Optimal Design Principles of Microwave Smores Maker

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Introduction

Materials and Methods

TO DO:

- Measure weight of hands

Reagents & Assembly: Smores were composed of mini marshmellows, salt crackers and small Hershey's Milk and Dark chocolates. Each smore was assembled with a chocolate bar at the bottom followed by exactly 3 mini marshmellows per smore. We ensure the stability of each structure before starting the microwaving process. In experiments where the slinky hands were used, they were used to hold the structure during the transport from table to microwave.

Heating: Smores were microwaved is a traditional microwave with or without water in the water chamber for a total of 75 seconds and 55 seconds in separate experiments. The status of each smore was checked every 30 seconds, resulting in a brief delay of no heating. In experiments with water in the water chamber, filtered water (room temperature) was added to the prescribed fill line.

Results

Slinky hands critical for Smore stability

The soft and bouncy form of marshmellows, whether big or small, makes the assembly of a smore quite a chore. To ensure that an assembled smore retains its structural integrity throughout the melting process, the maker incorporates light "hands" to hold the structure down in the microwave. Given that the hands are light and barely produce any pressure, it was unclear if it is truly maximizing its functional potential. We test the necessity of such a feature by microwaving the smore with and without the hands to support its structure. This experiment was done without any water in the water chamber (see below). To our surprise, we find that in spite of its light weight, the hands are indeed serving their function of maintaining Smore structural integrity **(Figure 2)**. Without the hands, the smore collapses sideways as its contents melt. It is worth noting however that there is also considerable collapse of the smore produced with stable slinky hands

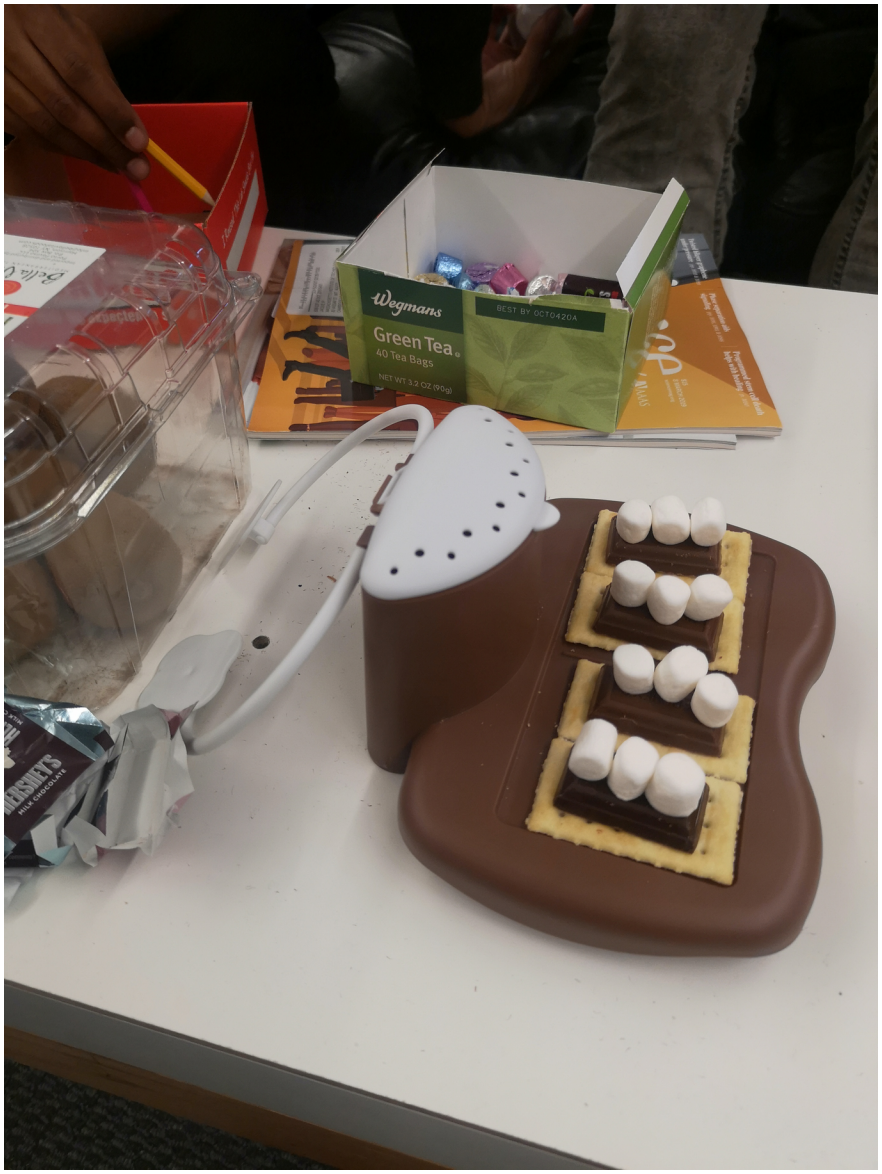

Figure 1: Experimental Design showing the composition and assembly of smores. A top salt cracker (not shown) is subsequently added to sandwich the smore.

