

Hwa Chong Institution

Project Work

Category 3 Inventions Log Book

Title of Project:	<u>Sweep Up</u>
Group Name:	The Broomsweeps
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Problem Finding

The refrigerator gives out heat. Certain parts of refrigerator feel hot and we feel that this heat is wasted. Heat is given out by the refrigerator because the refrigerator cannot produce coldness and the heat from the food stored in the refrigerator is transferred to outside of the refrigerator, heating the kitchen. This problem was surfaced by complaints from family members and our own past experiences. We confirmed this problem when we received a comment on our forum. We felt that is was a waste of money to use the electricity only for transferring heat from the interior of the refrigerator to the exterior of the refrigerator. We thought that the heat could be used for something else and thought of using that heat to boil water.

Another problem that was provided was people not being able to tell when a fish is fresh or not. They feel that they were cheated by the fish sellers, causing their money to be wasted on what they thought was fresh fish.

The survey also informed us of the problem of switching from a broom to a mop. This is time consuming and is also said to take more effort. We thus had the intention to create a multi-purpose broom.

We also noticed dust particles stuck in broom bristles and thus, we conducted a survey to understand the problem. People claimed that they would hit their brooms forcefully against the wall. Some also washed it with water. Others threw the broom away. As buying a new broom would be expensive, we thought of using a brush to remove particles stuck in the broom. We were also told that it was hard to sweep corners with broom and that there was no space to store broom.

We eventually chose to go with the idea of having a broom to sweep corners and has small storage space. We also wanted to create a comb to remove the dust particles. We chose this as we thought it would be useful and not as expensive as some other products in the market. It was a simple idea that could be linked with daily life. Although technology would take over cleaning in the time to come, we feel that our product would be able to help those who cannot afford the technology.




Considerations for Selection	Problems (out of 5)				
	#1	#2	#3	#4	#5
Usefulness	2	1	5	4	3
Cheap	2	1	5	3	4
Simple	1	2	5	3	4
Link with daily life	4	3	5	2	1
Total Score	9	7	😊 20	12	12

Defining the Problem

Dust particles get stuck in broom, the broom takes up too much space, and it is hard to sweep corners and underneath objects. With these problems solved, cleaning would be easier.

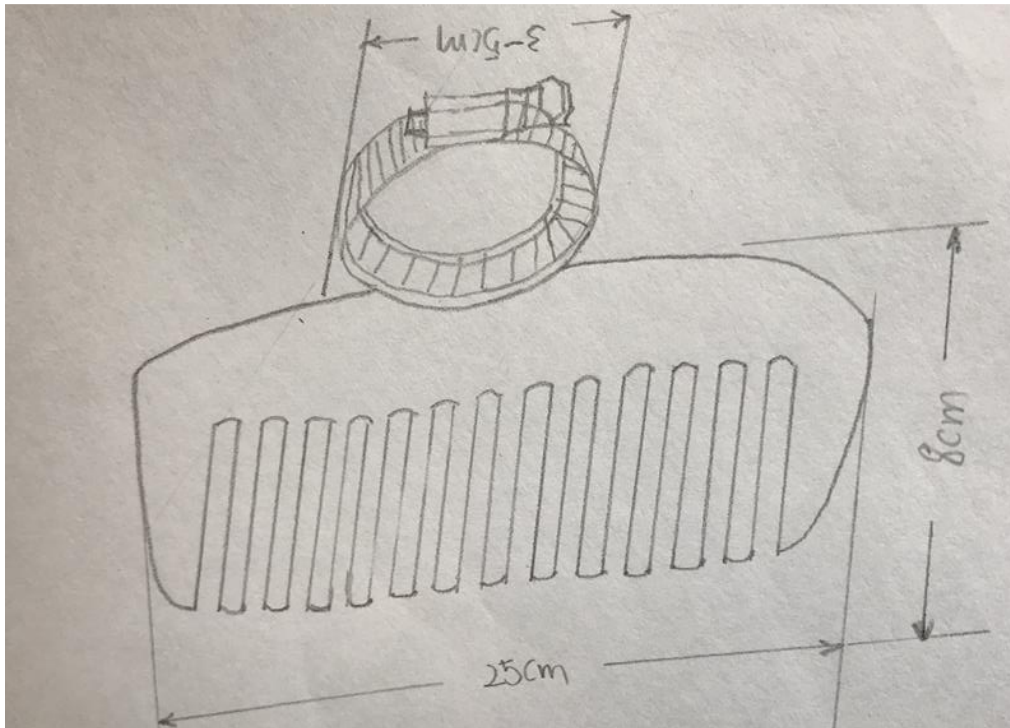
Before we began to draw prototypes, we compared brooms with the other current products. As many people questioned why we should still use brooms, we also did a comparison between brooms, vacuum cleaners, and Swiffer, which is a refillable dry mop.

