Hwa Chong Institution
Project Work
Category 3
Inventions Log Book
(Revised for 2021)

Title of Project: Heating Lunchbox
Group Name: 3-31
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1. Problem Finding

(The beginning…)

Identify a problem you would like to solve. You may want to brainstorm for problems using different approaches e.g. thematic, survey or general brainstorming etc.

1 A Document a list of problems you have identified. Your documentation should show clearly how your group came up with the problems.

The first problem is:

Shoelaces being untied easily.

This link is about automatic shoelace tying shoes. We think that the shoes are very costly so it is not a good solution.

https://www.youtube.com/watch?v=0Nz5x6EtSyI

This link is about a shoelace fastener. We think that it is a good invention and also very cheap. We were planning to make a thing somewhat like this but it is already created so we think that we should not continue with this problem.

KR101768182B1 - Automatic shoelace fastener - Google Patents

The second problem is:

Sometimes when we leave our houses, we leave our windows open.

When we searched 'window' on the archive, we found out only 1 result which was about a window closer when it rains. We thought that it was a pretty good idea and was very creative but we think we could probably improvise it if we can make our idea correctly.

https://sites.google.com/site/innovationprog/archives

The third problem is:

People usually place their masks in their pockets, which is very unhygienic.

We did not find any pictures or websites about a mask armband.

The fourth problem is:

Contents in a cup spill easily and are a hassle to clean up.

There are a lot of links with gyroscope cup holders like our idea. However, our ones have a cap on top to prevent spillage too.

https://patents.google.com/patent/US20200029710A1/en?q=gyroscope+cup+holder&oq=gyroscope+cup+holder

https://patents.google.com/patent/US20160081505A1/en?q=gyroscope+cup+holder&oq=gyroscope+cup+holder

The fifth problem is:

The food that we bring to school easily gets cold/the salad/any cold things in the lunch box warming up.

We found a lot of heatable lunch boxes on the web but none of them had a cooling place to cool down some food items if you wanted. Also, we might plan to build something to not let the water vapour on from the food rise up and condense into water droplets and drip into the food and make it soggy.

This is a link for self heating lunch boxes. Most of these lunchboxes heat up by using electricity so these lunch boxes are basically electric lunch boxes. However, 1 of the examples to us are very interesting. It is about using the charger in the car to heat up the lunchbox. We think that this is very innovative and we might implement it.

https://www.inverse.com/mind-body/best-self-heating-lunch-boxes

The sixth problem is:

Sometimes we are very uncomfortable wearing jeans/long pants.(etc.too hot)

We found out about these athletic cooling and heating systems. We think that it is very interesting but the thing is that this takes up too much space. Our invention will use very light chemicals to make these heatable/coolable pants.

https://patents.google.com/patent/US20160361196A1/en?q=heatable+and+coolable+pants&oq=heatable+and+coolable+pants

The seventh problem is:

When it rains, our shoes/socks will get very wet and it will be soggy and uncomfortable.

These are all ideas about waterproof shoes/socks and there are still many more websites. With many of these ideas already created, we have decided to give up temporarily on this idea unless something inspires us and makes us adapt this waterproof shoe.

https://patents.google.com/patent/CN109430950A/en?q=water+socks&oq=water+socks

https://patents.google.com/patent/CN105581429A/en?q=waterproof+shoes&oq=waterproof+shoes

https://patents.google.com/patent/TWM530553U/en?q=waterproof+shoes&oq=waterproof+shoes

JP2004230889A - Waterproof shoes - Google Patents

1 B You should have selected a problem based on some considerations. Identify and justify these considerations.

Problem 1

We chose the heatable and coolable pants because most of the time, especially when it is hot, we would be very uncomfortable wearing our pants. That is why we think that this is a good idea and also when we searched it online, most or all of the products are very expensive.

Problem 2

We also chose the automatic windows closer when it rains because sometimes when it rains heavily, rain might be blown in the house by strong winds and the floor would be very wet. It would be a hassle to clean it up.

Problem 3

Lastly, we chose the heatable and condensation-proof lunch box. This is because sometimes when we bring food to school, especially hot food, condensation of water vapour will occur at the top of the lunch box and the condensed water droplets will drip into the food and cause the food to be soggy and no one likes soggy food.

1 C List some problems your group would like to solve. List also the considerations for selection of problems in the evaluation grid below. Score the considerations, against the problems, with points 1 (least significant) to 4 (most significant). Sum up the total points for each problem. Identify that problem you would like to solve.

Problem Evaluation Grid

*add more columns and rows where necessary

Considerations for Selection	Problems		
	#1 Pants being uncomfortable.	#2 Leaving our windows open when we leave our houses.	#3 Food in lunch box getting soggy/ cold
Are the materials to make our product accessible?	2	1	3
Is it a problem most people face daily?	2	2.5	2.5
Are there already efficient solutions to the problem?	3	3	3
Total Score	7	6.5	8.5

2. Define the Problem

(This is one…)

Now that the problem has been identified. It is important to gather information on the extent of the problem and/or evaluate the usefulness of existing solutions based on *some criteria*. You may need to conduct surveys and research on existing solutions.

