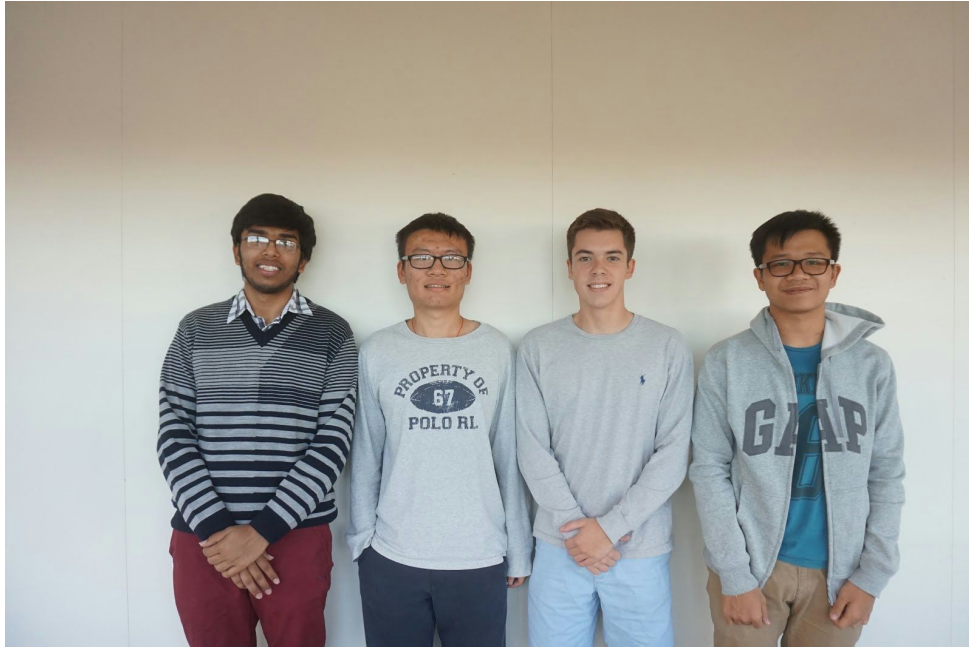


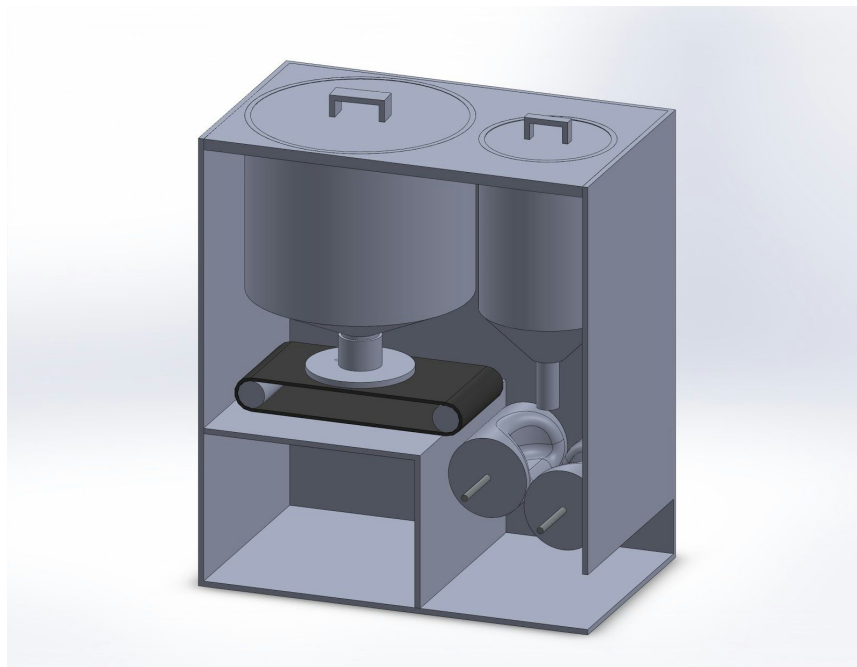
Portable Dumpling Maker Project



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Submitted to [Xinli Wu](#)

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Abstract

[Shunran Xu](#)

This is a report of an EDSGN 100 project by [Shunran Xu](#), [Swapnil Dubey](#), [Faris Ghazali](#), and [Kyle Moran](#). The objective is to design and build a prototype of a dumpling maker to the given specifications. This report documents the process of design for the dumpling maker.

