Hwa Chong Institution
Project Work
Category 3
Inventions Log Book

Title of Project: Batch Of Badges
Group Name: 3-05
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1. Problem Finding

(The beginning…)

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

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

The beginning- We came up with a broad topic on problems encountered by students in school as we are also students and we feel that we will be able to empathise better with their needs. Through much brainstorming and surveying from the students, we came up with four problems we wanted to try and tackle.

The first problem we came up with is **procrastination**. As students ourselves, we sometimes procrastinate on many matters such as homework. Thus we felt that it is relevant to us and many other schoolmates.

The second problem we came up with was the **lack of sleep** due to a great deal of **homework**. During the transition from primary to secondary school, the amount of homework increased tremendously. This caused us to lose much needed sleep on some days as we could not finish our homework before bed. As such, we decided to try and tackle this issue as we felt that a lack of sleep will impact students greatly.

The third problem we came up with was the **inconvenience** caused from **putting on** and **taking off** the school buttons. We identified this issue as many of our peers, just like us, found it an inconvenience to put on and take off the school buttons. It may seem like a minor inconvenience, but the few minutes putting on the buttons might cause us to be late for school as we may consequently miss the scheduled bus or train. Thus, our group decided to identify this as a problem.

The final problem that we had identified was being **late for school** due to **traffic congestion**. Many students have been late due to traffic congestions on major highways or outside of school. Although our teachers have recommended some ways of avoiding traffic congestions, some of us still turn up for school late. Thus, we decided to try and solve this issue.

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

As a group, we selected the problem :"*Inconvenience caused by putting on buttons for uniform*". We felt that this issue is the most suitable area for us to focus upon as the subject of our project as it aligns itself closest to the following criteria:-- Feasibility, Need, Severity and Positive Impact.

With regard to the criteria of "Feasibility", our selected issue on the uniform buttons scored a "5" as the changes proposed are very much within our means and ability to correct and improve on. The other issues are comparatively lower in scores as they are significantly beyond our immediate control. On the issue of "Procrastination", we feel that individual discipline is more critical in resolving this, rather than being reliant on externally imposed or shared packages. A similar parallel can be deduced in relation to the problem of insufficient rest and sleep. Although this problem appears to not score higher in terms of the degree of "Need", compared to some of the other problems we pointed out, it is still an issue that very few people have pointed out, much less found a solution to tackle. Lastly, as the population who are inconvenienced by the buttons is relatively big, we felt as a group that tackling this issue would have a positive impact on the highest number of students. Thus, we chose the problem regarding "Inconvenience caused by putting on buttons for uniform" to address.

Here are our survey results to prove our selection.

Approximately how long do you spend putting on and removing the buttons every day in total?
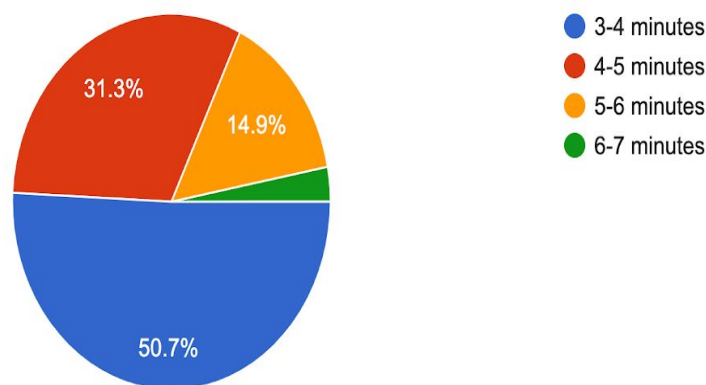67 responses

- 3-4 minutes
- 4-5 minutes
- 5-6 minutes
- 6-7 minutes

Figure 1.1

From this survey results, we can see that putting on and taking off the buttons takes a long time thus, emphasising the need to fix this issue and what these people can benefit from once the problem is solved.