We compared existing broom products and came up with a graph.

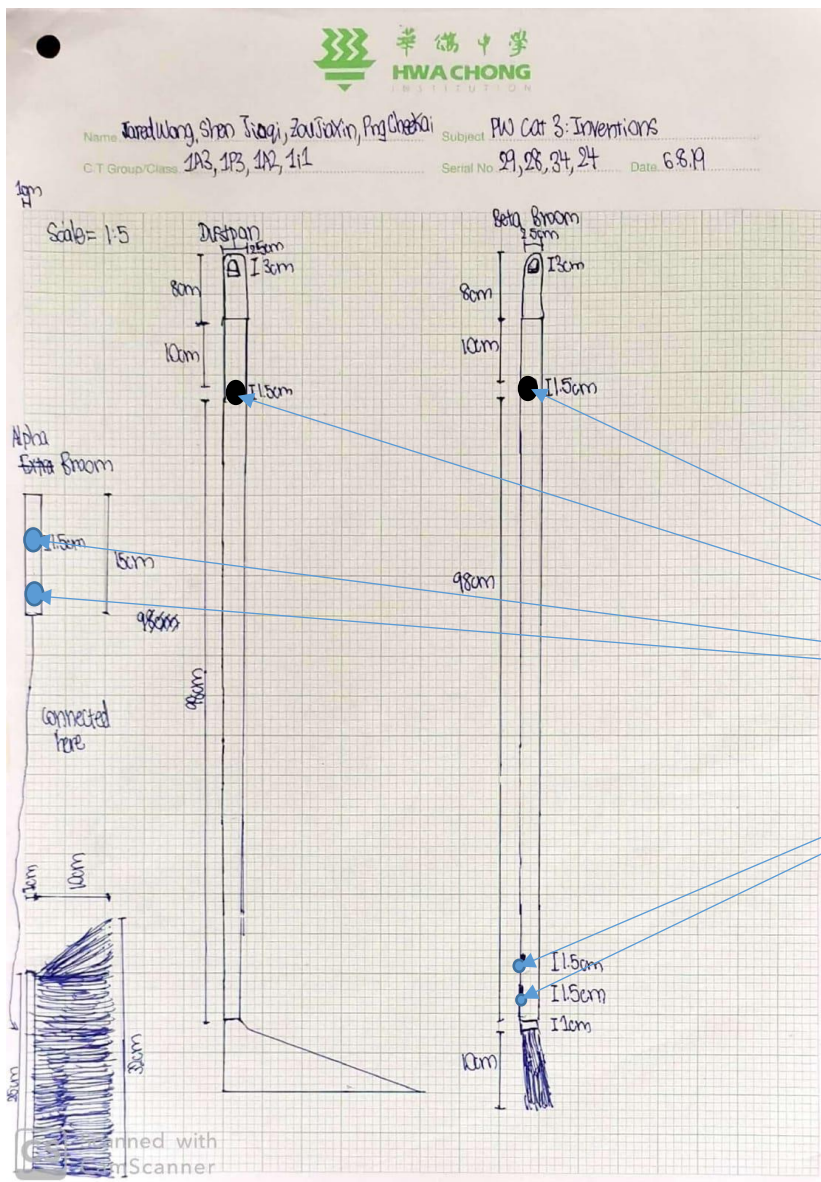
Product	Product name	Cost(\$)	Durability	Advantage	Disadvantage
	H&xy Broom Cleaning Tool	\$7.99(Comb)	Average	→Easy debris cleaning →Can be attached	→Does not fit all dust pans →Gets loose easily
	OXO(Good Grips Small Upright Sweep Set)	\$30.00++(set)	Good	→Easy debris cleaning	→Must buy whole set →Cannot be attached →Expensive
	Libman(1150 Step-On Dust Pan with Molded Teeth)	18.00++	Good	→Easy debris cleaning	→Must buy dustpan →Expensive