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Introduction

[Shunran Xu](#)

Dumplings are one of the most popular Chinese foods in the United States. However, manually making dumplings is laborious. In EDSGN 100: Introduction of Engineering Design, Dr. Xinli Wu challenges students to design a fully or semi-automatic dumpling maker that can facilitate the process of making dumplings in a household or restaurant setting.

Description of Design Task

[Shunran Xu](#)

Problem Statement:

Traditionally, dumplings are made by hand, but this manual process is tedious, as well as inconsistent. Industrial dumpling makers, on the other hand, are very expensive and bulky. The great demand for dumplings in the consumer market calls for a newly-designed dumpling maker that is convenient, cost-efficient, and easy to use in a normal household or restaurant setting.

Mission Statement:

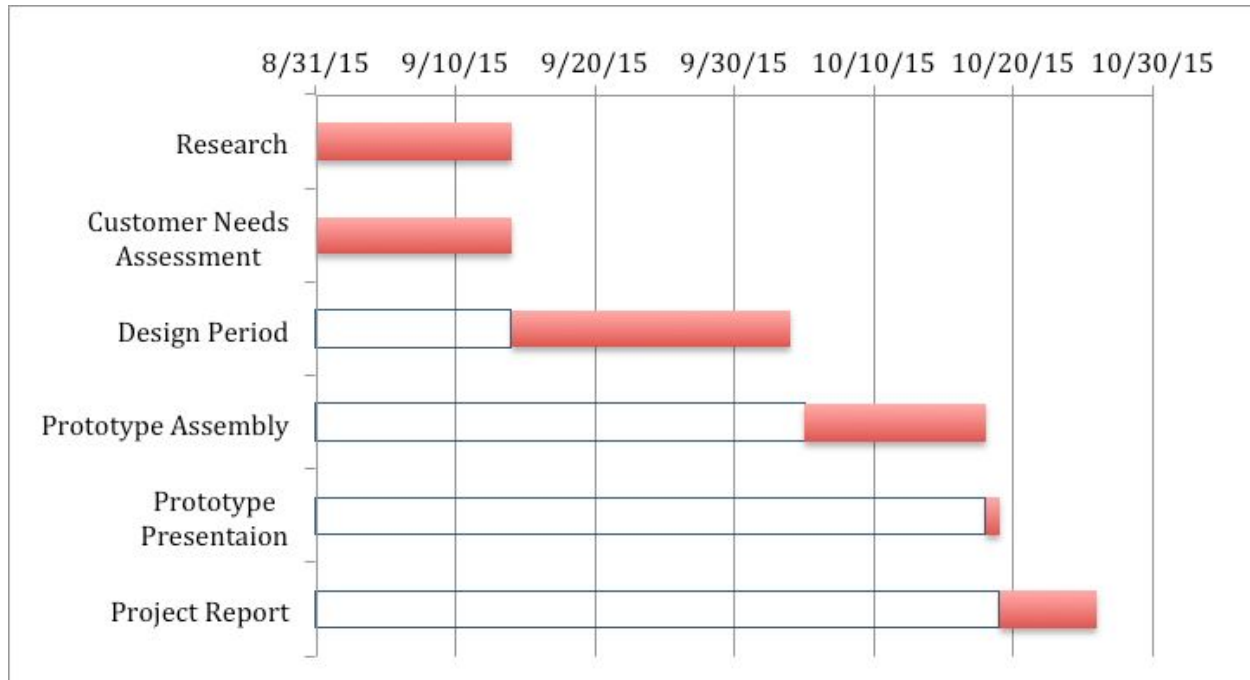
The mission is to design and construct a conceptual prototype of a semi- or fully automatic dumpling maker suitable for either personal or restaurant use.

Design Specification:

- The dumpling maker should be automatic or semi-automatic.
- The dumpling maker should produce no less than 10 dumplings per minute on average.
- The material cost for the dumpling maker should not exceed \$200 unless it can be justified.
- The dumpling maker should be safe as a food processor, easy to maintain, safe to use, and dishwasher safe.

Gantt chart

[Kyle Moran](#)



Customer Needs Assessment

[Kyle Moran](#)

Question 1: If an affordable automatic dumpling maker was available, would your restaurant be interested in purchasing that machine?

