LESSON 2: Scientific Method vs. Engineering Design Process

The scientific method is a series of steps followed by investigators to answer specific questions about the natural world or to explain an occurrence or phenomena. It involves making observations, formulating a hypothesis, conducting experiments to test the hypothesis, gathering and evaluating data to form conclusions.

The engineering design process on the other hand is a series of steps that engineers follow to solve a problem. Many times the solution involves designing a product that meets certain requirement/criteria and/or accomplishes a certain task.

This lesson will introduce you to the scientific method and the engineering process – how they are similar and how they are different from one another by doing two (2) separate activities but which revolves around a common theme: cereals.

Activity 1: Using the Scientific Method: Food Detective/Cereal Slayer

Learning Goals: Students will

- read nutrition labels and find out how much fiber and sugar are found in different brands of cereals.
- choose a product that has the highest fiber but lowest sugar content.

Materials:

- labels from different brands of cereals
- handout: how to read a nutrition facts label
- cereal slayer worksheet

Procedure:

1. Work in pairs or groups of 3 or 4.
2. Place all labels on the table.
3. Analyze each label. Use the hand-out “How to Read Nutrition Facts Label”
4. Fill out the cereal slayer worksheet with your answers/observations.

Discussion Questions:

1. Why is breakfast referred to as the most important meal of the day?
2. What food groups are predominantly present during breakfast?
3. What are cereals? Which cereals are healthier choices and why?
4. What is the difference between sugar and fiber? How important are they in one’s diet?

5. What is the recommended daily allowance for sugar and fiber?

Activity 2: Using the Engineering Design Process - Redesigning the Cereal Box

Overview:

Studies show that breakfast is the most important meal of the day since it jump-starts our activities but our busy schedules and lifestyles sometimes do not allow us to indulge in sit-down breakfasts where we can sample an assortment of food items and make healthy choices. Oftentimes, the quick fix is a bowl of cereals which contains carbohydrates (sugars and starches) that provide us with energy and loaded with fiber that can help curb our hunger and keep us feeling full and satisfied throughout the day or until our next meal. Most of these cereals contain a lot of sugar and too much of a good thing can be a bad thing. And monitoring sugar consumption can be problematic if one is always on the go. Designing and constructing a cereal box that would provide consumers with a portion that contains the recommended daily allowance of sugar and fiber can help promote health since people often mistake package size for recommended serving size.

Challenge:

Design a cereal box for an amount of cereals that contain the recommended daily allowance for fiber and sugar. (Note: Choose a particular cereal and consider packing and handling requirements from point of origin to your table in your design for no one wants to eat crushed cereals!)

Learning Goals: Students will

- apply concepts of measurement
- select and use appropriate laboratory tools and units of measurement depending on degree of accuracy required.
- use research, critical-thinking, and problem-solving skills
- design a cereal box that will contain a single serving of cereals with the recommended daily allowance of sugar

Materials: cardboard, scissors, glue, plastic wrapper

Procedure:

1. Brainstorm with your partner or group.
2. Make a sketch of your proposed design. Indicate measurements.
3. Create a prototype.
4. Test your prototype.
5. Present prototype.

Discussion Questions:

1. In your cereal box design, what is the relationship between form and function?
2. What is the importance of precision and accuracy in making measurements and their effect on design?
3. How does your cereal box differ from the other boxes found in the market? How much cereal can your single-serving box design contain?
4. What features of the cereals you chose did you consider in redesigning your cereal box?
5. What were some of the constraints that you had to grapple with in redesigning your cereal box?

Data and Results:

Activity 1**.** *Tables and Graphs (if any)*

Activity 2. *Cereal Slayer Worksheet*

Cereal Box Design

Cereal Box Prototype (3D model of the Design)