(see Discussion). Unlike unsupported Smores, its collapse did not result in Smore content spillover and the Smore remains in tact upon removal from device.

Water chamber ensures optimal humidity and prevents burning

A key element of the Smores maker is water chamber with vent holes. To test the hypothesis that heat in the microwave, without water, is sufficient for making smores, we microwaved a batch of smores for 55 seconds. This duration is much shorter than the control 75 seconds because the smores began burning and the experiment had to be aborted prematurely. Upon closer examination, we find the marshmellows have

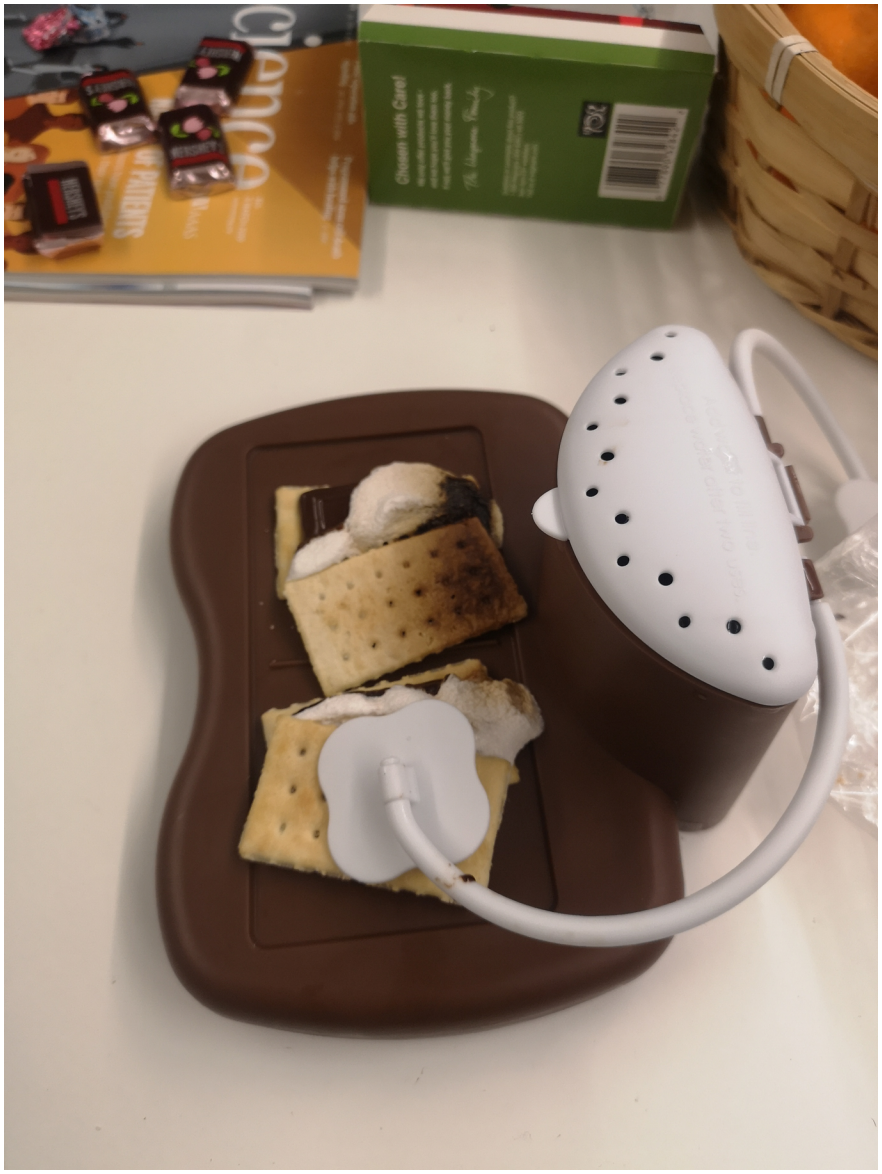

Figure 2: Smore structural stability

become dried, charred and hardened (Figure 3). A taste test confirmed that the resultant smores were inedible. The burning also left charred, sticky marshmellow residue on the device, which can require heavy scrubbing for removal. Thus, unsurprisingly, the lack of water in the making of microwave smores is likely to cause rapid burning, and is not recommended for future smore production.

Result Conclusion

We find that the Progressive microwave Smores maker was indeed progressive and has functional design, with each element making critical contribution to the production of optimal Smores.

Figure 3: Charred Smores when produced without water

Discussion

The limitation of our experimental design was the use of salted crackers instead of graham crackers as in classic Smores. Relative to salted crackers, classic graham crackers are less dense but heavier, thicker and wider. The different cracker composition can contribute to Smore stability and influence burning.

In addition, the experiments involving slinky hands and water were done with 2 smores per batch instead of the 4 smores (its full capacity). It is conceivable that the reduced batch size can provide more room

for smore collapse. Unfortunately, limitations in research funding has restricted the extent of our research questions, but we believe this to be a pressing question we shall soon address with more funding.