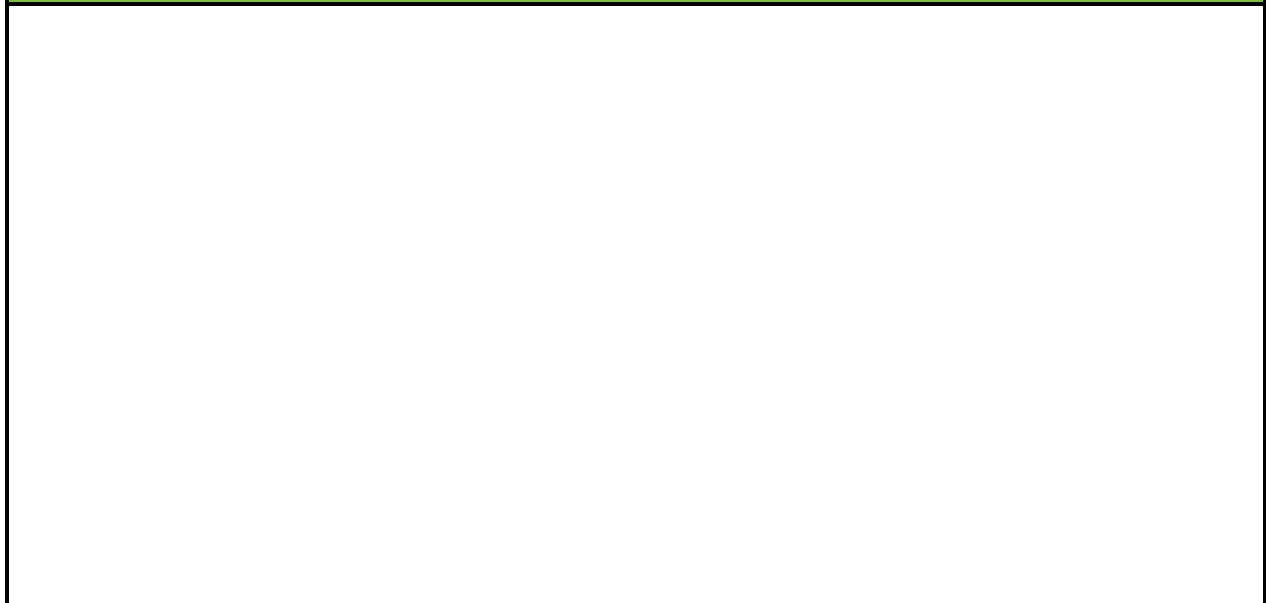
Sunnie McCloudster, Chief Meteorologist

Step 2: Imagine

Possible Solution #1
(include a diagram with labels)



Possible Solution #2
(include a diagram with labels)



Step 3: Plan

Team Solution (include a diagram with labels)	Materials List (include material types and amounts)