SIWI
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United Arab Emirates
Entry to the Stockholm Junior Water Prize 2022

MY WATER BOTTLE PROJECT

Small actions, big impact

A GAMIFIED SCHOOL PROGRAM AIMED TO REDUCE SINGLE USE PLASTIC AND STRENGTHEN WATER SECURITY BY FOCUSING ON YOUTH THROUGH A PLATFORM BASED ON EDUCATION AND INCENTIVIZATION

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WATER ALLIANCE

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II. BIOGRAPHY

Mishal Faraz, 15, is a high school student at The Winchester School, Jebel Ali, Dubai, United Arab Emirates. Mishal has been a dedicated environmentalist since the past 8 years and has spearheaded several national campaigns to advocate sustainable living. Her core belief is that the responsibility to take care of the planet lies with every human being who inhabits it. Mishal's commitment to sustainability has been recognized by prestigious international bodies. She is the recipient of the Diana Award 2020, a laurel instated in the name of the late Princess of Wales, as well as the winner of the Global Good Canon Young Champion of the Year Award 2021. A recognized gifted and talented student, Mishal is the recipient of three of the most coveted academic awards given to students in the United Arab Emirates – Sheikh Hamdan bin Rashid Al Maktoum Award for Distinguished Academic Performance, Sharjah Award for Educational Excellence, and Sheikha Fatima Bint Mubarak Award for Excellence. She has been a guest speaker on prominent platforms including the Swedish Pavilion at Expo 2020 where she presented *My Water Bottle Project*. A published author and radio host, Mishal uses these mediums to propagate environmental protection. Mishal hopes to create a ripple effect to make the planet a more sustainable, equitable and inclusive place.

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1.0 SUMMARY

Oceans cover 70% of the Earth's surface, contain 97% of the planet's water, produce half of the planet's oxygen, represent 99% of the planet's living space by volume,[1] and absorb 30% of carbon dioxide. They are key drivers of the economy with the estimation that by the year 2030, 40 million people will be employed by ocean-based industries. [2] They are home to the world's largest biodiversity containing over 250,000 species. [3] Oceans are a source of livelihoods, and economic growth. Their careful management is a key feature of a sustainable future.

Unfortunately, the health of our oceans is at a historical tipping point. They are choked and gasping for breath. One of the major components of this fate are plastics. According to a 2021 survey there are approximately 269,000 tons of plastic in every square mile of ocean. [4]

This project is focused on single-use plastic water bottles which constitute a large percentage of the plastic debris in oceans. Globally, more than a million single-use water bottles are sold every single minute! Less than 30% gets recycled. The rest make their way to landfills or oceans where they linger for anywhere between 450-1000 years, remaining as ocean debris, microparticles and nanoparticles in the water, and eventually make their way into the human body. [5] If this trend continues, by the year 2050 plastic would overwhelm the number of fish in the ocean!

The safeguarding of oceans starts on land - it starts with each one of us. This is the pivotal belief that *My Water Bottle Project* rests on. *My Water Bottle Project* is a gamified platform meticulously designed to discourage the use of single-use plastic water bottles and strengthen water security. The project is focused on the places which groom future change makers and global citizens – schools. It aims to embed a deep responsibility in these young minds and inspire them to take action. If school children are made aware of the monumentally detrimental impact of single-use water bottles, they will not only shun them themselves but also impact their circles of influence starting with their families, which will further grow to relatives, friends, colleagues. To put it into perspective, the UAE has 1219 schools with a combined strength of 1, 081, 020 students [6] – that is 1,081,020 circles of influence. Hence, to use a water analogy, schools are just the perfect places to drop the stone to create a ripple effect, the impact of which will grow exponentially at every tier. It is small actions taken at the individual level which will lead to huge, impactful, cumulative results.

2.0 BACKGROUND

2.1 The Plastic Menace

Over the last 10 years, our world has produced more plastic than during the whole of the last century. Plastic is virtually indestructible - it is not biodegradable, and instead gradually breaks down into smaller pieces over the course of thousands of years, all the while leaking hazardous pollutants and chemicals into the air, soil, and, most devastatingly, water. [7]

Plastic is the most significant component of marine debris, including microplastics, which albeit being <5mm have the most impact on marine biota. Marine debris presents conflict to several sectors of society, be it environmental, social, economic, and even cultural, and will continue to be a multigenerational problem if not combatted. Marine litter is a transboundary concern, and action needs to be taken by all stakeholders, from governments to industries to consumers.

