

Task: Snack Assembly Line

Science: Middle School

A. Introduction

In this delicious activity, teams of students learn about the engineering design process and the Kaizen method by creating an assembly line to pack as many snack bags in 2 minutes as possible. They then see if they can improve their process using the Engineering Design Process or Kaizen methodology. At the end of the project student groups will create a report and graphic representation of their data using Excel. They will also make a presentation to the class with a focus on using the Kaizen story or Engineering Design Process.

B. Materials

Note: Amounts for 20 children include 100 of each size of plastic bag, 4 bags of cookies, one large container of sprinkles, 2 boxes of Cheez-Its, 2 containers of frosting, 2 large bags M&Ms, paper and markers for each groups, a knife for each group, 3 cups per group to hold sprinkles, frosting, and candies. Adjust the amount per snack bag depending on what you have and size of group.



A complete snack bag (above) must contain: 1 small bag with 12 M&M's and 4 Sour Patch Kids; 1 small bag with 8 Cheez-its; 1 small bag with two cookie sandwiches; 1 note (any shape) from Mom that says "have a good day" or "love from Mom."

For each group of 3-5 students:

- Very small snack bags
- Sandwich bags
- Cookies (small, such as the small chips ahoy or vanilla wafers)
- Sprinkles
- Frosting
- Cheez-Its
- M&Ms
- Sour Patch Kids or other candy
- Paper
- Markers
- Scissors
- Plastic knife for frosting cookies
- Small cups to separate M&Ms, sprinkles, etc

C. Procedure

1. Create teams of approximately 4 students per group.
2. Explain that their task is to create an assembly line to pack as many snack bags in 2 minutes as possible. (Students or teacher can time the 2-minute task.) Only completed snack bags count.
3. Each snack bag will contain a small bag with 10 M&M's and 4 Sour Patch kids; another small snack bag with 2 cookie sandwiches; another snack bag with 8 Cheez-its; and a heart shaped note from Mom.

The cookie sandwiches consist of two cookies, frosted, sprinkled, and put together. (Photo, below)



4. Students must document their assembly line layout prior to the activity. They can shift people as needed as time progresses and they must complete their bags. These changes must be documented at the end of the "shift."
5. Repeat – but with only one minute. Ask teams to use the Engineering Design Process or Kaizen to find ways to improve their process.
6. Students create graphs of their data using Excel and prepare a presentation for the class using either the Engineering Design Process or Kaizen story.

Common Core State Standards

1. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
2. Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
3. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
4. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
5. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.

6. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.
7. Use precise language and domain-specific vocabulary to inform about or explain the topic.
8. Establish and maintain a formal style and objective tone.
9. Provide a concluding statement or section that follows from and supports the information or explanation presented.

State Standards

1. Evaluate a protocol to determine if the engineering design process was successfully applied.
2. Interpret and translate data into a table, graph, or diagram.

Essential Understandings

After completing this activity, students should be able to:

- Collect data to frame and solve problems
- Connect time with task completion and productivity
- Understand that work can be broken down into discrete tasks
- Develop ways to improve a process (Engineering Design Process/ Kaizen)
- Understand the role of industrial engineers in making systems more efficient.
- Utilize Excel to produce graphs from their data
- Make a presentation of their findings to the class

Possible Solutions/Solution Paths

Groups will have to work cooperatively to have the best results. They may choose to have each member "specialize" in a portion of the task or have the group as a whole make the completed product from start to finish. Groups will have to design the setup and layout of their assembly line as well as assign individuals to specific roles. Students must all speak during presentations and have a working knowledge of the Engineering Design Process in order to be able to answer questions at the end of their presentations.

Additional Teacher Information

Note that if an assembly line runs out of "materials" due to workers eating the products; that factory is out of business.