The Candy Factory

Lester Long, West Fork School District, Arkansas

Overview

Students produce packages of candies using one of two methods: felt-weight or scoop. The time limit for production is 5 minutes for the felt-weight and 1 minute for the scoop.

Prepare

For small groups of students: a scale that can measure between 80 and 180 grams (2 or more groups can share a scale), 2 bags of party-size (56 oz.) M&M's in a large bowl, 10 plastic sandwich bags, a bag of washers weighing 119g, and a 5 oz. cup (Solo brand).

The Processes

(1) Felt-weight. One student holds the bag with washers in one hand and an empty sandwich bag in the other. A partner fills the empty bag with M&M's until the weight of the M&M's feels equal to the weight of the bag containing washers. (Students are not informed that the weight of the bag is 119 g.) Students continue production until time expires. After time expires, they weigh and record the weight of each bag.

(2) Scoop. Partners take turns filling a 5 oz. cup and transferring its contents to the plastic bag. Students continue production until time expires. After time expires, they weigh and record the weight of each bag.

Using Statistics as Measures of Process

The class assembles the data into a TinkerPlots file that includes a variable for method of production. I recommend starting out with the entire set of data to make inference about the target value of the process, using the sample mean or median, and the consistency with which the target was attained, using the average deviation or IQR. Be sure to emphasize the interpretation of what each statistic is measuring about the process.

Then separate the data by method of production and consider whether or not either method is in some sense "better" by appealing to statistics of central tendency and consistency.

Teacher Note

There is a slight variation by manufacturer in 5 oz. cups, so if you use another brand, be sure to fill it carefully and calibrate the weight of the washers to that brand.

Variations

Because M&M's are costly, some teachers use beans instead of M&M's. The felt-weight bag of washers must be calibrated to the 5 oz. cup equivalent in beans. Because beans are organic rather than manufactured, there is more variation in mass from 5 oz. cup to 5 oz. cup, so a mean weight is likely a good choice for the felt-weight condition (the mass of the washers). Do not inform students of the mean weight.

Another potential variation is to use the scoop as a standard "pile" of beans, and students fill the bag until they visually estimate that the amount of beans in the scooped pile and in the bag are the same. This is then a felt-weight vs. visual-estimate comparison.

A third variation that I have not yet tried is to use buttons instead of beans, because buttons are also manufactured and hence tend to be less variable from button to button.

Resources

See CandyFactory.tp for previously collected data comparing the felt-weight and scoop methods.

Student Names_____

Date_____

You are working in a candy factory making packages of candies. You are attempting to make the weight of each package exactly the same. There are two methods that the factory is considering adopting. You will try out one (or both) of these methods in order to see how consistent it is and to discover the target value per package of candies.

The **scoop method** consists of scooping the candies into a scoop and then pouring the contents of the scoop into a plastic bag. Label the bag in order of production (1, 2…). The maximum time allowed is 1 minute.

The **weight method** consists of holding the bag of washers in one hand and pouring candies into a production bag until the weights feel the same. Label the bag in the order of production (1, 2…). The maximum time allowed is 5 minutes.

For the method you use, after you package the candies, record the weight of each pack.

Method: Scoop	
Bag #	Weight (gm)
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

Method: Weight	
Bag #	Weight (gm)
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	