602 Final Project Proposal

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Steamed egg custard is a traditional and homely Chinese dish found all over China. I really like this easy and delicious dish because it always reminds me of my parents and my childhood. The cooking steps for it are quite simple: beat the eggs and slowly add water to create a more tender texture; regularly stir them to fully mixed; pour the mixture into a container and scum the bubbles; steam. You are also free to add additional flavor like salt and solid ingredients like scallion and shrimps. However, overcooking will generate cellular bubbles and lose soft. So a common difficulty of this dish is to control the cooking time critically to get the extent of just fully firm for a smooth and silky taste. In real life, to avoid overcooking, it could be annoying to repeatedly check whether the egg custard is fully cooked or not. The problem is more obvious when we use microwave or pressure pot for it, which I have experienced many times. Additionally, there could always exist some differences in our cooking procedure, such as the ratio of egg and water, the use of salt, the addition of ingredients, the coverage of plastic wrap, the material or shape of our containers and so on. So I wonder how would these factors affect the cooking time? Therefore, I carry out this experiment to find out their effects and then offer guidance to better control cooking time in our daily life.

In this experiment, I want to explore five factors consisted in the cooking procedure to test their effects on the just firm time of egg custard. The factors and factor levels are as follows:

1. The ratio of egg and water (control the total volume of mixed liquid to be 10oz) one egg plus water vs. two eggs plus water
2. Use of salt — one spoon vs. no salt
3. Coverage of plastic wrap — cover with plastic wrap vs. cover with nothing
4. Addition of ingredients — add shrimp bits vs. add nothing
5. The material of containers — glass vs. stainless steel

The reason for choosing these factors and levels is straightforward as I mentioned before. The most common reason is that the cooking steps are quite flexible and may vary from person to person.

For the ratio of egg and water, some people that prefer smoother taste would like to add more water, others that prefer more egg smell would choose to add less water but more egg, and also different composition should lead to different firm time. So I choose two common ratios and make a comparison. People have different flavors, and salt may have some chemical effect on the solidification speed of egg. As for the coverage of plastic wrap, the reason I know people use it on steamed egg custard is to get a clean surface instead of a layer of water formed by steam, but whether it affects the cooking time is under experiment. Some people, especially for children, would like and be better to add some

ingredients like shrimps for balanced nutrition. And they may also increase the cooking time. Different materials of containers—— steel, glass or ceramic, should also have some influence on the cooking time.

The experiment will be realized in an AROMA 3-in-1 Super Pot. I would use it as a steamer that we add water into it and put our container with the prepared mixture on a steaming rack, then cover the pot with a transparent lid. The experiment results are easy to obtain. To better identify and record the exact time of just getting fully firm, I would always put some scallion pieces in the middle of the egg liquid surface, then I would waggle the pot and identify when the scallion pieces are stable with egg and record that time.

I would carry out a 32 runs, 2^5 blocking complete factorial experiment, each of them would contain 10oz mixed liquid. The main cost would be buying 4 boxes of eggs, a measuring cup, and some suitable containers.

The estimated time for each run may take 5 to 10 minutes. Since it is not easy to carry out 32 runs in a short time and also I don't want to cause a waste, I would do 16 of them on the first day and another 16 on the second day, regarding day effect as the block effect. Let block only confound with the interaction effect of five factors, and then do the these 16 runs in the first day. I would write these 16 tickets with standard order and five factors with their levels, and put them in a black box, then randomly pick tickets out one by one to be the new order. On the second day, I would repeat this procedure.

There are some difficulties I may face during the realization of this experiment. Firstly, I could not be precise enough that I may make an error when identifying the exact cooking time. To reduce the personal variance and get more precise results when checking the just fully firm time, I would invite my roommate together to decide the recorded time. Secondly, the pot is made of metal, so the remaining heat after one run would affect the next. But a great thing about this pot is that it is electric and can control the temperature at the same level, so I would always let the water boiled first and then put these bowls in. Thirdly, buying 32 containers, like bowls could be a waste, so I may just use one of each type and reuse them by cleaning and cooling them after one run (Is that alright?). Another possible difficulty is that for the runs without covering plastic wrap, there may be a layer of steam water on the surface, the exact time may not be easy to check. If that happens and at the moment I am not sure, I would open the lid and lightly touch the middle of the surface with a spoon for verification.

I hope the coming results of the experiment could show some clues on the time of egg custard getting just fully firm, from which we could better adjust our cooking time. For example, if the results show that container material is significant and the egg custard in a glass bowl will take a longer time than in a steel bowl, we may add cooking time by one minute afterward. We may also find estimated cooking time for egg custard and adjust it with personal preference. When we make a larger volume of egg custard, ideally we could increase the cooking time proportional. However, I could not prove that in this experiment and whether the relationship is true is under further research.