

Hwa Chong Institution

Project Work

Category 3

Inventions Log Book

(Revised for 2021)

Title of Project: Improved refillable toothbrush
Group Name: grp3-46
Group Members: 1) Ong Zhong Ray 2) Isaac Ng 3) Jayden Goh 4) N.A.

1. Problem Finding

(The beginning...)

Identify a problem you would like to solve. You may want brainstorm for problems using different approaches eg 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 regular toothbrush may cause wastage of toothpaste when toothpaste is squeezed onto it
- People who travel often may find it very troublesome to bring the toothpaste along with the toothbrush, as it is not uncommon for them to lose it and it may be troublesome to carry both at the same time
- Although the market has come up with solutions to solve this problem, such as the refillable toothbrush from Toob Brush, Travelon, Quirky, etc, these products have some of their own problems. These problems are usually about hygiene, wastefulness, and convenience

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

We want our product to be as non-wasteful as possible as our products would require a lot of materials as compared to the regular toothbrush. Our product also must be successful in fulfilling its purpose - convenience. However, since it also has a storage system, it needs to be hygienic.

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	#2	#3
Consideration 1	The toothpaste storage must not leak.	The storage tube must be able to store enough toothpaste so that it needs to be refilled only once in a while.	The toothpaste storage tube must be as airtight as possible to prevent contaminants in the air from entering it.
Consideration 2	The toothpaste dispenser must not produce excessive amounts of toothpaste at one go	The product must be small enough to fit into the user's mouth.	The toothpaste storage valve must be as secure as possible to prevent the user's saliva from entering.
Consideration 3	The product must not break easily.	The product's changing period must be as long as the regular toothbrush.	The storage container must be able to be opened up for washing.
Total Score	8	10	6

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)

The majority of the results from our survey conducted showed that those unwilling about our products were mainly concerned about its convenience as they did not want to clean up the possible mess our product could make. Other non-related reasons were its pricing.

2 B Compare and contrast the existing or similar solutions.

According to our findings, Toob Brush, Travelon and Quirky all could create mess from the toothpaste spillage. However, Travelon was the most inconvenient, as it may also be difficult to refill the toothpaste since there is no screw to hold the refill toothpaste tube to the body of the toothbrush and the toothpaste is refilled from the intersection of the head and toothpaste storage tube.

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 invention as stated is an improved-refillable toothbrush. It has a one-way storage valve between the toothbrush and the storage tube to prevent leakage and also has many grooves to help facilitate the toothpaste dispensing. The valve is also controlled by a switch on the toothbrush near its head.

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

The purpose of our invention is to bring convenience to the travellers who find it troublesome to bring both the toothpaste tubes and the toothbrush while travelling. This invention could also benefit users who have butter-like fingers and always either put too much toothpaste or they put too little, or users who simply find it too troublesome.

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

Our proposed invention would work on the problems stated above from the comparable market solutions we have found, such as hygiene, environmentally-friendliness and convenience. This would allow the users to have an easier time brushing their teeth, while minimizing the damages to the environment. It would also reduce the chances of users getting sick as we would try to make it as hygienic as possible.

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

We would expect problems like the choice of the materials, as we need to minimise the use of plastic, problems with the valves, and whether it is 100% hygienic.

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

They are:

- Switching teammates within two different project work groups
- The mentor we found finally accepted our project idea
- Finished the project proposal evaluation

#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 or 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.