2.2 Marine life/ biodiversity

Plastic waste is one of the most dangerous threats to the oceans and its biodiversity and wildlife[8]. Plastic pollution destroys the natural habitat of these thousands of species, and has been found as deep as the bottom of the Mariana trench and as far as the Arctic sea. It pollutes ecosystems and suffocates animals when they either get entangled in or end up ingesting plastic, resulting in chronic injury and death. Entanglement of wildlife in plastic waste has been recorded in more than 270 species of mammals, birds, reptiles, and fish. [9]

2.3 Human health/microplastics

Chemicals from plastic have become a part of our diets. According to a study conducted in 2019 by the University of Newcastle, Australia, “an average person could be ingesting approximately 5 grams of plastic every week”. [10] To put that into perspective, the study continues to state that “is the equivalent of a credit card’s worth of microplastics.”

Being exposed to microplastics, whether through ingestion or inhalation, has an array of consequences on human health, such as apoptosis, necrosis, oxidative stress, genotoxicity, and inflammation, which can all in turn lead to cardiovascular diseases, diabetes, inflammatory bowel disease, rheumatoid arthritis, auto-immune conditions, neurodegenerative diseases, stroke,

and cancer. Just in March 2022, for the first time ever, microplastics have actually been identified and quantified in human blood. [11]

2.4 The truth about single-use plastic bottles

When single-use plastic bottles were first introduced in 1947, they were hailed as cheaper, lighter, and a convenient alternative to glass bottles. However, recently, the world has become conscious to the multilayered perils associated with single-use plastic bottles.

Firstly, while we may assume that bottled water is completely pure and safe, as the plastic breaks down it leaches chemicals into the water. Several recent studies show that 93% of bottled water is contaminated with microplastics, the levels testing at twice of those in tap water samples.[12] It must be mentioned here that plastic bottles consist of two different types of plastic – the bottle contains Polyethylene Terephthalate (PET), and the bottle cap is made of Polypropylene (PP). [13]. The World Health Organization has stated that as of now, we have limited information about the extent to which microplastics impact human health. However, caution must be exercised and conscious efforts must be made to reduce plastic pollution worldwide. [14]

Annually, more than half a trillion plastic bottles are sold worldwide of which hardly a third are recycled. A study by the prestigious Science magazine shows that more than 8 million tons of plastic bottles are dumped in the ocean every year, polluting water bodies and threatening the marine life.

2.5 The actual cost of bottled water

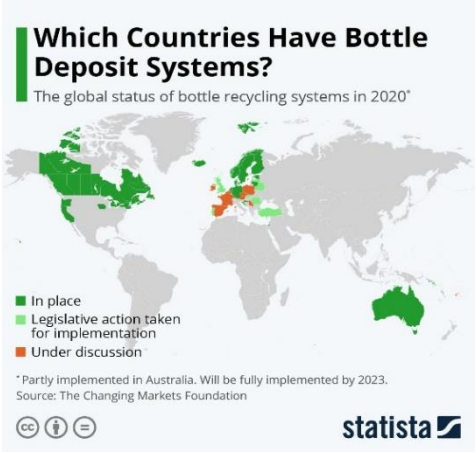
Bottled water is hundreds of times more expensive than tap water. It's just not water that we are paying for, but the manufacturing cost of the plastic bottles, their transportation and distribution. In 2016, while the cost of producing tap water was half a penny per gallon, it was an average of $1.11 per gallon for bottled water. [12] The production of bottled water also uses as much as 2000 times the energy needed for tap water. Plastic bottle production uses 151 billion liters of oil each year, and the energy wasted to produce bottled water is enough to power 190,000 homes. Additionally, 2.5 million tons of carbon dioxide are produced in manufacturing plastic bottles every year. And here's the ultimate paradox – it takes three liters of water to produce one half-

liter plastic bottle! [15] Precious, exhaustible resources are being used up to produce these single-use plastic bottles.