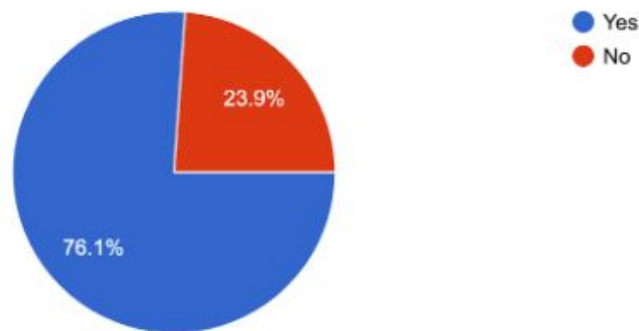Do you find it an inconvenince to put on and remove the buttons before and after school?

67 responses

● Yes
● No

23.9%

76.1%

Figure 1.2

From above, we can see that 3 quarters of the respondents felt the inconvenience from the buttons, suggesting that a new button mechanism is needed to help increase convenience and efficiency in the lives of students.

Would you be willing to try out our improved school buttons?
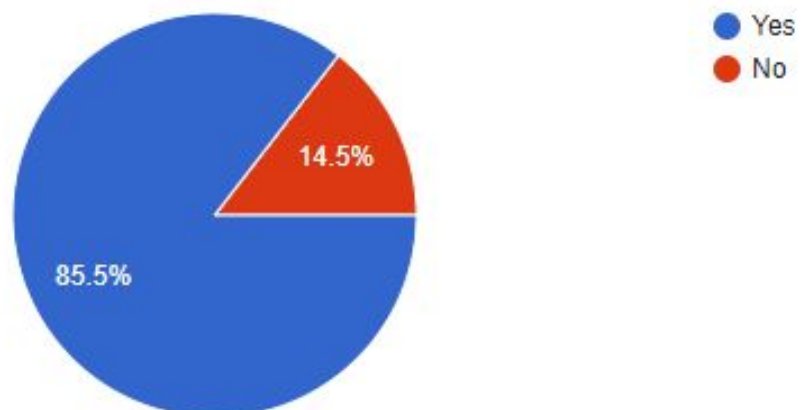
69 responses

● Yes
● No

14.5%

85.5%

Figure 1.3

Also, we can see that the vast majority of the students are open to a new button mechanism. Thus, this shows that our project is viable, relevant and potentially useful to many.

Do you feel proud wearing the school button?
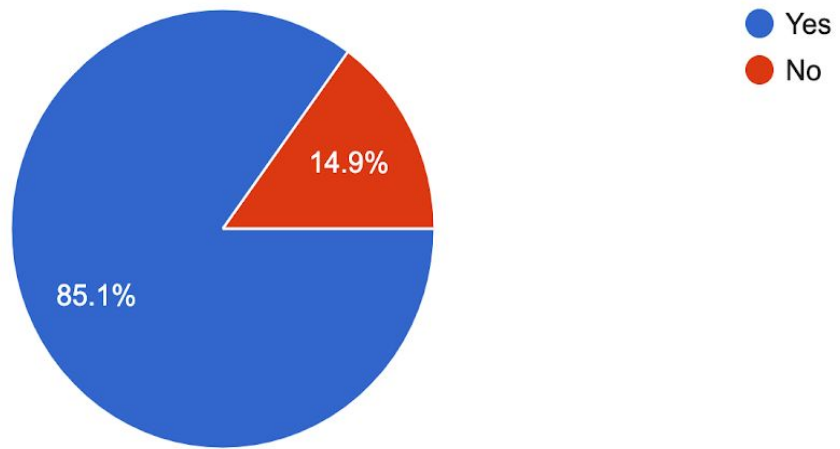
67 responses

Yes 85.1%
No 14.9%

Figure 1.4

Lastly, a majority of the students find pride in wearing the button, due to the design logo on it which represents the significant history of Hwa Chong. Thus, we will be not making any amendments to the design logo embedded in the school button.

