

# **CAT 4 RESOURCE DEVELOPMENT**

## **Group 4-62 MakerSpace**

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# Makerspace Web Report

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We declare that the web-report is our own work and does not contain plagiarised material.

## ABSTRACT

The school has built a Makerspace, as part of its revamp of Block B as a learning space for students. It is an area where students gather to design, invent and create things of their liking. There is a wide array of activities one can do in the Makerspace, for example woodworking, electronics and sewing, and with such activities, there are naturally many tools that have to be used in order to conduct such activities, such as scroll saws, soldering stations and sewing machines. Some of these tools can also pose safety hazards such as sharp blades or high temperatures. Hence, our resource package serves to bridge this gap through empowering students with the skills needed to use these tools as well as educating them about safety precautions to maintain a safe working environment.

## 1 INTRODUCTION

### 1.1 Rationale

Even though the idea of the MakerSpace will benefit the student population, problems arise when students have to learn how to operate these tools properly. Most students have never come into contact with these tools and are unsure of how to use them, stating that it was “too difficult, too dangerous, too inaccessible and too time-consuming” to learn how to use them properly.

### 1.2 Objectives

The objectives of the MakerSpace project is to:

- Provide our target audience the knowledge needed to operate tools in the Makerspace
- Educate our target audience on proper safety procedures to ensure no damage or injury

### 1.3 Target Audience

Our target audience is all Hwa Chong students from Secondary One to JC2 who intend to use the tools.

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## 1.4 Resources

Our resource package consists of instructional videos for each workshop tool. Accompanying these videos are quizzes which the students are required to attain a full score on before being permitted to use the tool in question. All these resources are held in a temporary website for easy access to students.

### 1.4.1 Videos

Since we are working with another Makerspace group, we have split up the work and chose to focus on these few tools: Jigsaw, Wireless Power Drill, Soldering Station, Scroll Saw and all the different Hand Saws.

We have also ensured that all our videos stay below 5 minutes by being clear and concise due to the short attention span of students.

Each of our videos follow a well-structured format in this order:

- Introduction  
The introduction contains fast and short cuts of the tool in action which serves to attract the viewer's attention. Showing the tool in action also serves as a quick overview of what the tool is used for. The introduction also contains an overview of the video, with timestamps to each individual section, which would be useful to students who already know how to use the tool and only want to learn about the safety precautions to take note of.
- Mechanics and Uses  
This section briefly explains how the tool works to improve the student's understanding about the tool. It also describes what the specific uses of the tool is in detail. This is important as it prevents misuse of the tool. Also, certain tools have similar functions but has its intricate differences that make it more effective in different kinds of work.
- How to use  
This section goes in depth about how to set up and operate the tool involved. We pay specific attention to the subtleties in operating the tools efficiently from the experience we have gained from operating them, so that students can have an easier time using the tool. Different techniques on how to use the tool for a specific purpose are also highlighted in this section.
- Safety Precautions  
Here we give pointers on the 4 categories of safety; safety to persons, provisions, project and place. We list these safety precautions in a chronological order i.e. what should be done "Before, During and After" using the tool. This allows for them to remember these pointers much more easily.

