

## Hwa Chong Institution

### Project Work

### Category 3 Invention Log Book

Title of Project:

Phlegm Paper

Group Name:

Phlegm Paper

Group Members:

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## Appendix 3

### Diagram of Prototype 3

#### 1. Problem Finding

##### 1 A How our group came up with problems + our list of problems

Our group got together and brainstormed on problems that we and others face in daily life. We put ourselves in the shoes of many people, like working adults. We also thought about the problems that people with disabilities face, like people with muscular dystrophy.

After brainstorming, we came up with many problems. We then selected the best 4 of those problems through voting for our favourite ideas.

These 4 problems are:

1. Phlegm spitting. It is inconvenient to spit out phlegm as a sink or toilet bowl is not always accessible. Spitting it into tissue is not an option either as the phlegm will leak through the tissue.
2. Tying shoelaces. People with muscular dystrophy, missing arms or difficulty bending down have difficulty tying their shoelaces.
3. Falling bag. When people put down their bag, for example in a MRT, it nearly always topples over. This is inconvenient to the user who needs to find something to prop the bag on.
4. Speeding E-devices. Increasingly often, e-scooter users are going too fast and hitting
5. pedestrians, causing injuries.

##### 1 B Considerations that we have selected our problem with + justification of these considerations

We decided that there were 3 important considerations that had to be made when deciding which problem to choose to work on for our project.

The three considerations we used to select our problem were:

1. The market size that the invention would appeal to if it succeeded in solving its problem
2. How feasible it would be to solve that problem
3. The scale of the issue or how big the problem was

The size of market is how many people our product could help if it was successful, and also how much money it could make from sales. The bigger the size of market, the better because more people would use our product and our product would be more successful.

The feasibility of solving the problem is also important as we have to choose a problem that is feasible to solve. The more feasible a problem is to solve, the easier and more likely it would be to be able to create a good solution to that problem.

Last but not least, the scale of the issue determines how big a help our product would be to people who used it. It is slightly similar to the size of market criterion as it also decides how many people would use it.

##### 1 C Evaluation Grid with which we decided which problem to solve

**1 is the lowest score and 4 is the highest**

Problem Evaluation Grid

|                                | Phlegm Spitting | Speeding e-devices | Falling Bag | Tying Shoelaces |
|--------------------------------|-----------------|--------------------|-------------|-----------------|
| Size of market                 | 4               | 2                  | 3           | 1               |
| Feasibility of solving problem | 3               | 1                  | 2           | 4               |
| Scale of issue                 | 3               | 4                  | 1           | 3               |
| Total points                   | 10              | 7                  | 6           | 8               |

Thus, we decided to choose Phlegm Spitting as our problem to solve.

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## 2. Define the Problem

### 2 A Extent of problem (Research and discussion of the problem.)

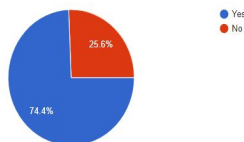
Problem statement: It is very difficult to conveniently get rid of phlegm/mucus.

Firstly, we did some online research to find out exactly how large the scale of the problem was.

We found out that adults have an average of 2 to 4 colds a year, and children have an average of 6 to 10 colds a year<sup>1</sup>! Extra phlegm is often produced when people have a cold<sup>2</sup>, so that adds up to a lot of phlegm. As phlegm serves the function of flushing harmful bacteria/viruses out of the body<sup>3</sup>, phlegm contains harmful bacteria/viruses, so if not handled properly may spread the disease to others.

Do you find it irritating when you have phlegm? (because you have to leave whatever you are doing)

121 responses



To find out how others felt about this problem, we also sent out surveys.

According to our preliminary survey with 122 responses, we found out that approximately 75% of people find it irritating when they have phlegm.

Our solution will take away this annoyance by making it a lot easier and far more convenient for people to get rid of their phlegm in a hygienic and easy way.