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

CONSIDERATIONS	Feasibility(5)	Need(5)	Severity(5)	Positive Impact(5)	Total(20)
Problems:	NIL	NIL	NIL	NIL	NIL
Inconvenience caused by putting on buttons for uniform	5	3	3	4	15
Late for school due to traffic congestion	1	4	3	4	12
Procrastination	2	4	2	3	11
Lack of sleep due to too much homework in school	2	5	3	4	14

2. Defining 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 created a survey and asked our peers from Secondary 1 to 4 to help complete it. Here are just some questions that we have included in the survey, namely -- "Do you find it an inconvenience to put on and take off the school buttons before and after school" and "Have you faced any inconveniences due to the buttons." After collating the responses that we received, we found out that many students actually found the buttons to be inconvenient to put on and take off. Over 80% of respondents have voiced out that they have indeed faced problems such as being late for school, such as when they had missed the bus due to the time wasted putting on their buttons and some even had disciplinary actions taken against them as their buttons had dropped off without their knowing. Over 70% of respondents found a need for a button with a more convenient design for the putting on and removal of, and 86% of them are willing to try out our new design.

2 B   Compare and contrast the existing or similar solutions.

Figure 2.1

The button seen in Figure 2.1 uses a magnetic locking mechanism. However, it may slide off if the magnetic pull is not strong enough.

Figure 2.2

The button seen in Figure 2.2 is another button that is currently in use. This design will be relatively harder to put on compared to our newly-designed button. The "locking mechanism", in fact, has more parts than our current button and, thus, there is a higher risk of losing one or more of the component parts. This will then result in the button becoming unusable.

3. The 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 new button as seen in Figure 3.1 consists of a circular top with a similar design as the current school button and a locking mechanism at the bottom of it. Every morning, we would just have to push the yellow part of the button in Figure 3.1 into the grey part of the button to lock it.
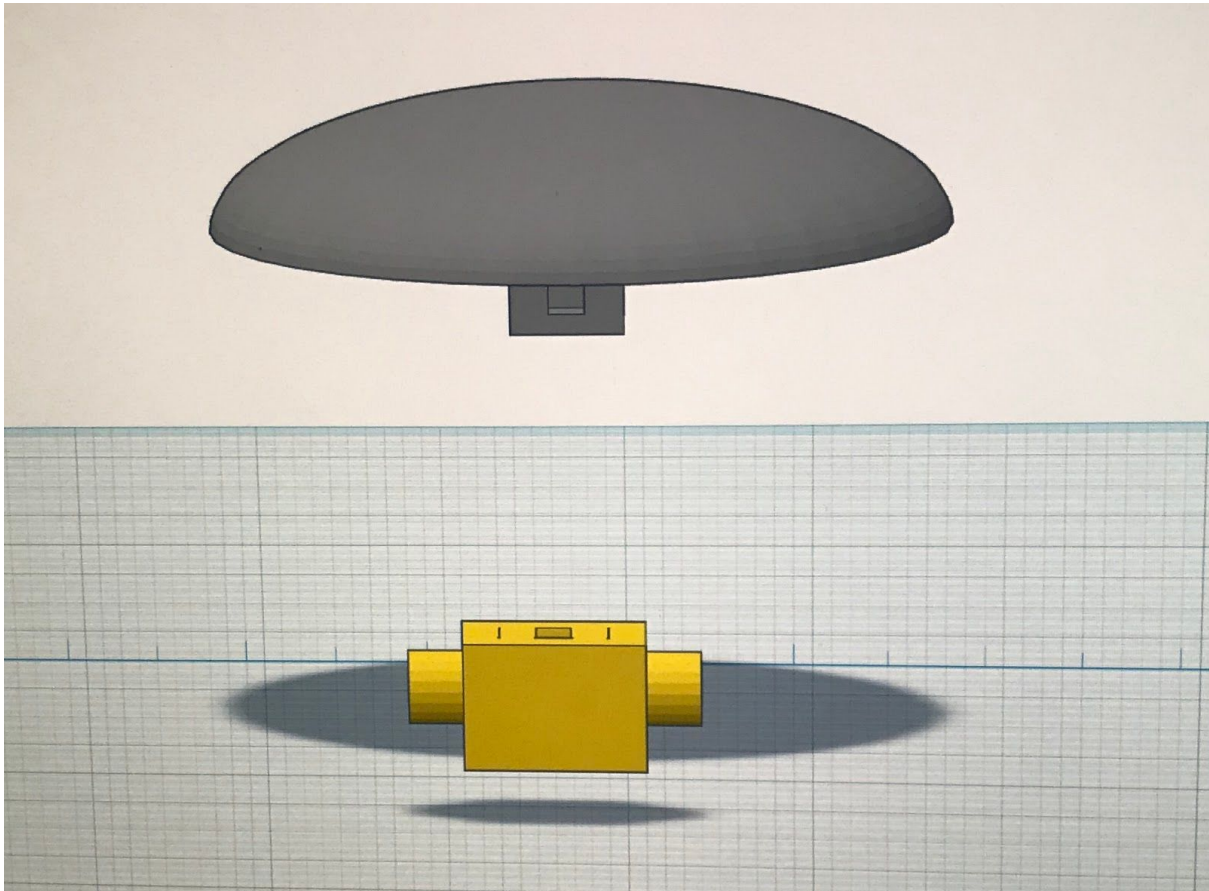