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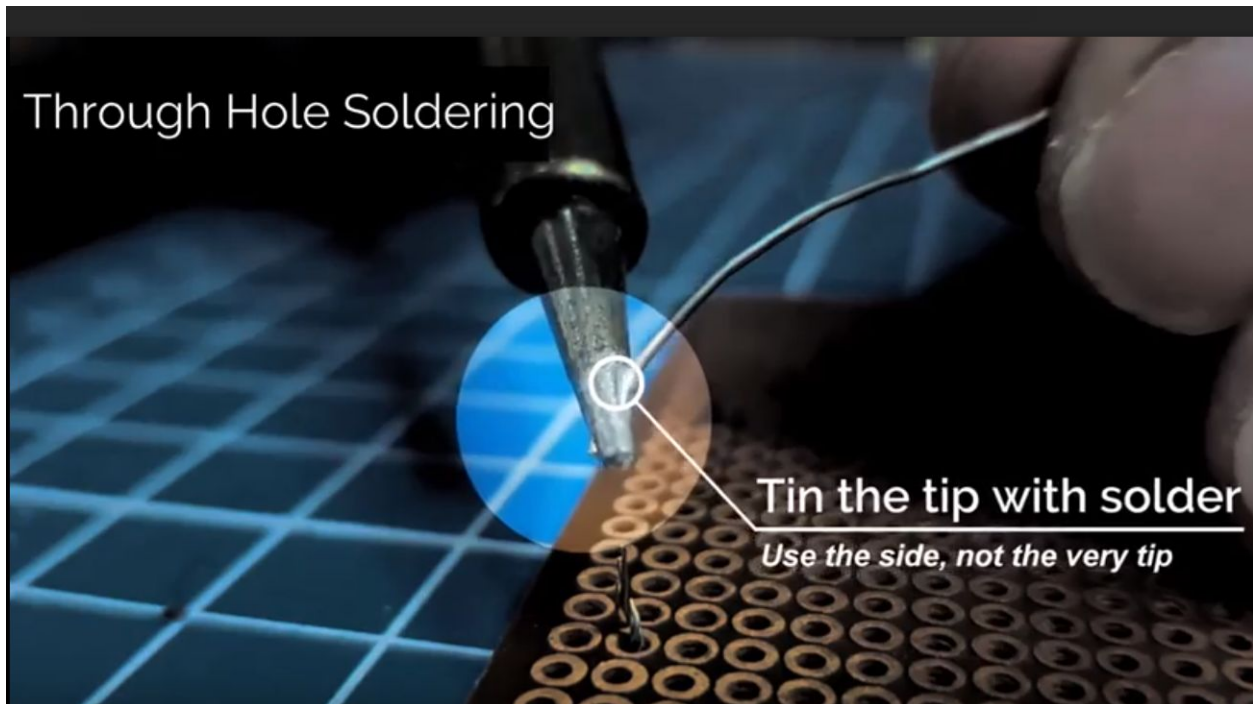
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Following are some snapshots from our actual videos of each relevant section.

## Soldering Iron Tutorial

Mechanics and Uses	0:13
Through Hole Soldering	0:49
Soldering 2 components	1:44
Safety Precautions	3:02