- China Wok Restaurant (Binghamton, NY): We learned from this restaurant that they roll each piece of dough out by hand into a circle (which sounds time consuming) and then proceed to fill and fold the dumpling. They did not seem interested in such a machine, probably due to the tradition of the process and because a machine would not give as professional of a look as a hand fold.
- Foliage Chinese Restaurant (Johnson City, NY): The manager of this restaurant seemed intrigued by the idea of an affordable dumpling maker and said that although dumplings are a rather small part of their menu, this kind of device would be helpful if it was easy to maintain and relatively cheap.

Question 2: How long does it take your restaurant to prepare an average order of dumplings?

- China Wok Restaurant (Binghamton, NY): This restaurant claimed that they could typically have a dumpling order ready to cook in under 5 minutes and to the customer in under 30 minutes. If we set our machine to produce 10-12 in a minute it seems our method would be more efficient.
- Foliage Chinese Restaurant (Binghamton, NY): This restaurant gave a very similar answer to *China Wok* explaining that they are able to fold dumpling fairly quick (under 5 minutes) and can have an order ready in about 25 minutes. We received more evidence from this answer that a machine able to produce 12 dumplings in a minute would be both more efficient and less labor intensive than hand folding.

Concept Generation

[Kyle Moran](#)

Research

Our first step in our developing process was to gather all of our research, customer needs, and design specifications. From the initial assignment we knew basic parameters and constraints we were dealing with. Those guidelines were as follows:

- The design must be dishwasher safe.
- The design must be able to produce ten dumplings in one minute or less.
- It must be able to produce the dumplings after loading only dough and filling into the machine.
- It could be either semi-automatic or automatic.
- The final product must cost less than \$200.
- The design must be functional for both a home kitchen and a restaurant.

Design

Once we gathered all of our background information we were then able to start brainstorming and the initial design. We decided the most appropriate approach would be for each team member to come up with a design that we could then compare and collectively troubleshoot. We did this first through the use of design matrices in which we were able to narrow down a rough design that we could work off of. The design matrices also allowed us to transfer aspects of different designs to one final design.

Once we chose a model, our design process was not yet over. We still had to work to pick apart every part of this design and think of every possible situation in which it may or may not fail. Additionally, we continued to analyze the design in an effort to improve efficiency and ultimately save material and money.

After we settled on a final design we began the prototyping process, so ending our design phase of the project.

Design Selection Matrices

[Kyle Moran](#)

FIG. 2. Inverter Design

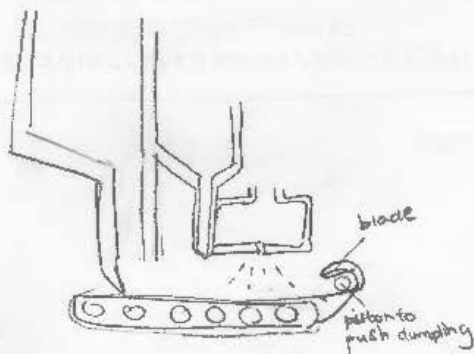


FIG. 3. Roller Design

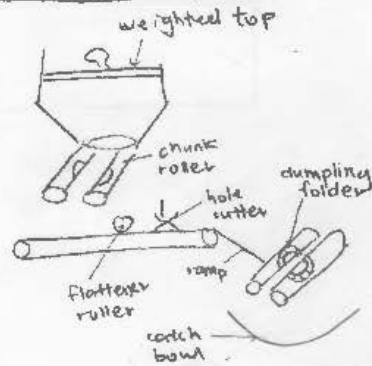


FIG. 4. Vertical Design

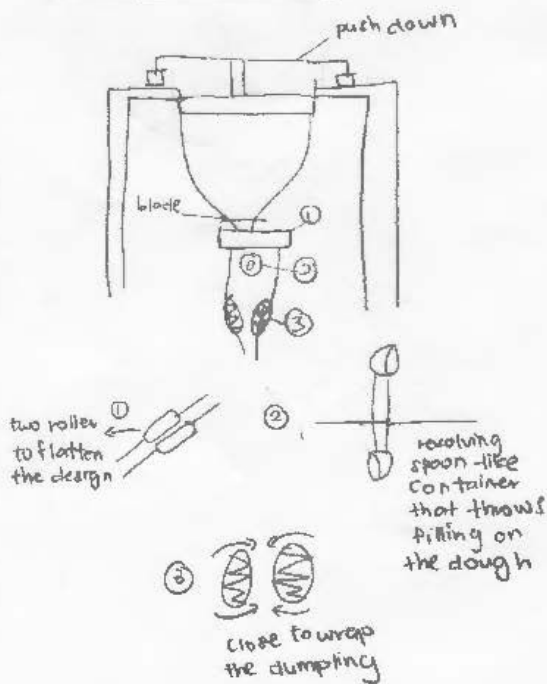
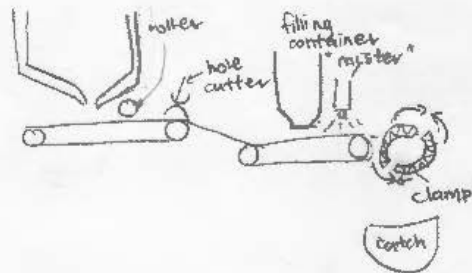