Product	Ability to Clean	Noise	Electricity	Portability	Price	Other Problems
Vacuum Cleaner	Dust, Dirt, only some can clean wet mess, small objects	78-80dB, as loud as a truck	Average best selling model will use around 1400 watts	Some are heavy and bulky and therefore cannot clean stairs	50 for old models. to over 1000 dollars for newer and most advanced models	-Not Applicable-
Swiffer	Dust and dirt only	Soundless	Some models require batteries	Light and easier to carry about	Expensive refills	The refills may contain ingredients with potential for acute aquatic toxicity, respiratory effects, biodegradation

Our Proposed Idea



This is a comb device to remove dust and particles from the broom. This was our idea at the start but not our final invention. We eventually settled with a brush to remove particles. (left)



This is the drawing of the broom and dustpan. (left)

The magnets in black are used to connect the broom to the dustpan. The magnets in blue are used to connect the larger sweep for normal sweeping.

Magnets

Our product will effectively extend lifespan of the broom as the dust particles would not disrupt in the cleaning and can be used longer. Consumers would not need to hit their brooms against the wall and the broom would not be damaged. Our product would also allow corners and small spaces to be swept and can also save storage space. Compared to some other brooms and all vacuum machines, our product is cheaper. With the addition of the comb, the brooms lifespan would effectively be extended. The magnet will bind the broom and dustpan together. Besides, the different brooms (broom for general sweeping and broom for sweeping in small spaces) are together in one broom, which makes our product multi-purposeful and helps ease the sweeping.

Some problems we faced along the way was the selection of materials as we do not have any knowledge of any specific materials that we should use to make our invention better. Drilling of hole for magnet was another issue as we had no previous experience and the maximum size of the drill is 13mm, which was too small. We were also unable to find suitable ball and socket joints and thus had to change our idea.

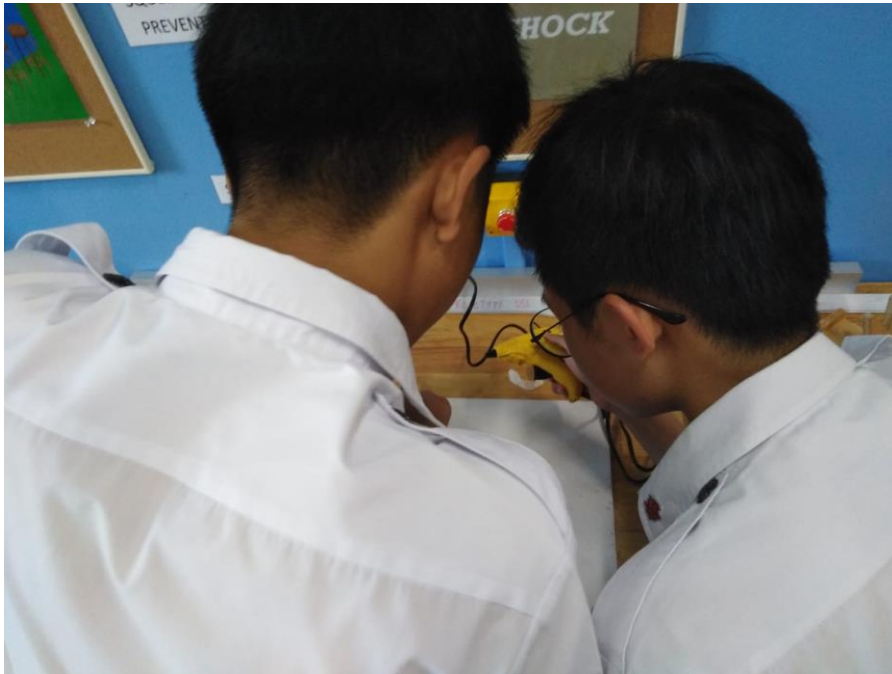
We would define our major milestone as the time when we tried to make the broom adjustable such that it can become a big broom to sweep normal floor and a small broom for corners and small spaces.