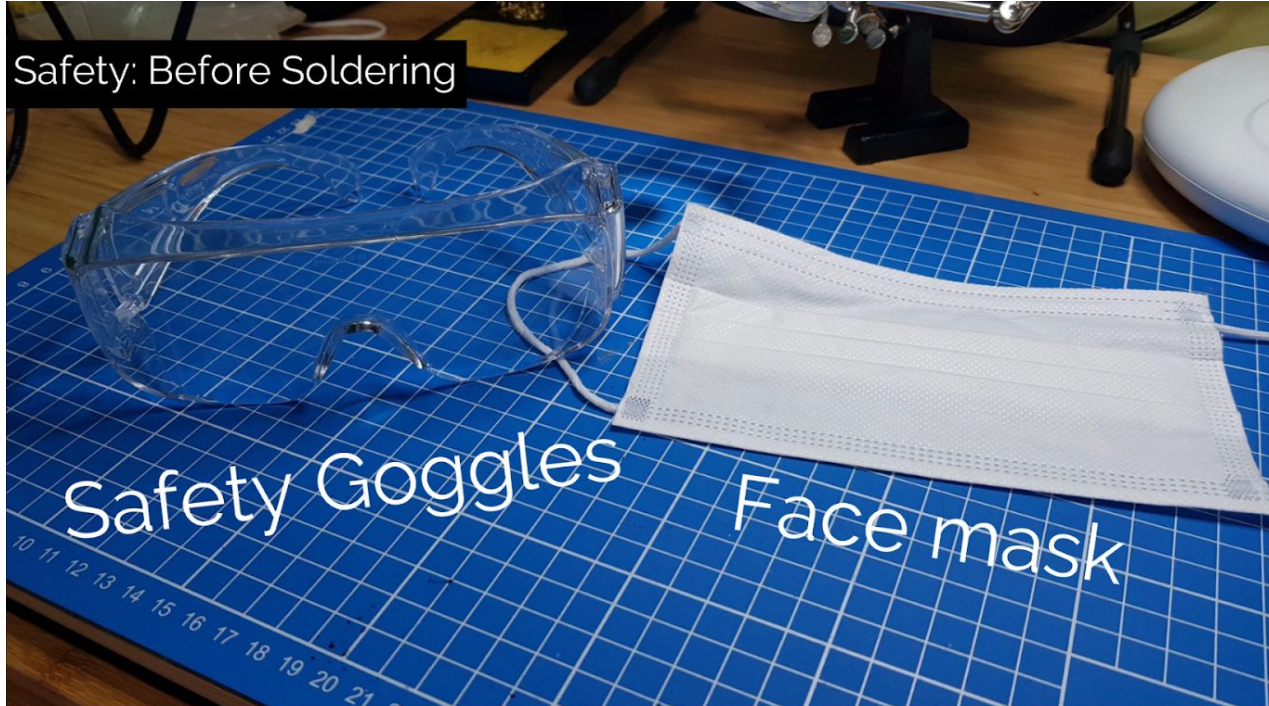
*Overview of video*



*A part of the How to Use section for the soldering iron*

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*Safety precautions*

### 1.4.2 Quiz

Our resource package also contains quizzes for each tool in order to test students' understanding of the safety implications of the tools and how to properly use the tools. For ease of data collection, we have used Google Forms to create these quizzes.

Students' scores will be saved in a spreadsheet and only those who have attained a perfect score will be qualified to use that specific tool. (The tracking of scores is handled by another Infocomm group). This process validates all users of the tools to be responsible enough to handle them, thus providing a safe work environment for all students. The questions in the quizzes are entirely based off the information covered in the video.

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What is the first thing you should do when preparing to use a jigsaw? \* 0 points

- Put on your safety goggles and gloves
- Clean and polish the wood with sandpaper
- Turn on the switch
- Jam the blade into the jigsaw
- Use a screwdriver to loosen the screw

How should you ensure that the material you are using does not move about? \* 0 points

- There is no need to hold it down at all
- Put a heavy material directly on the material you are cutting
- Hold it down with a clamp
- Hold it down with your friend's hand
- Hold it down with your hands

*Sample of a quiz for the Jigsaw*

### 1.4.3 Website (temporary)

Finally, we have created a simple yet user-friendly website to collate all of our teaching resources and quizzes. This website will allow students to search for resources based on the tools they need, allowing for more efficient learning.

We have used Google Sites for this as it is something that most teachers have been using recently, which makes it familiar to students. Besides, since the official Makerspace website is already using Google Sites, it would allow for easier integrations of our resources into the official website in the future.

## 2 REVIEW

Throughout the project there has only been one website on Hwa Chong made by the teachers, but this website does not have any safety videos on it, and hence we were tasked with creating videos.

In addition, most online videos typically place more emphasis on how to use the tools rather than on the safety precautions that one should take note of. For example, instructional videos on how to use a Jigsaw, will usually go through things like how to replace a saw blade or how to saw materials. However, safety precautions will be

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mentioned in passing, like to wear personal protection equipment, or not even mention it at all.

Besides, the tools used in most online videos are usually of different brands and models, each with its own intricate differences. Thus if online videos were used to educate the students, it will be easy for them to get confused.

Hence our resource package, will be the most effective way to teach the students how to use the tool, since our videos will be tailored specifically to the tools actually present in the Makerspace, as well as the safety precautions, filling up the gap found in most online videos.

## **3 METHODOLOGY**

### **3.1 Needs Analysis**

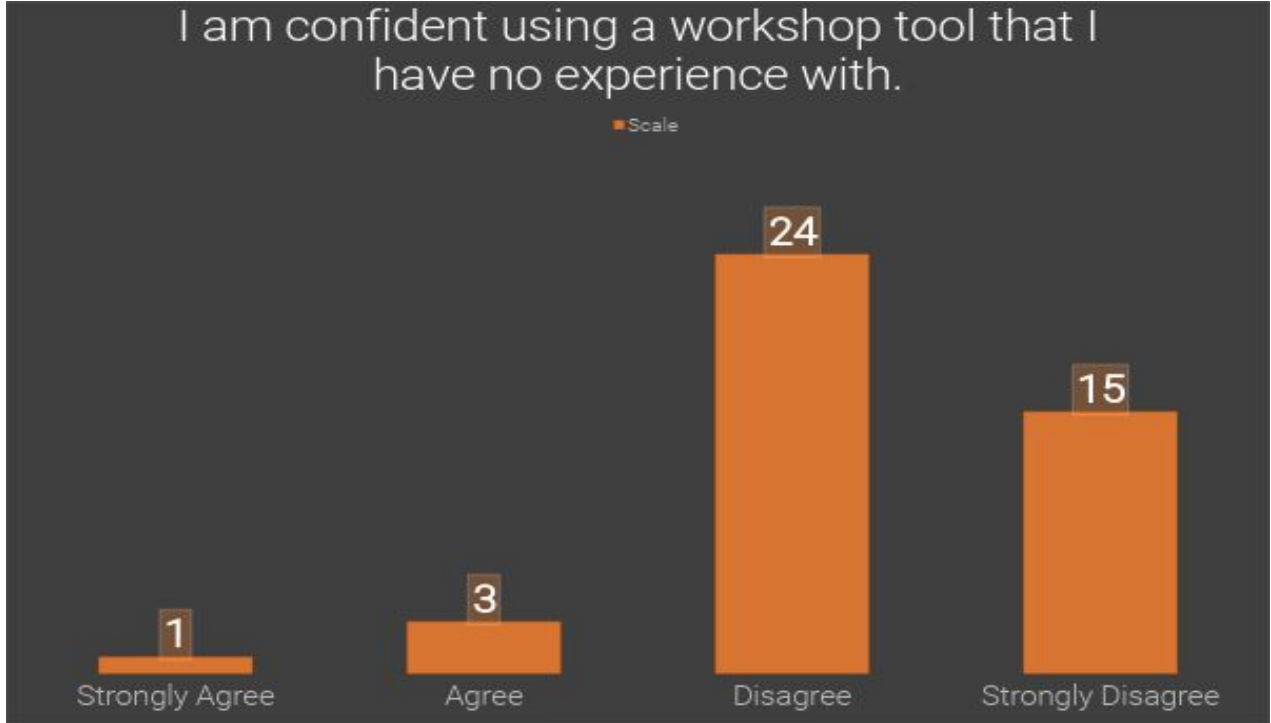
To ensure that our resource package was relevant, we conducted a needs analysis survey that focused on 2 main questions: “How great is a need for our resource package?” and “What are the most effective resources for teaching?”

To address the first question, we asked what the Makerspace could provide for the students, to which a majority said it could be used for their project work, especially for those in the Inventions category. Others stated that certain CCAs like Robotics would find the Makerspace to be useful. Hence, it is safe to say that the Makerspace will be a popular and useful place for students.

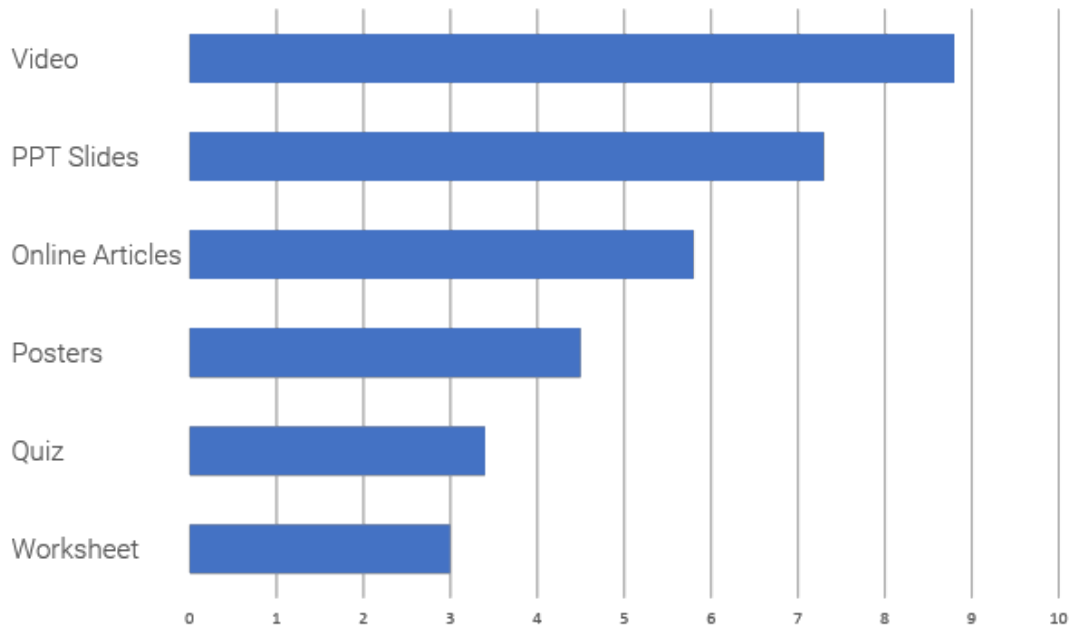
To answer the second question, we got students to rate a list of resources from 1 to 10 based on how effective they found them to be, with 1 being the least effective and 10 being the most effective. Instructional videos achieved the highest average rating of 8.8, hence we opted to use videos as our main form of teaching.