2.6 What is being done?

As the public gains increased awareness about the menace of plastic pollution, all kinds of solutions are being proposed and tested. In laboratories, new versions of bottles claiming to be biodegradable or compostable appear regularly, and plastic industry scientists are experimenting with “chemical recycling” that returns the polymers to their original monomers, so that they can be remade into new plastic bottles multiple times. Many of the solutions are not scalable to a level that would make a noticeable difference. Moreover, the bottle caps and the plastic wrapper covering the bottle are made of different kinds of plastic, hence all these components need to be separated to be recycled effectively. This technicality further affects the recycling statistics.

One of the most prominent efforts in plastic bottle recycling is the establishment of bottle deposit systems, where customers at supermarkets can deposit their single-use plastic bottles and get credit for it. This incentive-based initiative has been hugely popular in achieving 100% recycling rates. However only 40 countries out of the 195 countries in the world have implemented this initiative, and the global figure for recycling of single-use plastic bottles remains dismal.



Source:
https://www.statista.com/chart/22963/global-status-of-plastic-bottle-recycling-systems/

The fact remains that plastic in the ocean are putting an unsustainable pressure which is a looming threat to the wellbeing of every living entity on the planet. Prevention is better than cure, hence the solution is a total cessation of single use plastic. A positive step in this direction is the United Nations recently approving a roadmap for a plastic pollution treaty in March 2022, which is being hailed as the “biggest green deal since the Paris Agreement of 2015”. As we await the finalization of this consequential treaty by 2024, our efforts to eliminate single-use plastics must start now.

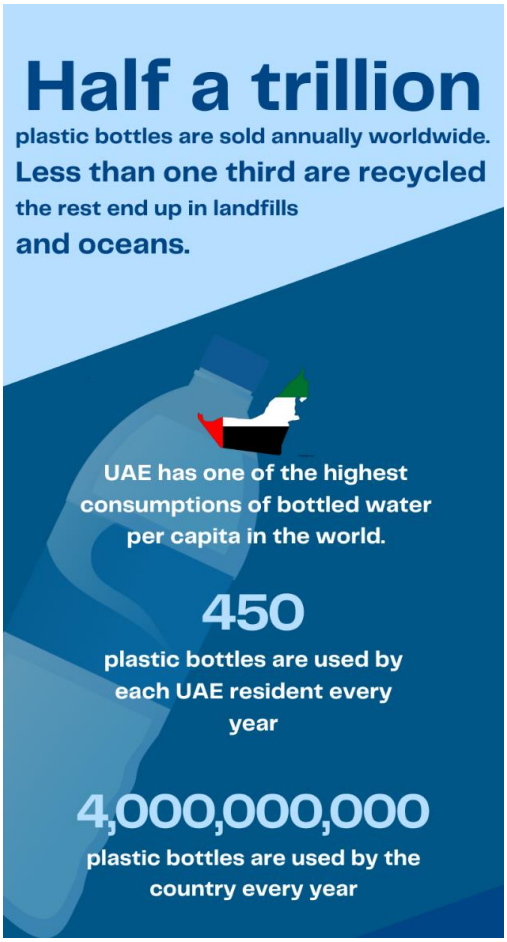


Figure 1: *Statistics related to single-use plastic bottles in UAE.*

2.7 Single-use plastic bottles in the United Arab Emirates

UAE has one of the highest consumptions of single-use plastic bottles per capita in the world. A typical UAE resident uses 450 plastic bottles every year, bringing the net number to four billion plastic bottles for the entire country. [16]

Recently, the Crown Prince of Dubai launched an initiative titled Dubai Can, under which water fountains were installed across the city to encourage residents to use reusable water bottles. For people to use these water fountains, it is essential that they are made aware of the calamitous impact of plastic bottles and how a simple action on their part – that of carrying a reusable water bottle and saying an irrefutable "no" to single-use water bottles – can have a decisive positive impact on the health of the planet, especially our oceans.

This is why a project like *My Water Bottle Project* is topically vital and much needed at this point in time. When we start with the youth, we can be sure that the change, the much-needed ripple effect, would be impactful and far-reaching.

3.0 INTRODUCTION

3.1 Planning using the Design Thinking Process

For the intricate planning of *My Water Bottle Project*, I followed the principle of Design Thinking. The ideation process was divided into five stages –

- Stage 1: Empathize – gain an empathetic insight into the problem.
- Stage 2: Define – identify and state the problem.
- Stage 3: Ideate – brainstorm about potential solutions.