Construction or Modelling Process

We chose wood as the material for the broomstick as wood is strong and therefore the stick doesn't break easily. Besides, it is easier for us to drill a hole for the magnet and cut for our design. Metal on the other hand can easily rust when the broom gets wet due to various reasons such as rain, is heavier than wood and is also hard to drill/cut.

We had plastic broomheads and dustpans as plastic is easier to shape into rounder objects, and in addition, it is cheaper and easier to obtain plastic broom heads and dustpans. Also, plastic is lighter than most materials.

The magnets are strong, and a strong broomstick would allow the magnets to attract safely instead of breaking the broomstick and the magnet itself.



The completed broomsticks (Above)

A photo of us gluing the magnets to the broomstick (Above)

We sawed another broom to use it as a brush to remove hair and dust. (Below)



A photo of the broom being able to sweep under objects. (Above)

Modification and Evaluation

	<i>Pass</i>	<i>Fail</i>	<i>Potential Failure</i>	
Broom's ability to sweep in small spaces				The tinier broom could fit really well
Magnets ability to attract each other				A little too strong. It could hurt the person using it by accident. Therefore, we knocked the magnets to reduce its magnetic strength.
Broom's ability to change from big to small and vice versa				The broom has shown ability to sweep corners and sweep normally if light force is exerted. If too much force is exerted, the broomhead could fall off the broomstick.
Broom and dustpan's ability to be kept in smaller space				The broom and dustpan can be held together by the magnets and the dustpan prevents the broom from falling.
Convenience of sweeping with small broom				Both broomheads are connected by magnets. The small broom can grab dust from tight spaces and corners easily.

*Add more rows for more criteria

** Repeat table for next test iteration

Some of the modifications include changing from a comb to a brush. We decided that when using a brush, the brush bristles overlap each other and as compared to the broom, the brush and get rid of more particles easily without the need to comb the bristles many times. Another was regarding how the brooms would be connected to each other. As there were no ball and socket joints suitable, we decided to change how we connect the brooms. Furthermore, we decided that if the broomstick was at the side of the total combined broom, it would be difficult to sweep. Therefore, we changed our prototype such that we used magnets to hold the big broom and the small broom together when sweeping bigger spaces and when we need to use the small broom, we would remove the big broom and attach it to the top of the broom using a cupboard click clip.

References

- 1) [Digital image]. (n.d.). Retrieved from <https://www.amazon.com/Swiffer-Sweeper-Sweeping-Cloth-Refills/dp/B0035G075O>
- 2) Swiffer Sweeper Wet Mopping Cloths, Open Window Fresh Cleaner Rating. (n.d.). Retrieved from <https://www.ewg.org/guides/cleaners/5288-SwifferSweeperWetMoppingClothsOpenWindowFresh>
- 3) [Digital image]. (n.d.). Retrieved from <https://www.amazon.com/Swiffer-Sweeper-Mopping-Cleaning-Products/dp/B00N6FT6TM>
- 4) Electricity usage of a Vacuum. (n.d.). Retrieved from http://www.energyusecalculator.com/electricity_vacuum.htm
- 5) [Digital image]. (n.d.). Retrieved from https://www.iconfinder.com/icons/2233133/arrow_rotate_spin_whirl_icon
- 6) OXO Good Grips Small Upright Sweep Set. (n.d.). Retrieved from <https://www.amazon.com/OXO-Grips-Small-Upright-Sweep/dp/B00940DUE0>
- 7) H&xy Broom Cleaning Tool Collocation with a Broom Dustpan, Broom Brush... › Customer reviews. (n.d.). Retrieved from https://www.amazon.com/product-reviews/B07CWVNPR3?reviewerType=all_reviews
- 8) Libman 1150 Step-On Dust Pan with Molded Cleaning Teeth. (n.d.). Retrieved from <https://www.amazon.com/Libman-1150-Step-Molded-Cleaning/dp/B077P8W4TX>

The references above were used for comparison purposes. We made use of the product reviews to help us better understand the needs of the public so that our invention would be able to help serve the majority. Through these reviews, we can better understand the problems that are being faced and thus, can try to solve as many of them as possible.