FIG. 5. Reference Design



Selection Criteria	Vertical Design	Roller Design	Reference Design	Tractor Design
Ease of washing	0	0	0	0
Appropriate kitchen size	+	+	0	+
Less working parts	+	-	0	+
Circle(dough) symmetry	-	0	0	0
Filling accuracy	-	0	0	0
Cost	+	0	0	+
Scrap efficiency	+	0	0	-
Sum of +'s	4	1	0	3
Sum of O's	1	5	6	3
Sum of -'s	2	1	0	1
Net Score	2	0	0	2
Rank	Combine	3	3	Combine

Table 1. Design Matrix

Final Design and Prototype

[Faris Ghazali](#)

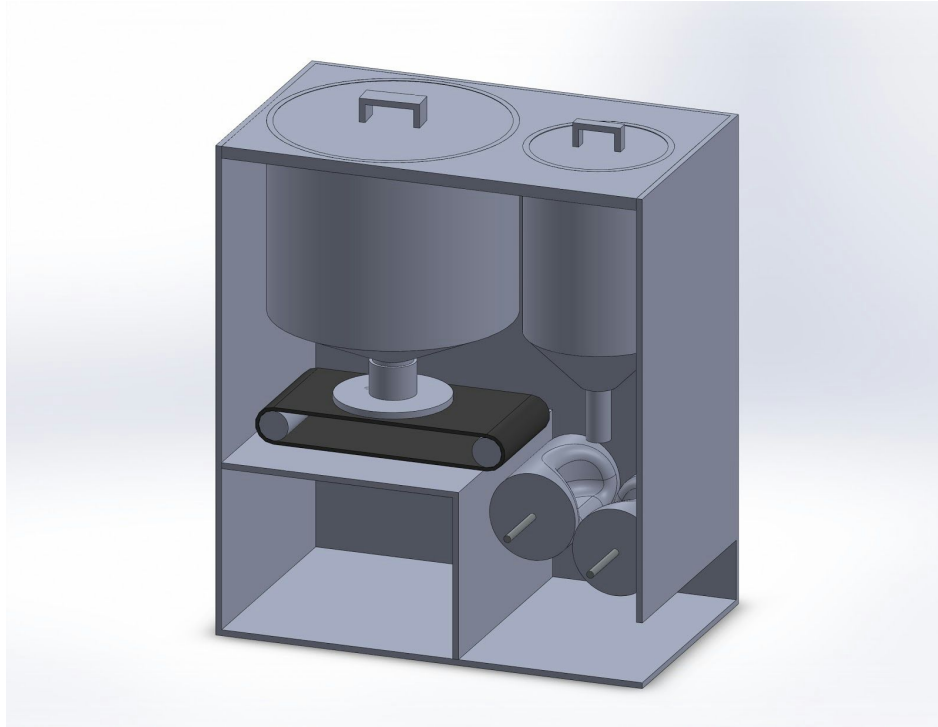