- Stage 4: Prototype – start working on and building solutions.
- Stage 5: Test – implement the solution, test it out, and evaluate its success.

Figure 2: *Planning the project using the Design Thinking Process*

After researching, ideating and brainstorming, I inferred that there have been numerous campaigns in the past advocating for sustainable practices, and environmental protection. *My Water Bottle Project* had to go beyond words – the project had to be human-centric. It had to involve the students in a way that they had fun, and at the same time had an enriching educational experience which would stay with them.

3.2 Gamification

My Water Bottle Project explores how the mechanics and dynamics commonly found in games can be applied in the environmental awareness context to embed positive, long-lasting habits in youth which they can pass on in their circles of influence thereby widening the impact. The main goals of gamification are to enhance certain abilities, introduce objectives, engage students, optimize learning, and support behavioral change. [17] Elements of gamification have undoubtedly always existed in education. A good example is that of house point systems where

students are awarded points for achievements. Having said that, the term ‘gamification’ itself is a relatively recent neologism.

The pivotal aim of *My Water Bottle Project* is to educate the youth about the debilitating impact of single-use plastic bottles, encourage them to be agents of change, mobilizing to advance the wellbeing of the planet. With minimal requirements, this initiative is designed to have the maximum impact because the amalgamation of gamification, education, and incentivization is an exponentially growing trend. Gamification can influence youth to adapt to sustainable practices. It can be the quintessential motivation to spur them into action and consciously adopt the habit of always carrying a reusable water bottle until it becomes second nature.

3.3 Incentivization

As per the *Incentive Theory,* one of the major theories of motivation, [18] human actions are greatly influenced by reinforcements - they are pulled towards behavior that leads to rewards. These rewards can be appreciation, commendation and recognition which increment self-esteem, which in turn leads to the embedding and repetition of behavior which is now considered desirable. However, it is vital to note here that the core incentivization of *My Water Bottle Project* is the inner satisfaction of being able to play a decisive role in protecting and safeguarding the planet – to embed the consciousness in young minds that they matter, their actions matter, their choices matter. That no individual is too young and no action is too small and constitutes a step closer to reversing the damages already inflicted on the planet.

3.4 Youth as agents of change

Today, there are 1.8 billion people between the ages of 10-24—they are the largest generation of youth in history. Their numbers are expected to grow—between 2015 and 2030 alone, about 1.9 billion young people are projected to turn 15 years old. [19]

Inspired, engaged, and empowered youth hold the power and the potential to make the most effective transformation of the world into a better place for all. The ripple effect that *My Water Bottle Project* aims for can best be created by the youth.

4.0 MATERIALS AND METHODS

4.1 Materials

- **Barcode scanners**

Barcode scanners were provided for the project by the school. These scanners had to be plugged into the USB ports of laptops to record the data.

***Figure 3**: A handheld barcode scanner*

- **Barcode Stickers**

The school provided me with the class lists of the Grade 7 students. Using an online barcode generator (https://barcode.tec-it.com/en/Code128), I generated a unique individual barcode for each student, with data about the student's name and class on it. These barcodes were printed out on sticker paper, and were distributed to the students, who were instructed to stick them on their reusable water bottles.

***Figure 4:** Barcodes printed on sticker paper*

***Figure 5:** Barcodes segregated as per class*

***Figure 6:** Each barcode has unique data related to each individual student*

4.2 Method

4.2.1 Target group

The project was trialed with 314 students from Grade 7, aged 10-12 years

4.2.2 Implementation period

May-June 2022

4.2.3 Awareness Webinar

It is knowledge which acts as the impetus to take action. To introduce *My Water Bottle Project* to the young students and meticulously lay out the core purpose and objective of the project, I organized a webinar. The webinar focused on the following:

- How the United Nations Sustainable Development Goals are the blueprint to a better future.
- The role of water in the attainment of the UNSDGs.
- Water security as the foundation to growth, development, health, and peace.
- The science behind how the ocean facilitates the wellbeing of the planet.
- The alarming insurgence of plastic in the ocean.
- Facts and scientific and social data about plastic bottles.
- How ocean health is a transboundary concern and every nation, organization and individual is responsible for safeguarding it.