Figure 3.1

The locking mechanism of the button is called a snatch-lock and it can be categorised into 2 parts, namely Part A and Part B. These can be seen in Figure 3.2.
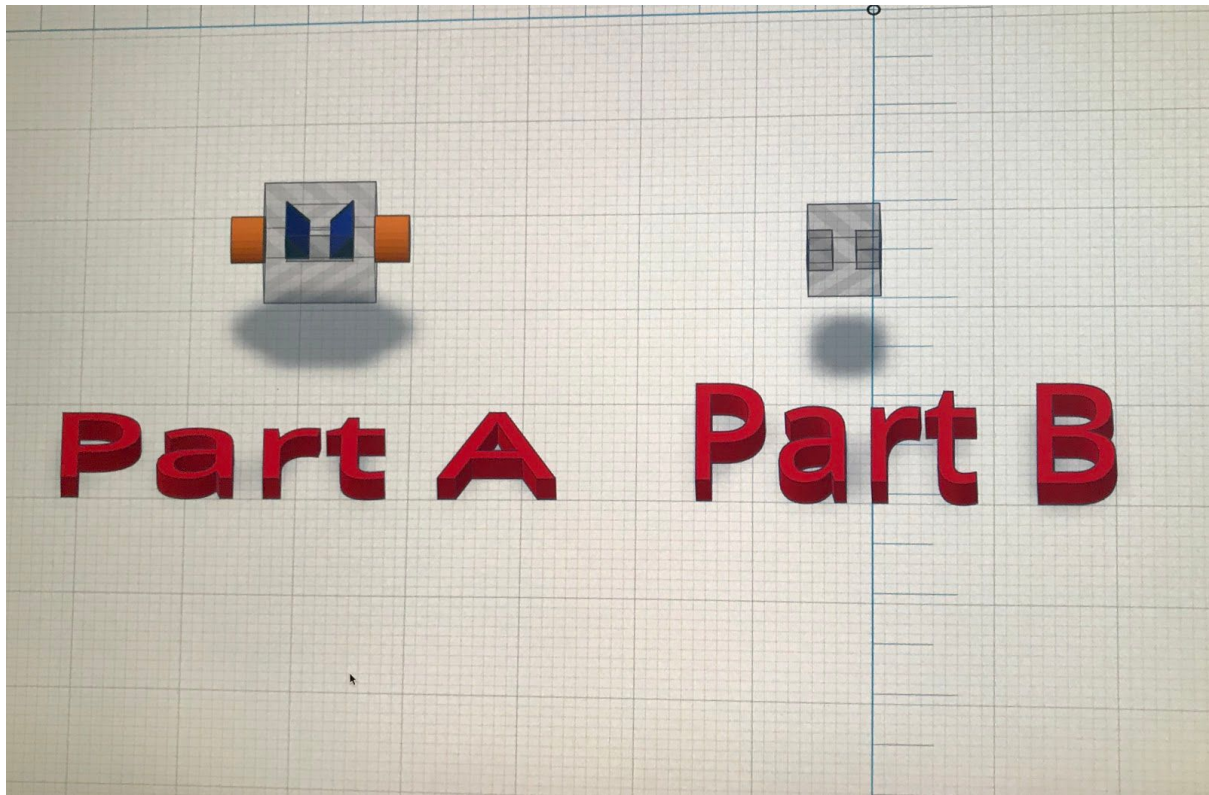

Figure 3.2

The blue wedges in Part A that are seen in Fig. 3.2 will clip into place in the small holes on Part B. This will secure the button onto our uniform. After school, when we want to remove the buttons, we will only have to push the two orange buttons at the side of part A in Fig. 3.2. This will compress the two wedges and we can then pull part A off, removing the button from our uniform. Below Part A, there will be some soft padding to reduce physical discomfort while we wear the buttons on our uniform.