### 2 B Faults of existing and similar solutions.

Other existing solutions to solve this problem include:

(1) Tissue Paper: Tissue paper is one of the most popular solutions to this problem. However, as tissue is not waterproof, phlegm can leak through, which aids the spread of harmful bacteria and viruses.

(2) Spitting into sink/toilet: The sink or toilet is much more hygienic than the tissue. However, it requires the person to leave whatever he is doing and go to a sink or toilet to spit it out, which is not always possible or convenient. (eg. when the person is in class)

(3) Diapers

Although diapers are not meant to serve the function of storing phlegm, it is a good solution as it has a soft inner layer, an absorbent core and a waterproof outer layer, which makes it effective to store phlegm.<sup>4</sup> However, it also has disadvantages, as it is meant to be used for different purposes, and will not contain phlegm well because of its shape. It will also not be very cost efficient. Our product will have the benefits of diapers but not its disadvantages.

## 3. Our BIG IDEA

### 3 A Description of our proposed invention.

Our proposed invention is a disposable item that allows users to spit their phlegm into. The intended outcome of our invention is that it:

- Is pouch-like, so that it is more difficult for mucus/phlegm to leak through
- Is easily sealable
- Is strong, so that phlegm can be stored easily without breaking
- Has a waterproof outer layer so that phlegm/mucus does not seep through the paper
- Has an absorbent inner layer

Diagrams of our prototypes can be found in the footnotes at the end of this document.

### 3 B Explanation of the purpose of our proposed invention and its potential benefits to users.

The purpose of our invention is to help people get rid of phlegm and mucus easily, conveniently and hygienically. People will no longer have to swallow their phlegm, which feels extremely uncomfortable and can cause stomach discomfort<sup>5</sup>. Our innovation will be easy to use, portable and hygienic in order to make it as convenient as possible.

### 3 C Ways in which our proposed invention is different and better than existing solutions.

Unlike tissue paper, our invention is waterproof, so phlegm and mucus would not be able to leak through. This greatly benefits users as users would not need to fret about phlegm or mucus seeping through the paper and dirtying whatever it comes into contact with. This allows users to keep their used phlegm papers in their bags without fear of their bags or their belongings getting dirtied. Our invention also enables the user to get rid of phlegm right where he is, unlike spitting the phlegm into a sink or toilet. This is convenient as he does not have to go to the toilet just to spit out the

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phlegm.

#### **3 D Problems that we may face when developing this product.**

We may find some difficulty in testing out our prototype as phlegm is needed to accurately test it, and phlegm is not easily accessible. However, we can use substitutes such as slime or oobleck to test it.

#### **3 E The major milestones (project timeline) in your invention process.**

T1W2 - Forming of group

T1W3 - Decided on Cat 3, met mentor.

T1W4 - Brainstormed on problems + researched and listed down good problems to solve

T1W5 - Thinking tools and PMI on best 3 problems to solve.

T1W6 - Briefing for Cat 3 & looked at past year projects archive.

T1W9 - Engineering Drawing/Sketching Tools and came up with prototype 1

T1W10 - Sabbatical week

March Holidays - Visited Beyond Design Centre

- Presented ideas to mentors

- Suggestions to improve our design:

  - > Usability (Why would people use your product instead of tissue paper)

  - > Eco-friendly (Biodegradable Materials)

T2W1 to T2W2 - Work on Prelim Judging Slides

T2 W3 - Improvement on 1st prototype

T2 W4 to T2 W5 - Testing of 1st prototype, result: fail

T2 W6 - Planning and construction of 2nd prototype

T2 W7 - Testing of 2nd prototype, result: fail

T2 W8 - Planning and construction of 3rd prototype

T2 W9 - Student Led Forum

T2 W10 - Sabbatical Week

T3 W1 - Testing of 3rd prototype, result: success

T3 W2 to T3 W5 - preparation for IVP project judging at NUS

T3 W6 - IVP project judging at NUS

T3 W7 to T3 W8 - final preparations for final evaluation

## **4. Construction Process**

#### **4 A How we chose the materials for the product of your invention.**

To achieve the aim of our product, we made sure that it was, hygienic, portable, eco-friendly and easy to use. Our product has a waterproof outer-layer of wax paper and an absorbent inner-layer made out of tissue paper, so that the phlegm would not leak out, making it hygienic. We used double sided tissue tape to allow the product to seal securely, making sure the phlegm does not leak out. All the materials used were also thin to make it compact and portable, and it has a very simplistic design to make it easy to use. Most of the materials used were also the biodegradable. The product as a whole allows one to spit, seal and throw away their phlegm into the proper disposal whenever possible, making it convenient for the user.