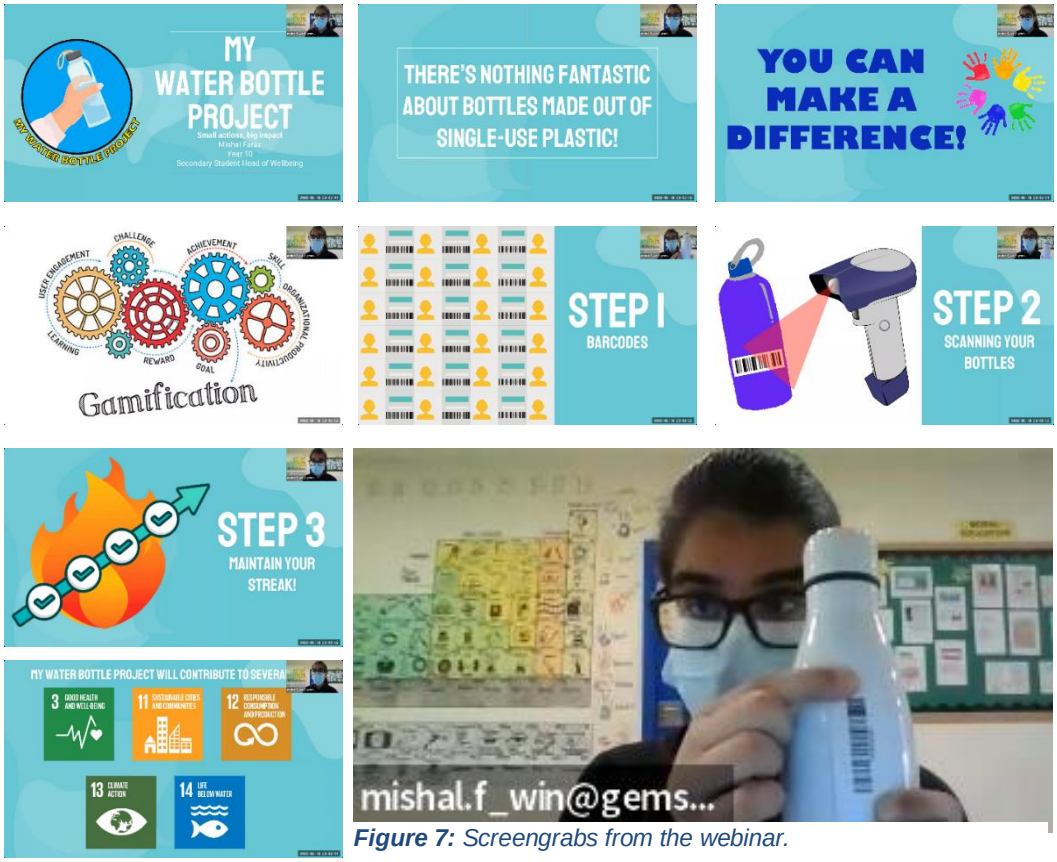


Figure 7: *Screengrabs from the webinar.*

4.2.4 Survey prior to the implementation of the project

Students were also asked to answer a survey question if they were regularly bringing a reusable water bottle to school. Here are the results. As we can see, quite a small percentage, about 28% of students actually brought a reusable water bottle to school. The rest used single-use water bottles.