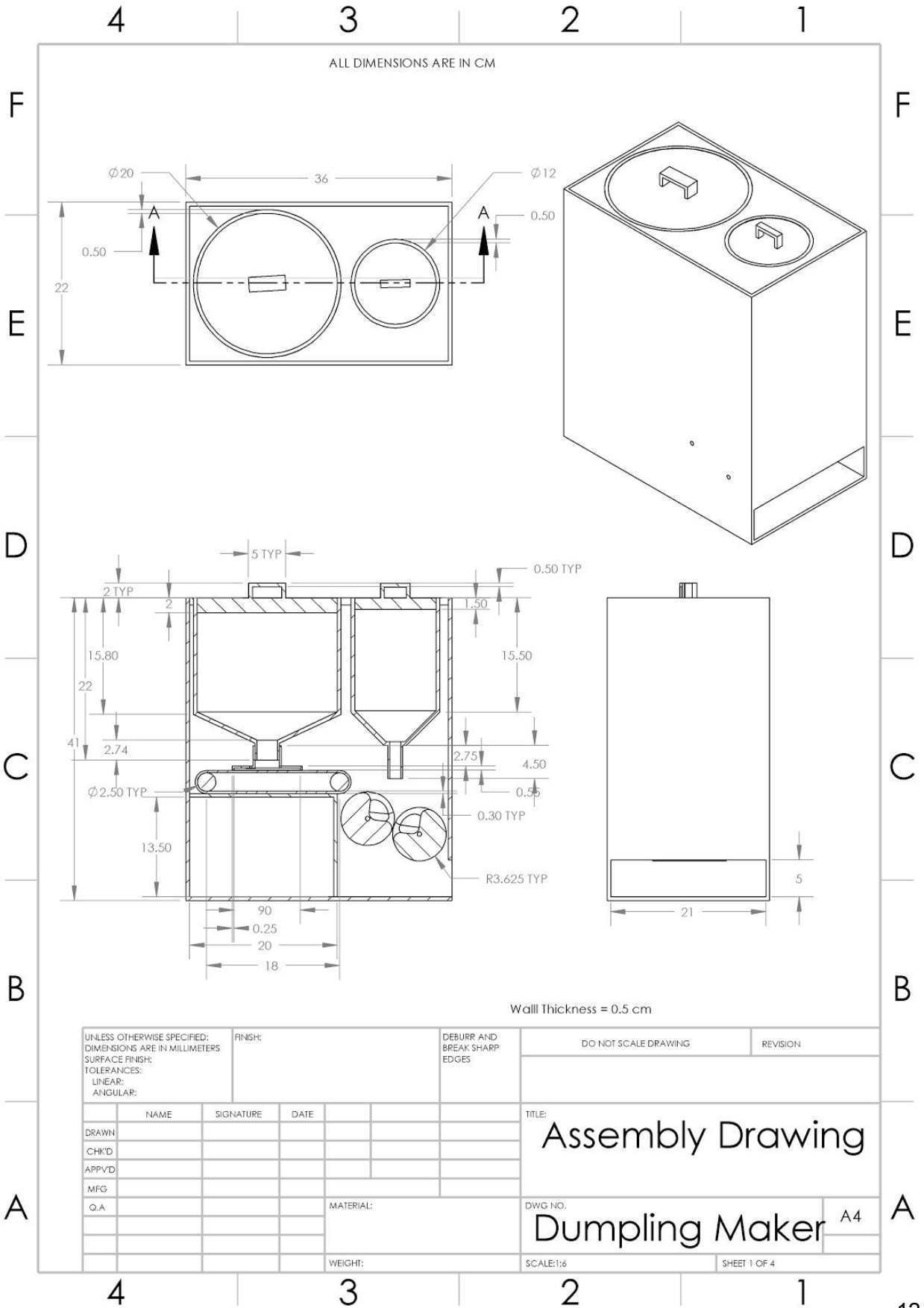
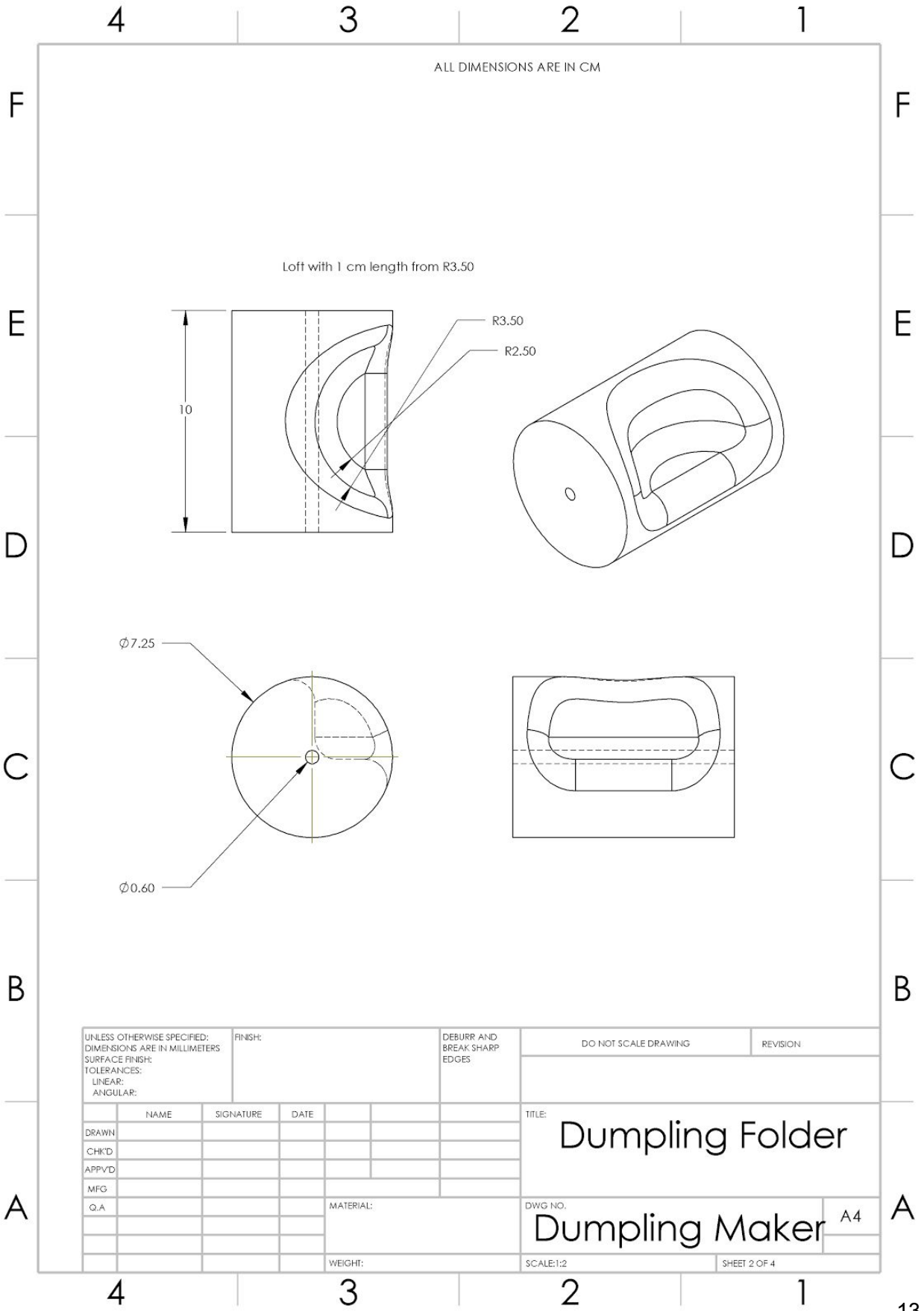
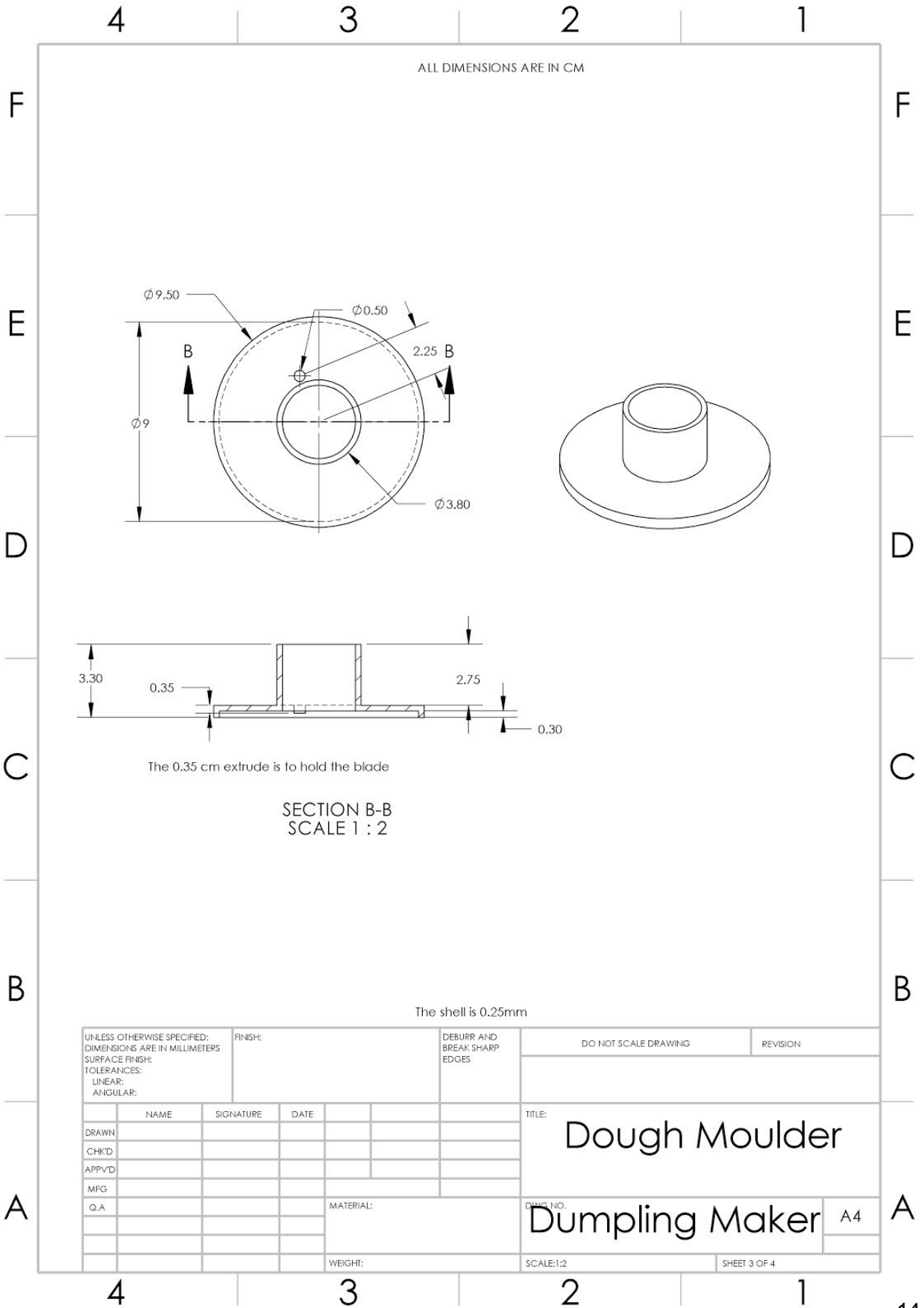
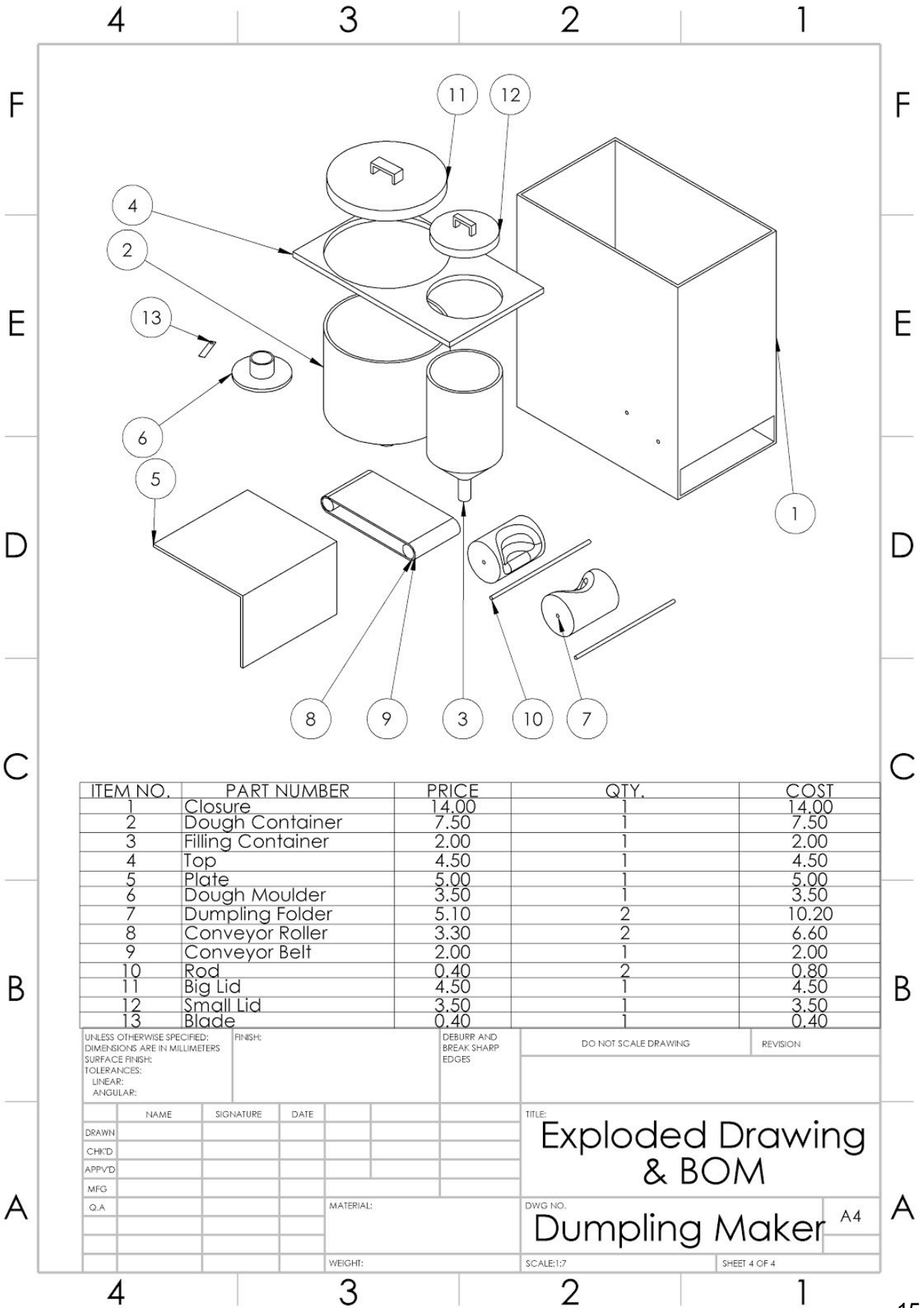