#### **4 B Exploration of the different considerations that guided the construction of our prototype.**

During the construction, we brainstormed for ideas to try to fulfil all our intended outcomes (portability, ease of use, hygienic, cost-efficient). We made decisions on the construction of our prototype according to what would best fit the intended outcomes of the product.

#### **4 C Documentation of the development stages of our invention with diagrams of our prototypes.**

Diagrams of our prototypes can be found in the footnotes at the bottom of this document.

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#### 5. Modification and Evaluation

**5 A Our prototype / product test criteria to help us assess the functionality/effectiveness of our prototype. Identification of areas of weakness and suggested modifications for improvement.**

##### Prototype 1

| <b>Test Date:</b><br>24/5/18 | <b>Score</b><br>(Out of 5) | <b>Remarks</b>   | <b>Suggestions for improvement</b>                     |
|------------------------------|----------------------------|--|--|
| <b>Eco-friendliness</b>      | 2                          | Adhesive is not biodegradable, large amount of materials are used.   | Use smaller amounts of adhesive                        |
| <b>Portability</b>           | 3                          | Relatively compact, but cannot be carried around without risk of substance leaking through.                      | Use stronger adhesive                                  |
| <b>Hygiene</b>               | 1                          | Adhesive does not secure phlegm securely as some phlegm may smear on the adhesive. Difficult to spit accurately. | Larger surface area, pouch-like design to secure it in |
| <b>Ease of use</b>           | 2                          | Inconvenient to peel adhesive off. Cannot store much substance.  | Use pouch-like design to store more substance.         |
| <b>TOTAL SCORE</b>           | 8                          |  |  |

##### Prototype 2

| <b>Test Date:</b><br>15/6/18 | <b>Score</b><br>(Out of 5) | <b>Remarks</b>   | <b>Suggestions for improvement</b>              |
|------------------------------|----------------------------|--|---|
| <b>Eco-friendliness</b>      | 2                          | Adhesive is not biodegradable, large amount of materials are used.   | Use double sided tissue tape                    |
| <b>Portability</b>           | 2                          | Quite thick and bulky, but if carried around has a considerable risk of product breaking apart if squeezed too much. | Use stronger adhesive,<br>Use thinner materials |
| <b>Hygiene</b>               | 3                          | Pouch-like design holds substance inside well, but phlegm may leak if it is in constant contact with adhesive.       | Make flat bottom for product to stand upright.  |
| <b>Ease of use</b>           | 4                          | Slightly inconvenient to peel adhesive off. Flap is somewhat difficult to secure well.                               | Use fold instead of flap                        |
| <b>TOTAL SCORE</b>           | 11                         |  |   |

##### Prototype 3

| <b>Test Date:</b><br>10/7/18 | <b>Score</b><br>(Out of 5) | <b>Remarks</b>  | <b>Suggestions for improvement</b> |
|------------------------------|----------------------------|---|------------------------------------|
| <b>Eco-friendliness</b>      | 4                          | Less amount of materials are used   |                                    |
| <b>Portability</b>           | 3                          | Still a bit thick, and still carries a small risk of bursting open if squeezed too much | Use stronger materials             |
| <b>Hygiene</b>               | 4                          | Difficult to spit accurately  | Have a larger hole to spit         |
| <b>Ease of use</b>           | 3                          | Inconvenient to peel adhesive off. Tissue is difficult to flip in and out.              | Use a different design             |
| <b>TOTAL SCORE</b>           | 14                         |   |                                    |