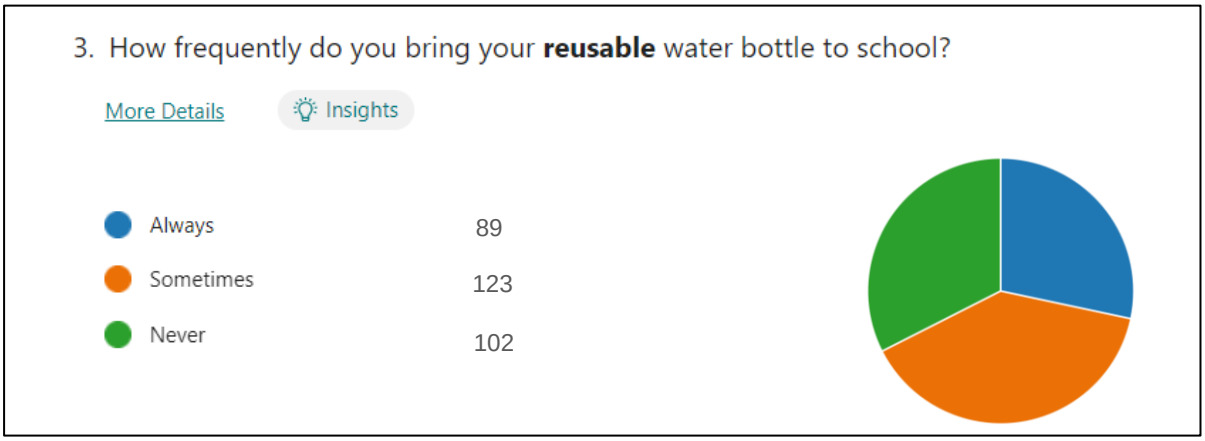


Figure 8: *Survey asking students how often they brought a reusable water bottle to school*

The students were all given barcode stickers exclusive to them. They were asked to stick the stickers on their reusable water bottles.

A precise, easy to follow set of procedures, well established goals and a rapid feedback system were laid out –

- The students had to bring their reusable water bottles to school every day.
- The barcodes on the bottles would be scanned daily.
- Students had to maintain a streak – that is, get their water bottles every day without missing a single day. Not bringing their reusable water bottle to school would reset the streak to zero.
- There would be incremental rewards – a flawless streak for 10 days would entitle the student to a Bronze Eco-Warrior badge. A flawless streak for 20 days came with the reward of a Silver Eco-Warrior badge, and so on and so forth.
- Leaderboards, individual as well as inter-class, would be maintained.

Figure 9: *A set of bottles with barcode stickers*

Figure 10: *A classroom of students holding their reusable water bottles after sticking their barcodes*

4.2.5 Daily Scanning

Every day, along with the volunteers, I scanned the barcodes on the reusable bottles just as the students came to school. An immaculate record was maintained for each student.

Figure 11: *Students having their bottles scanned*

Figure 12: *The students were very enthusiastic about bringing their reusable water bottles to school*

4.2.6 Regular feedback and reminders

In order to keep students involved, regular notifications were sent.

Figure 13: *Students who maintained a flawless streak would receive a congratulatory email in an attempt to reinforce their efforts.*

Figure 14: *If students forgot their bottles, they would receive a reminder to encourage them to continue getting them the next day.*

4.2.7 Spreading awareness

The main objective of the project is to educate the youth about water security, so pre-scheduled, automated messages were planned to keep them involved and boost their motivation by reminding them how they are contributing to a very crucial cause.

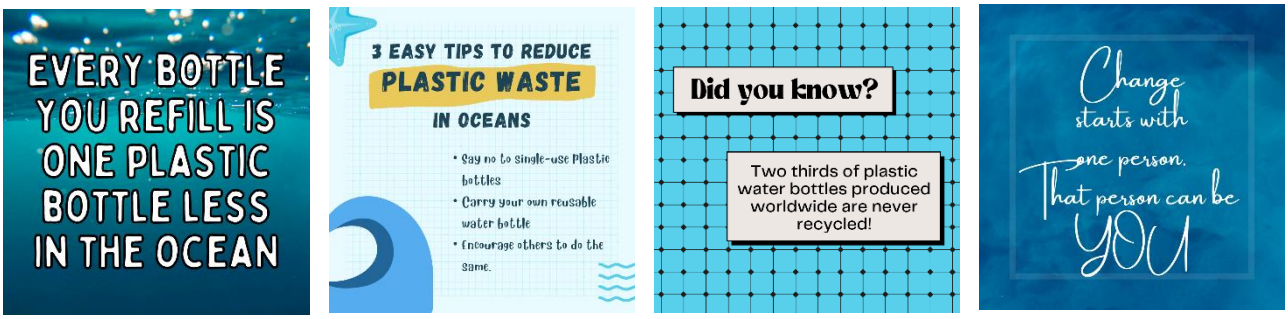


Figure 15: *Screenshots of automated messages sent to students to keep them engaged and motivated.*

4.2.8 Incremental progression

To make the project responsive, interactive, and building on the encouragement of incremental progression, *My Water Bottle Project* makes use of visible symbols of achievement, like badges which signified 'leveling up.'

Figure 16: *Incremental encouragement in the form of badges were unlocked as the project proceeded.*

4.2.9 Leaderboards

To maintain a sense of healthy competition, the students who diligently brought their reusable water bottles to school were celebrated as eco-heroes. Moreover, an account was also kept as to which class had the maximum number of students bringing their reusable water bottles. The interclass leaderboard was designed to embed a sense of collective responsibility, camaraderie amongst students, and increase their emotional investment in the project.