2 A Extent of problem (Research and discuss the problem and write down the problem statement)

We considered the first consideration of 'Are the materials to make our product accessible?' because we think that the product that we are making should be very cheap, cost efficient and accessible. Also, if the product that we are making is very expensive, we would not be able to afford it and thus we can't make this product.

We considered the second consideration of 'Is it a problem most people face daily?' because if the product that we are making isn't a problem that we are facing daily, it would just be a pretty useless product and would not need the hassle to make this product since no one would use it.

We considered the third consideration of 'Are there already efficient solutions to the problem?' because if there are already cheap, efficient solutions, we would not need to make our product because we could just use this efficient solution to solve this problem.

2 B Compare and contrast the existing or similar solutions.

There are several existing solutions about a heatable lunch box. But, most of the results are based on an electric lunch box which we think is dangerous because of a chance of an electricity leak in the charger or the heatable lunch box. Also, no matter what we searched, there was no website or webpage about a heatable and condensation proof lunch box.

3. Your BIG IDEA

(Developing the idea….)

Write down your proposed invention and why you want to do it. State also how you think your proposed invention is better.

3 A Describe your proposed invention.

Our proposed solution is to have a lunchbox with a layer of sodium acetate as it can heat up to 45 degree Celsius in a short period of time. We will also use a molecular sieve to absorb the moisture as it can absorb more than 40% of its weight in moisture. The molecular sieve pack, which Is approved by the FDA for food packaging, will be placed at the lid and we will use a small container to store it to prevent leakage. We will also use vacuum as our outer layer to make sure our food is as hot and fresh as possible. Lastly, we added a handle to the lid of the lunchbox to make sure that it is portable and easy to carry around.

3 B Explain the purpose of your proposed invention and the potential benefits to users.

The purpose of our invention is to allow users to be able to eat hot and fresh food when they pack their food in a lunch box as many people complain that their food is always soggy and cold when they pack their food which can sometimes make people lose their appetite. Thus, our invention will benefit them greatly as it will help keep the food fresh and when the food gets cold, our lunchbox can heat up the food in a short period of time. Hence, our users will be able to enjoy their food.

3 C In what ways would your proposed invention be different and/or better than existing solutions, if any?

Our proposed invention is easy to use and safe. It can also heat up the food without using electricity like other lunch boxes that are already available in the market. We also use the molecular sieve to absorb the moisture in the lunchbox in which most of the lunch boxes do not have. Unlike other electricity dependent lunch boxes, our lunch box does not come with a power cord, which can be very dangerous to use when the user's hand is wet or when it is near children. Thus, we can conclude that our invention is safe, easy to use and efficient.

3 D What are some problems you expect in the course of your proposed invention?

1. The food might not be hot enough even when it is heated or the heat is unevenly distributed.
2. The lunchbox could be too big and will not be convenient for carrying around.

3 E What and when are the major milestones (project timeline) in your invention?

1st Major milestone: Coming up with different problems (Jan-March)

2nd Major milestone: Deciding on our problem (March-Early April)

3rd Major milestone: Creating three prototypes for our problem (April-May)

4th Major milestone: Choosing our prototype (May)

5th Major milestone: Thinking of ways to improve our prototype (Late May-Early August)

6th Major milestone: Creating an improved prototype (Early August)

#***must be able to be constructed based on current / emerging technologies, must not violate the laws of Science or go against the laws of nature.***

4. Proposed Construction <u>or</u> Modelling Process*

(This first… then that…)

You are now onto the fabrication of your prototype/ product. You need to select material and understand how to put them together so that your prototype/ product can perform its function.

4 A Explain how and why the materials were chosen for the prototype/ product of your invention

4 B Explore these considerations that may guide the construction of your prototype/ product.

4 C Propose how the prototype/ product will be constructed or developed. You may use drawings and photographs.

OR

If construction of the prototype is not possible, then you have to create an animation / as a proof of concept that it can be applied on a bigger scale.

4A Explain why construction of a prototype is not possible and the proof of concept is needed in your case.

Due to the pandemic, we have been unable to meet in person. This led to us having to use google meet for our discussions which is very inefficient. We also had problems getting the materials to build a physical prototype due to the tight budget provided by our parents. Furthermore, the covid-19 pandemic caused us to be unable to meet up at one group member's house to construct the prototype. Thus, we had come up with a 3D model prototype in early August.

4B Briefly explain how the video / animation can effectively show how your invention will work and the different considerations.

https://drive.google.com/file/d/1n2Q1xRYM5pUDbtN-sTDE1d2Oe1dqq66i/view?resourcekey

Warning:

- *Video / animated simulation only if prototyping is absolutely no possible.*
- *Video / animated simulation must be logical and convincing that the invention works.*
- *Constraints must be clearly included in the logbook or the project will be heavily penalized.*

5. References

Read http://www.bibme.org/citation-guide/apa/ on how to cite references.

5 A Cite the references you have used for your project work. Your source of reference should come from different types (e.g. books, magazines, websites, journal articles, interview, photographs, product brochure, reviews etc.)

https://www.youtube.com/watch?v=0Nz5x6EtSyI

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