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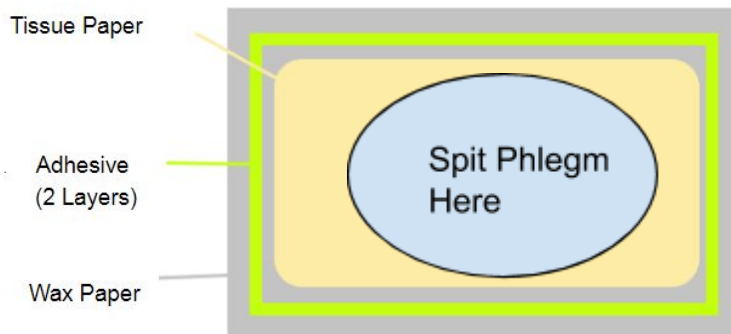
These tables show how much our prototype has improved, from prototype 1 to prototype 3. In conclusion, our prototype has achieved many of the outcomes we wanted. It is hygienic and eco-friendly, and it is fairly portable and easy to use. Although it is not perfect, overall, it has managed to solve the problem and we have achieved our intended outcome, of making it more convenient to properly dispose phlegm.

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### Appendix 1

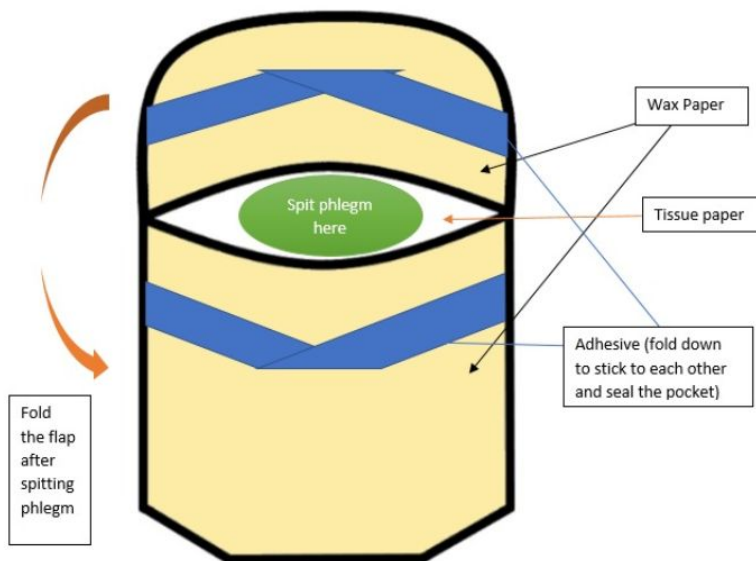
Diagram of Prototype 1



This is then folded down the middle.

### Appendix 2

Diagram of Prototype 2

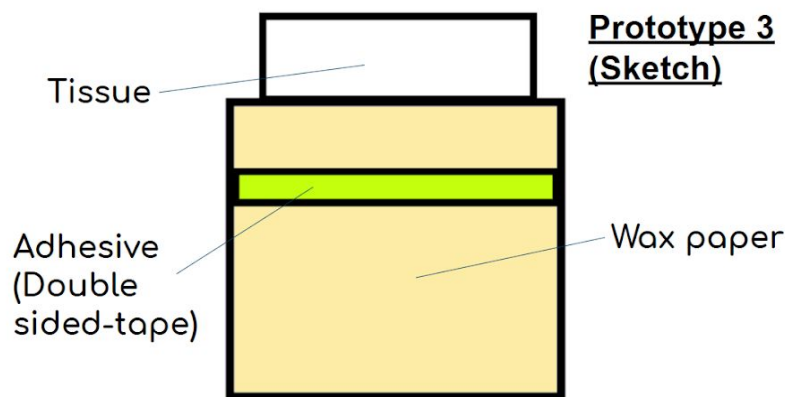


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Diagram of Prototype 3

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### Appendix 4

#### 6. References

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