Figure 17: *Individual as well as inter-class leaderboards ensured active participation as well as a collective sense of responsibility*

5.0 RESULT AND OBSERVATIONS

Figure 18: *The project was well-received in the school community with very active participation and has resulted in students keen to take on the roles of curators of change and widen the ripple effect.*

The project has had an overwhelmingly positive impact on the students and has helped embed a deep sense of responsibility towards the planet.

5.1 Survey

Another survey was conducted after a period of three weeks. The students were once again asked how frequently they brought their reusable water bottles to school. The results this time showed a considerable jump in the number of students who were regularly bringing their water bottles to

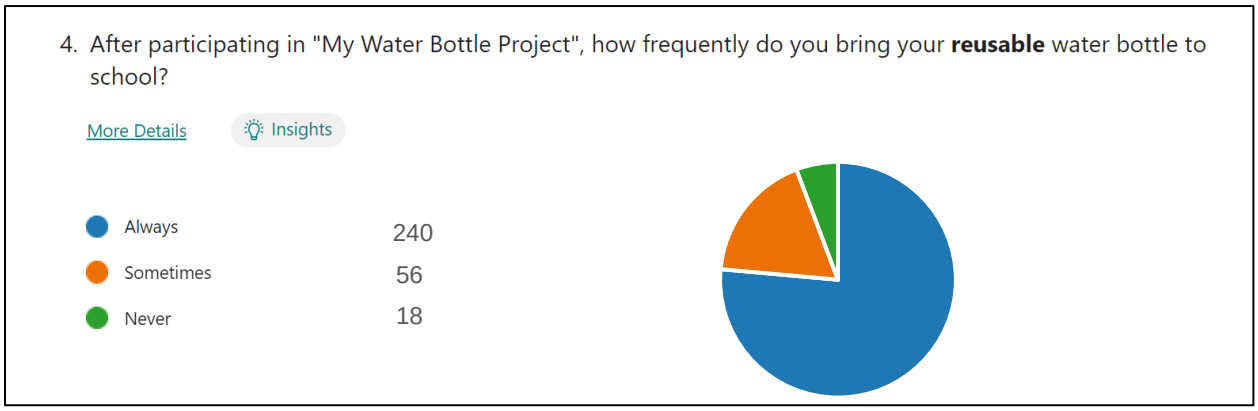


Figure 19: *Survey taken after the implementation of* My Water Bottle Project *shows a very substantial jump in the number of students switching to reusable water bottles.*

school. This time the results showed that 76% of students (a 48% increase) were now always bringing reusable water bottles to school, and we are confident of seeing these numbers grow in the coming weeks.

As is evident from the survey, *My Water Bottle Project* acted as an impetus for students to switch to reusable water bottles. In addition to the survey, in order to gain deeper insight into the impact of the project, the students were asked to answer some more questions in the survey as documented in Figure 20 below.

