**CUBLES STEM**

| **1. Lesson Plan Information** | |
|---|---|
| **Subject/Course:** SCIENCE & ENGINEERING | **Name:** |
| **Grade Level:** 6th | **Date:** **Time:** |
| **Topic:** Material Composition, Experimental Design, and Engineering | **Length of Period:** |

**2. Expectation(s)**

## Standard(s):

## SCIENCE

| | |
|---|---|
| **MS-PS1-1.** | **Develop models to describe the atomic composition of simple molecules and extended structures.** |
| **MS-PS1-3.** | **Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.** |
| **MS-ETS1-1.** | **Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.** |
| **MS-ETS1-2.** | **Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.** |
| **MS-ETS1-3.** | **Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.** |
| **MS-ETS1-4.** | **Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.** |

**3. Content**

***What do I want the learners to know and/or be able to do?***

- **Make observations.**
- **Design and conduct an experiment.**
- **Generate multiple solutions.**
- **Test a solution.**

**Today learners will:**

- **Measure objects using a ruler.**
- **Construct a figure from a foldout.**
- **Make observations about the function of a tool.**
- **Ask questions and generate a solution.**
- **Design and conduct an experiment.**

**4. Assessment (collect data) / Evaluation (interpret data)**
**(Recording Devices (where applicable): anecdotal record, checklist, rating scale, rubric)**

***Based on the application, how will I know students have learned what I intended?***

You can check the answers provided from your students throughout the handout. Questions 10-13 are to end the lesson and have students thinking more critically using data to generate answers. You can take it one step further by using the extension questions.

**5. Learning Context**

**C. Resources/Materials**

1.) CUBLE Packet
2.) Lined Paper
3.) Ruler
4.) Construction Paper
5.) Other materials possible depending upon student generated solutions.

**LESSON**

**ACTIVATE PRIOR KNOWLEDGE**

**TEACHER NOTES: Use questions related to shapes, measurement, and the function of tools.**

Sample Student Questions (these questions are not on the attached handout).

1.) What is a molecule?
2.) How do you think the structure of a molecule determines the properties of an object?
3.) If you have wood, paper, and metal, which would you use to build your house out of? Explain.

**LESSON INTRODUCTION**

**TEACHER NOTES:**

Pending on the CUBLE(s) your class is using this can be changed to reflect a more engaging hook.

Today, you are going to get a CUBLE, which you will assemble, construct accessories for, and test their durability. You will be thinking about the most durable materials used to build.

**MIDDLE:**

**TEACHER NOTES: This lesson develops students skills to design and conduct an experiment, and think make correlations between molecular structure and physical properties of substances. Students will answer questions 1-13 on the handout.**

**<u>Differentiation</u>:**

**(Scaffold Lower):**

(A) **Provide a links to find information on the materials and their molecular structures.**
(B) **Demonstrate how to assemble the CUBLE.**
(C) **Have a class discussion around ideas on testing durability before having students write their procedure.**

**(Scaffold Higher):**

(A) **Ask the student(s) to test more materials.**
(B) **Ask the student(s) to test multiple measures of durability.**

**CONCLUSION:**
**TEACHER NOTES: The final product for this lesson is question 10-13.**

**EXTENTION QUESTION:**
List 3 of materials that may be better to build CUBLES and construct a cube using one of the materials listed in #14, then repeat you experiment from #10 using the new cube.

STUDENT HANDOUT

CUBLES STEM
Grade Level: 6

Class:_____ Student Name:_____

GOALS for you:

- Make observations.
- Conduct an experiment
- Evaluate materials based on molecular structure

1.) Look through the materials in your CUBLES packet. Compare and contrast your thoughts on how a common toy is packaged vs. CUBLES.
   a. Highlight any words or phrases that you think are the most positive traits.
   b. Circle any words or phrases that you think can be dramatically improved.

2.) Make observations about the material used to build the CUBLE, then build it.

3.) Design a cube that will be an accessory to your CUBLE. Draw your layout below, then use a piece of common lined school paper to construct it.

4.) Create another cube identical to #3 using construction paper.

5.) Now that you have 2 identical cubes record observations about each.

LINED PAPER CUBE

CONSTRUCTION PAPER CUBE

6.) What type of material is your CUBLE made of?

7.) Research how each type of material is created and list your findings below.

| Material | How it is made | Cite your resource(s) |
|---|---|---|
| Lined Paper | | |
| Construction Paper | | |
| CUBLES material _____ | | |

| | | |
|---|---|---|
| | | |

8.) Research the molecular structure of the materials.

| Material | Describe & Draw the molecular structure | Cite your resource(s) |
|---|---|---|
| Lined Paper | | |
| Construction Paper | | |
| CUBLES material _____ | | |

9.) If the goal of CUBLES is to make a durable product. What does that mean?

10.) Design an experiment to test the durability of your CUBLE and your accessories.

- Research Question:
- Hypothesis:
- Procedure:

- Data you intend to collect:

11.) Conduct your experiment. Place your data above in #10 and summarize your results here.

12.) Examine your experimental results and the molecular structure of the materials. What pattern(s) do you see?

13.)Of the 3 materials you have researched, did CUBLES choose the best material to make their product? Explain.

**EXTENTION QUESTIONS**

14.) List 3 of materials that may be better to build CUBLES.

a.

b.

c.

15.) Construct a cube using one of the materials listed in #14, then repeat you experiment from #10 using the new cube.

a. Data collected:

b. Data interpretation: