

Hwa Chong Institution

Project Work

Category 3 Inventions Log Book

Title of Project: Project Prohibere Aqua
(P.A.)

Group Name: 3-24

Group Members:

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1. Problem Finding

(The beginning...)

Identify a problem you would like to solve. You may want to 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.

We have identified several problems based on the theme of our invention, which are problems faced in the household. We managed to identify these problems, namely Steep Water Prices, Electricity Wastage as well as Appliances Breaking Down, by observing our own homes and consulting our friends and family.

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

We considered the feasibility of the problem as we might not be able to find a solution if the problem is too difficult to solve. Secondly, we also considered the scale of the problem as some problems might be too trivial and do not have to be solved. Last but not least, we considered the availability of existing solutions in the market as this will affect the impact of our solutions as our problems might have already been solved.

1 C List some problems your group would like to solve. List also the considerations for selection of problem 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		
	Water Wastage	Electricity Wastage	Appliances breaking down
Feasibility	4	3	3
Scale of Problem	5	4	3

Availability of Existing Solutions	3	3	2
Total Score	12	10	8

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)

In 2017 the prices of water increased for the first time in 17 years by 30%. The price increase would go towards maintaining Singapore's infrastructure, and more expensive sources such as desalination. Furthermore, more unpredictable weather patterns have caused water levels at the important Linggiu Reservoir in Johor, which supplies 60% of Singapore's water needs, to fall. On top of that, several dry spells in 2016 led to water rationing in several Malaysian states and caused Linggiu Reservoir water levels to fall to a new low. In 2016, Environmental and Water Resources Minister Masagos Zulkifli called on Singaporeans to reduce the daily usage of water from 150 litres to 140 litres by 2030. Additionally, he added that national water agency PUB would phase out the sale of less efficient taps and mixers, and introduce a new rating for washing machines.

2 B Compare and contrast the existing or similar solutions.

We have found a similar product. It is the hand sensor tap. It does benefit the cause, it does prevent water from running when no hand movement is detected. However, this has a few issues. Sometimes, when you are doing household chores that involve filling a bucket, you might have to hold your hand there for a long time so as to get the water to come out. Sometimes, your hand may not even be sensed and that can be very frustrating.

Criteria	Functionability (Where are the areas it can be implemented?)	Approachability (Is it simple and easy to operate?)	Effectiveness (Are there any drawbacks?)
Existing Solutions			

<p>Hand Sensor Tap</p>	<p>Only can be used in public areas-not suitable for household use</p>	<p>The user has to hold their hand there for an extended period of time if more water is required.</p>	<p>Sometimes, your hand may not even be sensed and that can be very frustrating. The period in which the water continues to flow may be unnecessarily long at times, thus wasting water.</p>
<p>Self Closing Push Tap</p>	<p>Only can be used in public areas-not suitable for household use</p>	<p>The user has to continuously press if the usage period is long, which can be frustrating at times.</p>	<p>If the button gets stuck, water cannot stop and will continue flowing, wasting more water. In addition, the period in which the water continues to flow may be unnecessarily long at times as well.</p>
<p>Water Saving Mixer</p>	<p>At home-not suitable for public use</p>	<p>Rather simple to operate, however, much piping has to be installed beforehand.</p>	<p>Costly-needs a heater as well as much piping for the full benefits to be reaped. Electricity to heat the water also adds on to the costs.</p>

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.

We can install two sensors in rooms with taps. A motion sensor to sense the presence of humans, an impact sensor to detect the presence of water and a beeper and Led to alert the user. So if there is no movement but water detected, the alarm will go off (it will light up for the first few drops, but if it continues for a period of time, then the buzzer will sound) and other times nothing will happen.

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

As we all know, Singapore has a limited water supply. We have only four sources of water. Local catchment, imported water, newater and desalinated water. Two of these sources are very expensive, one plays only a very small part and the main source of water is from another country. Thus, we must prepare to be self-sustained and treasure every single drop of water. This invention will aid us in cutting down on unnecessary water wastage.

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

One of the similar products, such as the Hand-Sensor Taps is useful. It does prevent water from running when no hand movement is detected. However, this has a few issues. Sometimes, when you are doing household chores that involve filling a bucket, you might have to hold your hand there for a long time so as to get the water to come out. Sometimes, your hand may not even be sensed and that can be very frustrating. This can also be observed from the other solution-the Self Closing Push Tap. Thus, we have come up with a solution of our own.

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

Some problems we may face along the way may be issues regarding the building and execution of our prototype. Coding the prototype and assembling the various parts may take some time and well-thought out plans. There might also be some difficulty finding the various parts we need.

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

Feb-April: Brainstorm problems and identify how to solve them, come up with a few solutions then narrow them down.

June: Complete and finalise the prototype - Testing, Re-Iterations

#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 decided to use a water sensor and a motion sensor and link them together. The water sensor would be able to detect the presence of water in the sink while the motion sensor would detect the presence of people in the room.

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

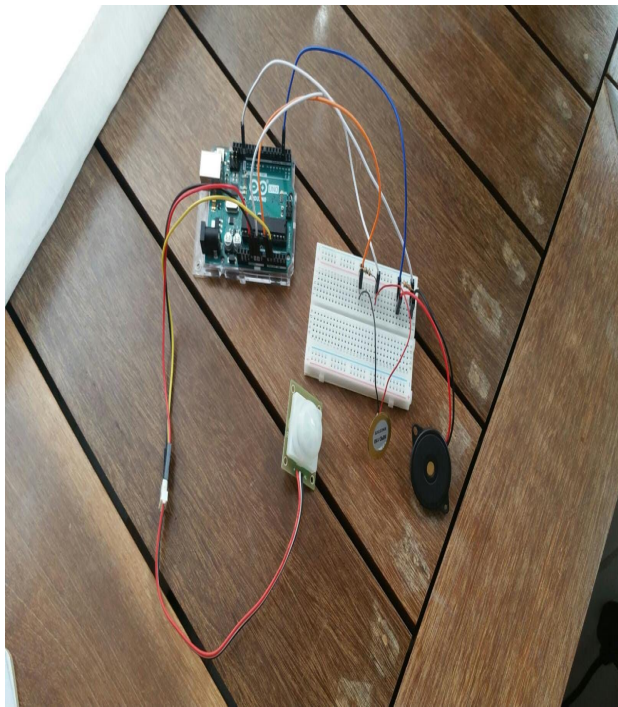
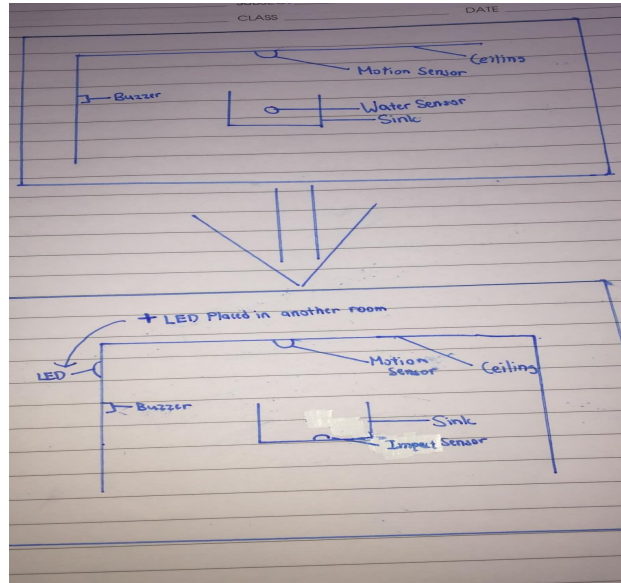
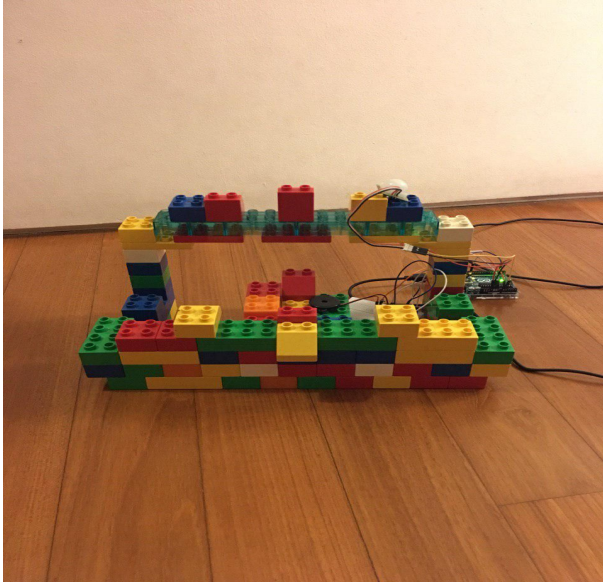
1. Were there any problems brought up by using these parts?

Yes, the water sensor might detect the residue water droplets in the sink after someone washes their hands, and trigger the alarm. Thus, we needed to find something else to use.

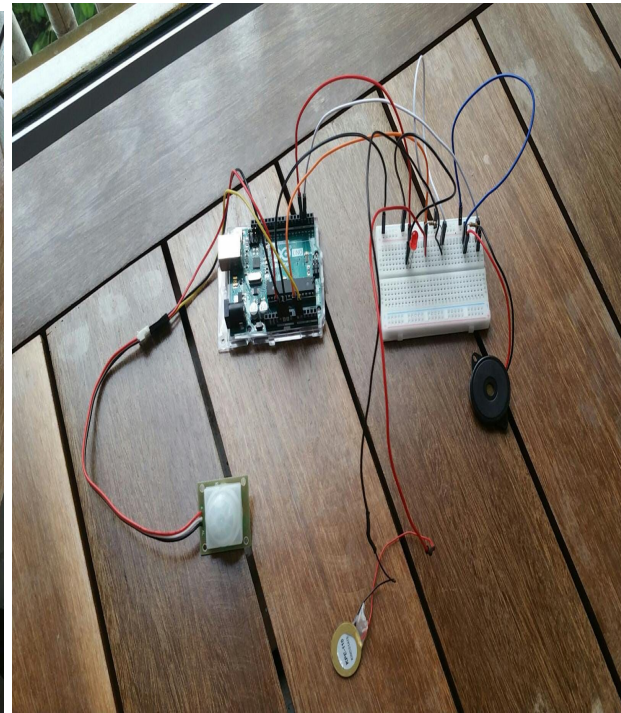
4 C Document the prototype/ product development stages. You may use drawings, photographs or videos.

Iteration 2: We realised that an impact sensor was more effective than a water sensor. The impact sensor would sense water flowing from the tap when the water droplets fall on it. This would thus solve our problem of the detection of residue water!

Iteration 3 : On top of that, we realise that an LED bulb lighting up will be much less annoying. However, we decided that some people may not notice the light. So, we included both notification strategies, which will also increase its efficiency. How we programmed it ,it will light for the first few drops, but if it continues for a period of time, then the buzzer will sound.



Iteration 2



Iteration 3

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 in 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. Modification and Evaluation

Upon the completion of your prototype/ product, you would need to see if it is working the way you want it to work. Check if your product has met the identified purpose and the user’s need; and implement necessary modifications and improvements. This process may take several rounds.

5 A Write down your prototype/ product test criteria and check against it if it works. Identify areas of weakness for modification. Indicate the test iteration and date of test.

Test Iteration: 2	Tick			Remarks
	Pass	Fail	Potential Failure	
Test Date: 28/6/19				
Test Criteria 1: Code	✓			
Test Criteria 2: Impact Sensor	✓			
Test Criteria 3: Motion Sensor			✓	Motion Sensor was not sensitive and sometimes did not sense vigorous waving in front of it.
Test Criteria 4: Buzzer	✓			

Test Iteration: 3	Tick			Remarks
Test Date: 2/8/19	Pass	Fail	Potential Failure	
Test Criteria 1: Code	✓			
Test Criteria 2: Impact Sensor	✓			
Test Criteria 3: Motion Sensor	✓			
Test Criteria 4: Buzzer	✓			
Test Criteria 5: LED	✓			

*Add more rows for more criteria

** Repeat table for next test iteration

OR if you are creating an animation / video to show how your invention will work, write down the different possibilities / outcomes [success or failure) if a full-scale prototype is to be constructed.

6. 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 (eg books, magazine, websites, journal articles, interview, photographs, product brochure, reviews etc.)

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