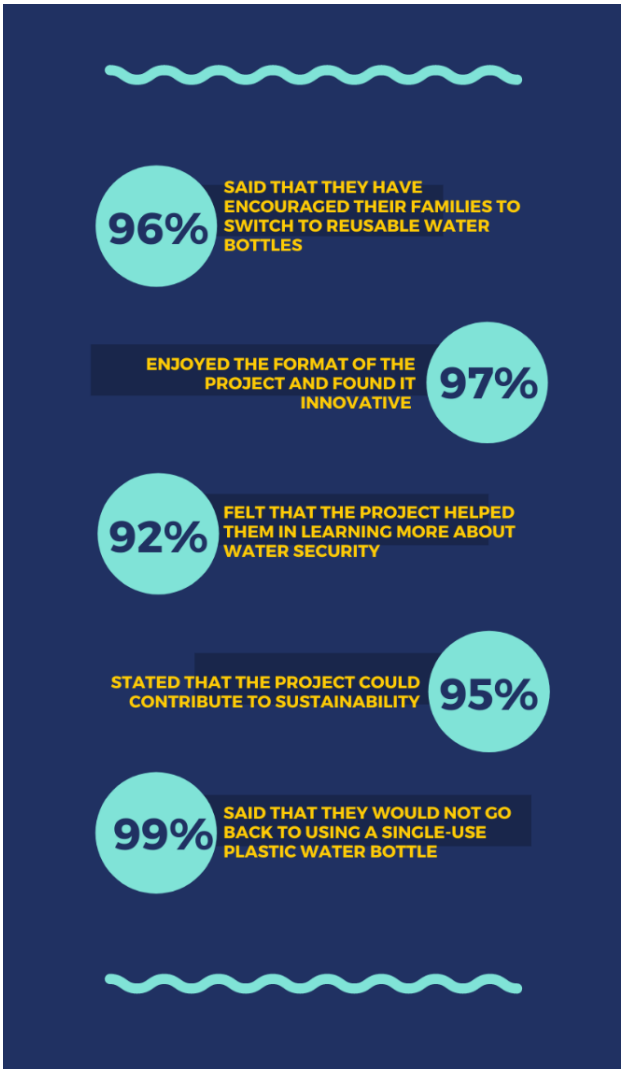


Figure 20: *The project was extremely successful in bringing paradigm shifts in consumer habits of young students.*

5.2 Observations

- *My Water Bottle Project* is designed to be a project which, through the amalgamation of science, education, gamification, and incentivization, instills a lasting sense of social responsibility in the youth. The response from the students is an affirmation that the youth are the real Generation Restoration.
- Most of the students remarked that it was the element of gamification that kept them involved. It must be noted that the competition was always friendly and did not result in any unpleasantness between students. They were in fact in competition with themselves, determined to maintain their own streaks.
- Students also stated that the fact that breaking a streak did not exclude them from the initiative and that there was an opportunity to start again resonated with the belief that it is never too late to adopt positive practices.

5.3 Future work and next step forward

- As a trial, *My Water Bottle Project* was implemented in Grade 7. Seeing its success, the next step would be to implement it in all the classes and maintain an inter-year group leaderboard.
- Liaise with other schools to participate in the initiative, thereby making an inter-school, national endeavour, engaging hundreds and thousands of young people, and consequently, their circles of influence.
- Install water dispensers with barcode scanners where bottles can be scanned every time there's a refill. This would help in keeping a track of water intake.
- With more monetary investments, install automatic barcode scanners at the entry points of the school so students can scan their bottles themselves as they walk in school.
- Create an app, which would keep track of the streaks, badges earned as well as have interactive features like a community chat box, as well as options to gain points by watching informative videos and answering quizzes.

6.0 SCALABILITY AND IMPACT

6.1 Program costs

The project uses minimal resources, thereby making it extremely viable to be implemented in Less Economically Developed Countries (LEDCs). To implement *My Water Bottle Project* at my school, these were the costs incurred –

- AED 100 ($27.22) to have the barcodes for 314 students printed out on sticker paper.
- The barcode scanners were already present in the school, hence no cost was incurred there. In the event of procuring the barcode scanners, they can be bought at costs as low as anywhere between AED 60 ($16.33) to AED 90 ($24.50).
- Three laptops were required to cover the ten Year 7 classrooms for data maintenance as well as communication and feedback.

6.2 Message and Potential Impact

My Water Bottle Project is a tool to increase awareness about the global threat of plastic pollution and promote local solutions at the grassroot level to prevent it. It starts by taking action at the school level with the focused goal of inspiring youth to be eco-warriors, champions, and curators of a sustainable, equitable future.

The project aims at preventing plastic pollution at the level of the individual, and local communities as a civic action, augmenting the efforts made at national levels through various legislative and industry initiatives, thereby affirming the motto of World Ocean Day 2022 – "Revitalization: Collective Action for the Ocean".

The ripple effect the project aims for does not stop at the borders of one country. Based on the project's ease of implementation, scalability, and the potential to contribute to the improvement of quality of the environment and life for people, it could be replicated in other nations very effectively.

With funding support from international and local organizations, *My Water Bottle Project* could collaborate with schools and organizations in countries like The Philippines, India, Malaysia, and Indonesia, which are some of the highest contributors to plastic in the ocean, [20] so that the project plays a crucial role in creating a generation of agents of change in countries that are the most significant contributors to this global transboundary issue, thereby spurring a movement of local solutions and initiatives to prevent plastic pollution right at its source.

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