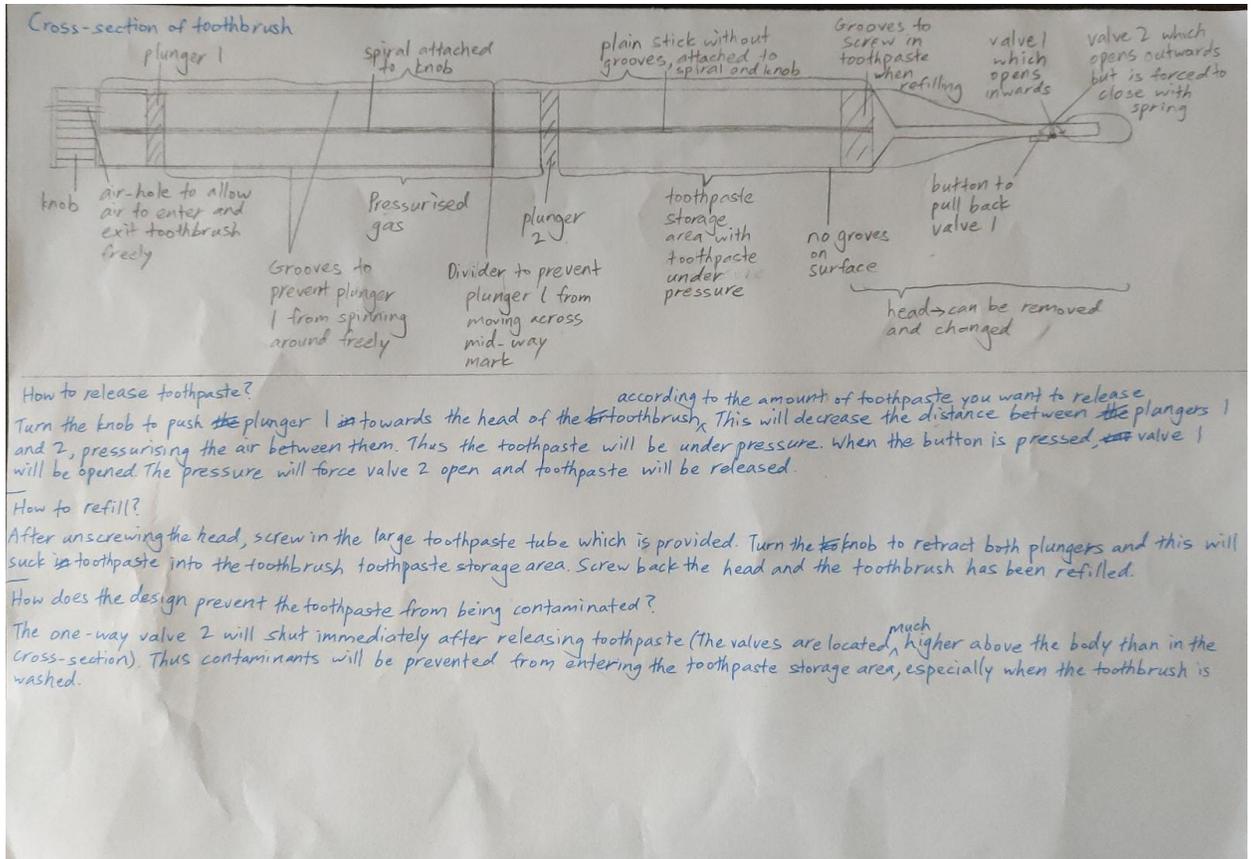
4 C Propose how the prototype/ product will be constructed or developed. You may use drawings and photographs.

OR

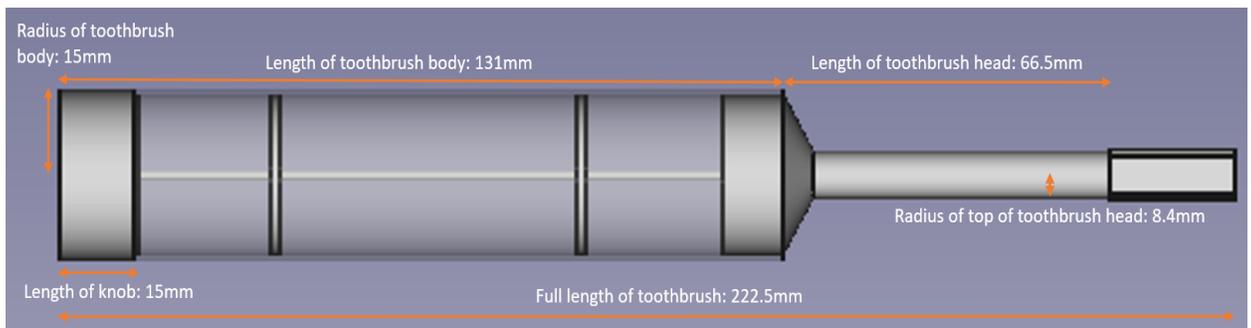
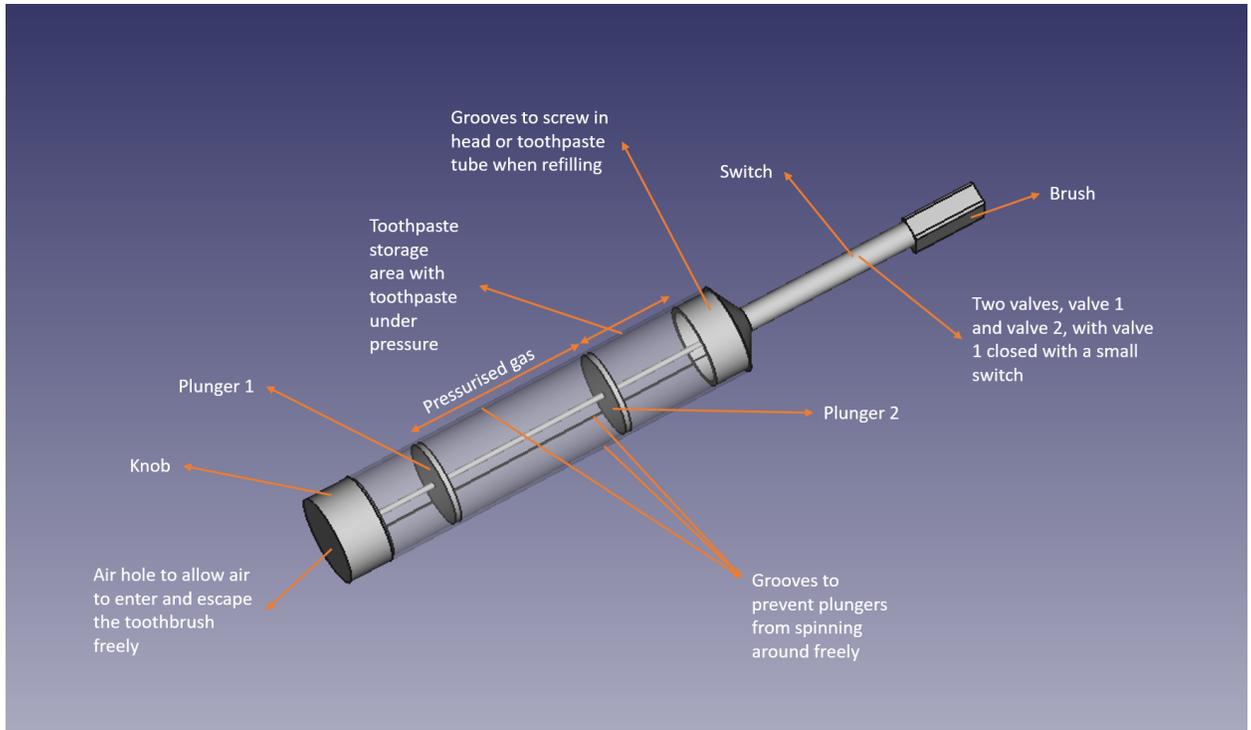
If construction of the prototype is not possible, then you have to create an animation / as a proof of concept that it can be applied on a bigger scale.

