

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

Title of Project: Table tennis Disinfector
Group Name: Handy Helpers (3-07)
Group Members: 1) Andric Kwan Jingheng 2) Yong Ze Kai 3) Gerard Qiu Rui De 4) Gan Wei Wen

## 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 school no longer provides students with sports equipment for Unstructured Free Play due to the current COVID-19 restrictions in order to minimise unnecessary contact between students and to curb and prevent the potential spread of Covid-19 in the campus.
- Students had since stopped taking part in Unstructured Free Play and lack daily exercise as a result. Much of the student population, including our group members, have experienced this.
- Many students have to expend finances in order to acquire sports equipment for Unstructured Free Play, which is often costly, even though it would be frequently used. This is reflected in surveys done with the respondents, who identified this as a root cause of them ceasing in taking part in Unstructured Free Play.

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

- Firstly, we should give students more opportunities and platforms to encourage students to exercise more regularly. Studies have shown that exercising can help in improving fitness, providing an opportunity to socialise, increasing concentration which in turn improves academic scores, encouraging healthy growth and development and improving self-esteem at the same time.
- We have noticed that many of our peers are suffering from academic stress due to the large amount of homework and many examinations which they find difficult to cope with. Sports help students channel stress and pressure from their school life into their workouts. It provides them with a safe and healthy way to unwind and relax. When we exercise, the body releases endorphins that act as stress busters. They help improve the mood and social disposition of students
- Unstructured Free Play is also the most attractive and favoured form of exercise for the students as they get to play a sport of their choice. This is backed up by the responses from our survey results.
- Also, students want the school to continue providing them with sports equipment for Unstructured Free Play. This is backed up by our findings in the survey. We hope that our project can help encourage the school to start providing sports equipment again.

**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 The school not providing equipment for free play due to Covid 19	#2 Students stop partaking free in free play and lose the opportunity to exercise	#3 Many students have to waste money to buy equipment needed for the sport
Allowing students to exercise more	3	4	1
Unstructured free play is the most attractive form of exercise	3	4	1
Letting the school provide equipment for free play once again	3	3	2
<b>Total Score</b>	<b>9</b>	<b>11</b>	<b>4</b>

## 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)

- Prior to the third quarter of 2020, students had access to sports equipment provided by the school. However, since the COVID-19 virus started spreading in Singapore, the school could no longer provide students with shared equipment. Many students therefore had to purchase the equipment by themselves, in order to engage in Unstructured Free Play which is pricey. It also becomes a financial burden as many students would most likely only use the equipment once or twice a week (survey). The survey conducted by us also showed that many students would like to receive the school-provided equipment for Unstructured Free Play which they find to be more convenient.

### 2 B Compare and contrast the existing or similar solutions.

- Sports ball disinfectors use UV lights that involve high power consumption and take a very long time to disinfect the balls. It is also very heavy and inconvenient to move around.
- Sterilization cabinet which also uses UV light: It is also less effective in disinfecting the balls on the top rack. It is not portable and takes a much longer time to disinfect the balls.
- *Our model uses disinfection spray which has a low power consumption and at the same time ensures that the equipment is cleaned thoroughly and quickly. It is also extremely efficient as it disinfects both the bat and the ball. It can also be moved around easily as it is a small and compact device which allows for flexibility.*

### **3. Your BIG IDEA<sup>#</sup>** (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 invention is a machine which automatically disinfects table tennis bats and balls. It makes use of disinfection sprays to clean and sanitize the equipment. This would kill the germs on the equipment, preventing virus transmission between different users through contact with the equipment.

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

The purpose of our invention is to disinfect the table tennis sports equipment. Its potential benefits are that the school will be able to resume providing sports equipment to students for Unstructured Free Play, as it solves the concern of transmission through the use of common equipment. This would in turn encourage students to partake in Unstructured Free Play more often, increasing their daily exercise routine and giving them the opportunity to socialize with friends who share a common interest in sports.

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

Many products similar to ours make use of UV light to disinfect the equipment. However, the UV light requires a long time to disinfect the equipment, and has a higher power consumption in comparison with our proposed invention. Our machine will use disinfecting spray, which our machine then quickly blows dry. It has a low power consumption as all the components are linked to a 24V power supply in our machine, which makes it more effective than current products in the market.

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

- Soldering the wires to connect the components
- Making sure that the pneumatic cylinder extends and retracts properly
- Ensuring that the components activate in the correct order

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

- Finalising our design of the machine, from about March to April.
- Generating the prototype of the machine, from May to June
- Making the slides for both final evaluations.

***#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. 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**

- We chose to use a proximity sensor to detect the bat as it is the most common sensor, and is also relatively cheap.
- We used an automatic switch so that the entire disinfection process will be fully automated whereby the user only needs to place his/her bat into the machine and the disinfection starts automatically.
- We chose to use an indicator light so that the user will know that his/her bat is being disinfected.
- We decided to use a PC fan to dry the bat and ball after they have been disinfected as it is inexpensive.

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

- The price of the components and parts needed for the product
- The availability of the components and parts needed for the product
- Whether any specialized skills are needed for the construction of the product (e.g. coding etc.)
- The time needed to construct the product

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

<https://drive.google.com/drive/u/1/folders/1qVYJrlmcTpWSiH7SDBoVoTYOYN1WkJf9>

**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.**

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

**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.

**6 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, interviews, photographs, product brochures, reviews etc.)**

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<https://www.halton.com/products/uvgi-es-sports-ball-sanitizer/>

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<https://www.mcmaster.com/power-supplies/output-voltage~24v-dc/>

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<https://www.stigasports.com/eu/stiga-royal-5-star-table-tennis-bat>

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