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3.2 Survey Results



Confidence level of students before using our resource



Type of resource the students wanted to see



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### **3.3 Development of Resources**

Since safety is compromised when students mishandle and misuse equipment, we chose to define the term “safety”. We realised that safety of four different things can be compromised, which are; Safety to oneself, Safety to others, Safety to materials and tools, and Safety to the Makerspace. Thus, we made sure that all our resources will educate users on how to better prevent any breaches of safety from these four areas.

The quizzes that were made were fully based on tips that were provided in the video, and to ensure that there is no damage or injury, we decided that a student who attempts must get full marks for the quiz or he will not be qualified to use that particular equipment.

### **3.4 Pilot Test**

After finishing up our jigsaw video and quiz, we decided to conduct a pilot test to collect some feedback on our project so we knew that we were headed in the right direction. We conducted this test within our class, and found 23 respondents. We got them to watch the video and complete the quiz, and give us some feedback on our project afterwards.

### **3.5 Results and Feedback**

The quiz appropriately tested their knowledge of the tools, with most respondents completing it within 1 minute, and aligning with our objectives, 90% of respondents got full marks on the first try, showing that our resources were successful in equipping respondents with sufficient knowledge to operate the tools. Most importantly, all respondents felt more comfortable using the tools after the video and quiz.

Some feedback that the respondents had for us was that despite the video being easy to understand, the introduction was too long. Hence, we shortened the introduction down to 10 seconds at maximum so as to quickly grab the viewer’s attention and move on. They also felt that we spent too much time on the functionality of the tool, and not enough on the “Safety” portion. Thus, we decided to balance out the “Safety to Functionality” ratio of information from 50:50 to 60:40, helping us stay focused on our aim of educating viewers about safety risks.

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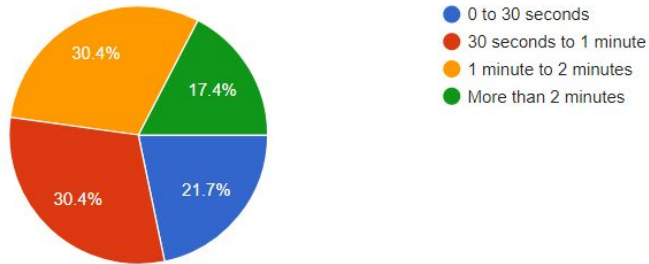
QUESTIONS

RESPONSES

23

### How long did you take to complete the quiz?

23 responses



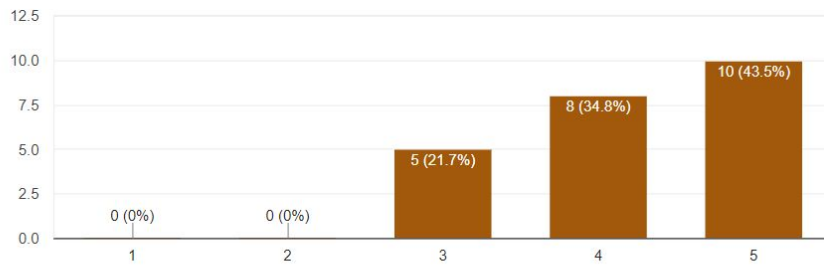
QUESTIONS

RESPONSES

23

### How confident are you in using the tool now?

23 responses



*Feedback*

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## 4. Outcome & Discussion

As the Pilot Test showed a positive outcome, we decided to incorporate that format for the rest of the tools that we were working on.

Some limitations we faced was the lack of time we had to make videos for more than the five tools mentioned. However, we will continue working with the school to receive feedback and improve on our resources. Another limitation we faced was our conflicting schedules, which caused us much difficulty in finding time to go down to the Makerspace together to film videos or learn how to operate the tools. Hence, we got around this by doing as much as we could beforehand, like planning our video and writing our script so that when we reached the Makerspace we could finish the video as quickly as possible.

## 5. Conclusion

All in all, for us, this project was a truly eye-opening experience. It incorporated all the aspects of resource development: the research, the experimentation of different techniques, and the formulating of a solution to the problem. It was the first time we got to interact with these tools up close. Through learning by hands-on experience, we felt enriched and empowered to help others use tools in the makerspace so that all students in Hwa Chong can exercise caution in using these tools, but also enjoy what they are doing in the process. For us, we have no regrets taking up this project and hope to be able to see most, if not all portions of our project be used by the school department to cultivate the “Maker Culture” within students.