FIG. 1 Image of prototype
(Scale 1:1)









Engineering Analysis

[Shunran Xu](#) / [Faris Ghazali](#)

Working Mechanism:

This dumpling maker works safely and expeditiously. First, the pre-made dough, water, and fillings need to be placed into their corresponding containers. Since this machine is automatic, once the materials are in place, users only need to press the start button to begin the process. The dough in the container will be pushed into a circular mold. Then, a steel blade will cut the dough and close the entrance to the mold. The mold compresses the dough into a thin circular sheet. Once the compression is complete, the mold will lift up and the sheet dough will move along the conveyor belt. Fillings will be dispensed onto the sheet dough, as it stops on top of two rollers. The rollers are designed to fold the dumplings, as well as creating their wrinkles. Finally, the finished dumplings will drop onto a ramp and slide down to a bowl of user's choice.

Cost Analysis:

ITEM NO.	PART NUMBER	PRICE	QTY.	COST
1	Closure	14.00	1	14.00
2	Dough Container	7.50	1	7.50
3	Filling Container	2.00	1	2.00
4	Top	4.50	1	4.50
5	Plate	5.00	1	5.00
6	Dough Moulder	3.50	1	3.50
7	Dumpling Folder	5.10	2	10.20
8	Conveyor Roller	3.30	2	6.60
9	Conveyor Belt	2.00	1	2.00
10	Rod	0.40	2	0.80
11	Big Lid	4.50	1	4.50
12	Small Lid	3.50	1	3.50
13	Blade	0.40	1	0.40

Table 2. Cost of Materials

The total price of the dumpling maker is USD 64.50. It is affordable for household uses and can also be used in a restaurant. All of the materials are made up of stainless steel except for filling container and conveyor belt which are made from PVC.

Summary and Conclusion

[Swapnil Dubey](#)

The final design is a compact and portable, fully automatic machine that can easily make 10 dumplings a second. It can easily be disassembled and since all parts are either plastic or stainless steel, they can be washed conveniently. Since everything is designed precisely such that there is no extra space wasted, we were able to make it compact which was key to our target customers as storage space was going to be a big concern. Yet the design is big enough to not compromise with amount of ingredients it can have at once, hence saving time by not having the user constantly refilling the machine.

Our team has worked hard to come up with this kind of blend of efficiency, ease of use, and productivity. We hope our customers also feel the same about our product as we do.

Acknowledgements

[Swapnil Dubey](#)

We are very thankful to everyone who contributed and helped us complete our project effectively and more importantly, on time.

We are thankful of our Professor, [Xinli Wu](#). He was always there to help us and would support us and guide us in our project. We are also grateful to our TAs, [Nick A. Petrunyak](#) and [William A. Haunstein](#). They were always ready to help whenever we found ourselves in a fix.

Last but not least, we would like to thank all the people in the restaurants who helped us gather data vital to our product's design and customer needs. Despite their hectic schedules, they gave us their undivided attention and shared invaluable knowledge.

References

[Swapnil Dubey](#)

Google Images (search text : Dumpling maker)

