The Bottlament

Project EP:IC, Raffles Girls School

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Objectives

- Encourage recycling in Singapore
- Reuse plastic bottles by converting them into filaments for 3D printing
- Reduce the amount of plastic waste in Singapore
According to data collected by the National Environmental Agency (NEA) in 2014, only 9% of the plastic waste in Singapore gets recycled.

789,000 tonnes of plastic waste was ultimately disposed, contributing to 25.9% of the total waste in Singapore.
Results of survey conducted on 235 secondary school students in August 2015
MORE THAN HALF OF THE STUDENTS SURVEYED DO NOT RECYCLE
(e.g. throwing plastic into recycling bin)

DO NOT RECYCLE: 55.7%
RECYCLE: 44.3%
OUT OF THE 44.3% WHO RECYCLE,

70.9% SELDOM RECYCLE, and

ONLY 29.1% RECYCLE REGULARLY
REASONS FOR NOT RECYCLING:

“It is troublesome.”  – 54.2%

“It is inconvenient.”  – 60.2%

“I do not know where the recycling bins are.”  – 61.4%
75% OF THE STUDENTS SURVEYED REUSE PLASTIC (e.g. reusing plastic bottle/container)
AWARENESS OF THE IMPORTANCE OF RECYCLING:

- 77% are **very aware** of the importance of recycling
- 19.6% are **aware** of the importance of recycling
- 3.4% are **unaware** of the importance of recycling
90% OF THE STUDENTS SURVEYED ARE MOTIVATED TO RECYCLE WITH INCENTIVES (e.g. monetary remuneration)
IF RECYCLING IS INCONVENIENT, ONLY 62% OF THE STUDENTS SURVEYED ARE MOTIVATED TO RECYCLE WITH INCENTIVES (e.g. recycling bin is far away)
Analysis of survey results

- Most students surveyed do not have a habit of recycling regularly
- Close to all students surveyed are motivated to recycle when given incentives
- Inconvenience of recycling is the main contributing factor to students not recycling

Conclusion: To increase rate of recycling, it is essential that recycling be made convenient and incentives are given.
Strengths

1. Promotes 3 “R”s – Reduce, Reuse and Recycle, to people of all ages.

2. Leverages on the sunrise industry of 3D printing

3. Incentivized recycling encourages active public participation while ensuring profit.
HOW DOES IT WORK?

AN EASY 3-STEP PROCESS
STEP 1: Empty the bottle, remove the plastic wrapper and dispose the bottle in a bin beside the machine.

STEP 2: Insert the bottle into the machine.

STEP 3: Place EZ-link card/Passion card on reader and monetary rewards will be transferred.
How it works

1. Purchase filament extruder (a machine that converts shredded plastic into filaments)
2. Liaise with EZ-link/Passion card for crediting system
3. Collect plastic from vending machines
4. Sterilize plastic shreds
5. Sell produced filaments
6. Up-keep and maintenance of machines
Adaptations

We have two prototypes to fit different budgets.

1. Bottlament Light
2. Bottlament Basic
BOTTLAMENT
LIGHT
Bottlament Light

- Flap to determine direction of bottle
- Bin to store bottles with wrapper
- Card scanner
- Hole to put bottle in
- Scissors
- Shredder
- Bin to store bottle caps and waste
- Bin to store plastic shreds
Bottlament Light

1. Upon inserting the bottle, the hole (a) will close.
2. The bottle will be clamped at the bottleneck, and the cap will be cut off by the scissors (b).
3. The cap will drop into a hole where it will then transported to a bin (c) through a tube.
4. The light sensor will then be activated to check if the wrapper is taken off.
5. If it is, money will be transferred to one's card (d). If not, no money will be transferred.
6. After that, the clamp will open for the bottle to fall through.
7. Based on the information from the light sensor, a flap (e) further down the chute will either open or close.

8. A bottle with its wrapper will go down all the way to the bin (f) at the furthest end of the machine.

9. Those bottles without its wrapper will drop through the hole to the shredder (g).

10. The bottles will then be shredded and the pieces will drop into the bin (h) below the shredder.
Bottlament Light

**BENEFITS**

- With the light sensor, the separation of bottles with and without wrapper can be ensured. This allows all the shredded plastic to be used to make filaments as only the plastic from the bottles can be used to make filaments.

**LIMITATIONS**

- With the light sensor, the extra incurred cost may take longer to recoup. Also, the light sensor will not be able to detect transparent wrappers.
1. Upon inserting the bottle, the hole (a) will close.
2. The bottle will be clamped at the bottleneck, and the cap will be cut off by the scissors (b).
3. The cap will drop into a hole where it will then transported to a bin (c) through a tube.
4. Once the cap drops through the tube, money will be transferred to one’s card (d).
5. The decapitated bottle drops out of the tube to a shredder (e) and gets shredded.
6. The shredded pieces fall into the collection bin (f).
Bottlament Basic

BENEFITS

- Without the light sensor, more profit can be generated as there is no extra cost incurred to purchase the light sensors.

LIMITATIONS

- Without the light sensor, we cannot ensure that people will remove the bottle wrappers. This will impede the collection of plastic shreds to make filaments directly as plastic from the wrappers are unable to make filaments.
Location of machine

1. Schools/Polytechnics/Universities:
   • Targeted at students
   • Large pools of people

2. Shopping malls/HDB flats:
   • Targeted at the masses
   • Increase people’s accessibility to the machine
How it affects our environment

- **REDUCE**: Less disposed plastic waste and less usage of additional synthetic plastic to make filaments.

- **REUSE**: Plastic from bottles can be reused as filaments for 3D printing.

- **RECYCLE**: Incentivized recycling through machine.
Involving Our Community

- **General public:** Contribute to the recycling of plastics in Singapore using our machine.

- **Schools:** Promote recycling within their school community by using our machine.

- **Students:** Educate others about the impacts of plastic pollution, and encourage and promote the use of our machine.
Thank You!