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

Our target audience is our schoolmates and students with buttons on their school uniforms similar to those of our school's. The main aim of our project is to help these students achieve greater convenience and comfort through our new design.

One key benefit of our invention is the less time wasted. The current pin that is used to secure the button takes some time to put on and take off. This is because the pin is hard to detach from the button. Although the time wasted might appear to be insignificant on everyday terms, the cumulative time spent over a period of time can be considerable. In our new design, we will ensure that the button is easier to put on and take off, hence reducing the time spent.

Secondly, there will be increased convenience as less effort will be required to attach and remove the buttons. The existing buttons require students to open the ring with their fingernails, align the pried open ring with the hole of the button then twisting it in. Students may find it particularly difficult to pry open the ring without fingernails as afterall, as per school rules, we are not allowed to keep long nails.. However, our new design will only require students to align before locking in the button, making it significantly convenient to attach the button.

Thirdly, the new design will help to lessen the discomfort on our shoulders. The rings that are used in the current button design are made of metal and have edges that can be quite sharp and abrasive. This is especially uncomfortable when students are carrying their bags as the bag strap often presses hard onto the buttons on the shoulder, hence applying a lot of pressure onto the students' skin. This frequently leads to blisters and even potential scarring. With our new design, we will ensure that its edges are blunt enough to not cause damage or inflict pain. Our new invention will make use of soft padding to blunt or cushion force exerted from the metallic parts. As such, the user will be able to wear the button for a longer period of time with reduced discomfort.

Another benefit will be, we believe, that of lesser disciplinary transgressions from being late. Due to the new button design, students will theoretically spend less time on the buttons and have more time to get themselves ready for school. This will ensure that they arrive in school on time or earlier.

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

Firstly, our proposed invention consists of lesser parts compared to the other extant button designs. The lesser parts in our design reduces the risks of losing one or more parts of the buttons. A lost button part renders the entire button unusable. Replacements inevitably incur additional, unwarranted costs. Our new design hence should prove to be financially prudent in the long run.

Secondly, our proposed invention steadfastly secures the button, especially when contrasted to other extant alternative versions. The button in Figure 2.2 uses a magnetic locking mechanism. The weak magnetic force of this design cannot keep the button affixed strongly, possibly consequencing in frequently slided off, missing buttons.

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

A problem we expected to face is with regard to graphic designing. We are not very familiar with the currently available softwares online. Moreover, we are uncertain about the technical intricacies required in the actual process of design creation.

Also, we expected to face the challenge of trying to include a mix of the advantages of all our 4 prototypes to make the final prototype. We knew that it would be hard as there are many factors we needed to take into consideration.

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

The first major milestone of our project is the brainstorming for ideas during the mid-year and final evaluation. This was before the creation of our proposal slides. The subsequent milestone was after the proposal evaluation round. Once our proposal was approved, we started brainstorming on possible solutions, designs and we also thought of the materials that we could use for our invention.

Thus the next major milestone in our project was the creation of a basic design of the few prototypes that we have brainstormed about.

The last milestone that we hit would be the choosing of the most appropriate prototype for our final evaluation and the creation of the accompanying slides. We had to take into consideration many factors and we decided on a prototype that satisfied most of the requirements we set out to achieve.

4. Proposed Construction <u>or</u> Modelling Process*
(This first… then that…)

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.**

Our group had planned to construct the prototype of the button through 3D printing. Confirmed booking with an NTU engineering lecturer for the 3D printing of our prototype has in fact been affirmed. However, due to NTU disallowing external visitors into their 3D printing laboratories, owing to restrictions imposed in face of the Circuit Breaker, we have not been able to construct the prototype as planned.

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

The Category Manager has instructed that videos / animations should not be included in the logbook or project appraisal process this year.

Also, due to the strict safe distancing measures implemented by the government and the school , we were unable to collaborate physically together and intermingle.

<u>Warning:</u>

- *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

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

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