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

The construction of our prototype is currently not possible due to the fact that we would have to go to Makerspace which is currently difficult to enter due to the SMM measures. Hence, we have created a 3D diagram of our product, which is an interactive animation which shows the design of our product. You can also find it at the link https://diagrams.211368e.repl.co/diagram_2.html.



This is our initial hand-sketched idea of how the product should look and some explanation. It was further developed into a 3D diagram at https://diagrams.211368e.repl.co/diagram_2.html.



Slides for Final Evaluation

<https://docs.google.com/presentation/d/1tk4B5GwSCJsj2oNK4mvhga2zxQA8NTmxfUm84SjKu74/edit?usp=sharing>

Script for Final Evaluation

https://docs.google.com/document/d/11Drr_ZcaiVGcb5G6_kLkJx-m78J7DPcw4mue8btEJSg/edit?usp=sharing

Log Book

<https://docs.google.com/spreadsheets/d/1UilutWSXVz-mEHsoNA7otbRi2UnF7Djt6mXbiUDsOqY/edit?usp=sharing>

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

The animation is able to showcase the product at any angle, display the dimensions of our product and also includes how we incorporated our solutions of the current comparable market solutions into our improved product.

Warning:

- *Video / animated simulation only if prototyping is absolutely not 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 (APA Format)

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.)

The sources are mainly websites, as we used them to compare and evaluate the market's solutions. They are:

- Ali Express. (n.d.) About Travelon refillable toothbrush brand retrieved at 15 July 2021 : <https://www.aliexpress.com/item/2038401978.html>

- Amazon (n.d.) About Toob Brush toothbrush brand retrieved at 15 July 2021: <https://www.amazon.com/Toothbrush-Refillable-Travel-Sized-Toothpaste-Protective/dp/B001OPF1FE>
- Aluminium Oxidation, 13 August 2020 retrieved from: <https://www.kloecknermetals.com/blog/aluminum-oxidation-is-aluminum-corrosion-resistant/>
- T.D. Wood. (n.d.) About How to choose a Water Bottle, retrieved at 13 July 2021 <http://peiroadrunners.pbworks.com/w/file/attach/32930524/How-to-Choose-a-Water-Bottle.pdf>
- What's the difference between LDPE and HDPE, 14 January 2021 retrieved at <https://www.essentracomponents.com/en-us/news/product-resources/whats-the-difference-between-ldpe-and-hdpe>
- Cambridge Dictionary. (n.d.) About Durability meaning in Cambridge Dictionary retrieved 1 August 2021 <https://dictionary.cambridge.org/dictionary/english/durability>