

# Single-Use Plastics: A Survey of Pre-Service Secondary School Teachers In Singapore

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## Abstract

The excessive use of disposable plastics coupled with Singapore's low 4% recycling rate of plastic waste renders this a significant environmental problem (National Environment Agency 2022). It is widely acknowledged that public school teachers play a crucial role in inculcating environmentally sustainable best practices among their students. However, this paper demonstrates that (pre-service) teachers in Singapore are often not adequately equipped with the necessary knowledge to be effective environmental educators. It argues that a more rigorous teacher training program with an emphasis on eco-pedagogy, alongside an eco-centric curriculum can help with the management of plastic waste on a national level.

## Introduction

The United Nations Environment Programme (UNEP) has stated that there is an urgent need to engender a change in actions and attitudes towards the consumption/disposal of single-use plastics (e.g. straws, grocery bags, food packaging). Studies have shown that the amount of plastic waste generated far exceeds the world's ability to cope with it. Plastic is a convenient, low-cost material that is widely used, but it is also largely non-biodegradable. Consequently, plastic waste that does not disintegrate can cause ecological degradation by clogging up

waterways, harming wild/marine life while releasing toxic chemicals when burnt (UNEP, 2018).

This paper contends that the reduction of single-use plastics as well as the management of plastic waste in Singapore could be attained via environmental education. It posits that deploying an eco-pedagogical approach in public schools intersects with the Singapore Green Plan 2030. Accordingly, instilling a sense of eco-citizenship among students, specifically with respect to plastic consumption/disposal/recycling would contribute immensely to Singapore's sustainable development, especially in its aspiration to be a Zero Waste Nation (NEA, 2021).

Educational scholars like Hicks and Holden (2007) have highlighted that for environmental education to be effective, teachers, particularly pre-service ones ought to be well-informed about issues pertaining to environmental sustainability. In this case, (Geography, Chemistry and Biology) teachers are required to have good content knowledge of single-use plastics before they can spur collective action on its reduction and management. As such, this paper seeks to assess and identify how knowledgeable Singaporean pre-service student teachers are about plastic disposal/recycling so that these knowledge gaps can hopefully be addressed in teacher education modules and the professional

development of teachers that are already in service.

**Background on single-use plastics**

Single-use plastics are usually only used once before being discarded or recycled (UNEP, 2018). Its long biodegrading process alongside improper disposal poses problems to not just natural habitats but also urban environments (e.g. polluting or choking waterways/drains, leading to floods, mosquito breeding and the spread of water-borne diseases, Clapp & Swanston, 2009; Jambeck et al., 2015). Besides compromising the environment, the Asia-Pacific Economic Cooperation (APEC) estimates that marine plastics have an economic impact of about 1.3 billion dollars on various industries such as fishing and shipping in the region (UNEP, 2018).

**Single-use plastics in Singapore**

Plastic waste is the third largest contributor to solid waste in Singapore (Table 1; NEA, 2021). More recently, the total amount of plastic waste generated has been increasing from 2010 to 2021 (Table 2; NEA, 2010-2021). Since 2011, the excessive use of plastic bags (about 3 billion pieces yearly) brought about by a “convenience culture” has been a cause for concern (Singapore Environmental Council, 2018; Lee & Goh, 2012). Additionally, solid waste, including plastic waste is incinerated in Singapore, which releases a large amount of toxic and greenhouse gases (up to 4605g/kg of net carbon dioxide emissions; Bai & Sutanto, 2002; Eriksson & Finnveden, 2009).

Table 1: 2021 Waste statistics and overall recycling rates of the top three types of waste in Singapore (NEA, 2021)

Waste type	Total Generated ('000 tonnes)	Recycling Rate (%)	Total Disposed ('000 tonnes)
Plastics	982	6	924
Paper/ Cardboard	1136	39	699
Food	817	19	663

Table 2: Total plastic waste generated and recycling rates from 2010 – 2021 (NEA, 2010 – 2021)

Year	Total plastic waste generated (Mil/tonnes/ yr)	Recycling rate (%)
2010	0.74	11
2011	0.733	11
2012	0.083	10
2013	0.832	11
2014	0.869	9
2015	0.825	7
2016	0.822	7
2017	0.815	6
2018	0.949	4
2019	0.930	4
2020	0.868	4
2021	0.982	6

Meanwhile, the Sustainable Singapore Blueprint (2015) which was prepared by the state purported to be committed to sustainable development, with an intention to work towards being a recycling “Zero Waste Nation” (MOE, 2018). Initiatives in this vein include the Singapore Packaging Agreement implemented in 2017, which aims to reduce product packaging while raising environmental consciousness among consumers (Zero Waste SG, 2016). Zero Waste SG had also spearheaded the “Bring Your Own” (reusable bottles, containers and bags) movement. Despite

such efforts, plastic waste generation remains unabated with extremely low recycling rates (SEC, 2018). Clearly, more can be done (in terms of environmental education) to reduce single-use plastic consumption in Singapore.

### **Environmental Education in Singapore**

Environmental education has been widely recognised as a tool to foster transformative social change (Fien, 1995; Hungerford & Peyton, 1976; UNESCO, 1980; Roth, 1992). The Singapore Green Plan 2030 acknowledges the critical role that education can play in cultivating environmental stewardship among its citizenry (MOE, 2012). According to Singapore's Ministry of Education (MOE), and consonant with the nation's sustainable development thrust, eco-citizenship is alluded to in the Geography, Chemistry and Biology curriculum. For instance the secondary school Geography syllabus outlines management strategies for environmental issues such as climate change and pollution while the secondary School Chemistry syllabus aims to inculcate care and concern for the global environment. There is also an emphasis on conserving/preserving ecological habitats in Secondary School Biology (MOE, 2017). MOE (2021) also stated its plans to strengthen environmentalist movements in public schools (MOE, 2021).

Single-use plastics are directly mentioned in secondary school Chemistry and Geography. Chemistry teachers have to address the environmental challenges related to plastic pollution under Organic Chemistry. Similarly, in Biology, single-use plastic as a pollutant is brought up in relation to the topic on "man (sic) and his (sic) environment". By contrast, plastic consumption is featured less explicitly in the Geography syllabus with respect to

ecological footprint and global warming. None of the syllabi has a dedicated section on reducing plastic consumption and recycling plastic waste. This glaring gap in the curriculum needs to be addressed urgently if Singapore were to take resource management seriously.

Apart from the curriculum's lack of emphasis on plastic disposal/recycling in public schools, limitations in upstream pre-service teacher training programmes in Singapore have also led to an overall lukewarm climate for environmental education. The literature on educational pedagogy shows that the world-views and attitudes of pre-service teachers can greatly influence how and what they teach in future classrooms (Merryfield, 2012; Sanger & Osguthorpe, 2011; Buchanan, 2015). Accordingly, this paper seeks to investigate the extent to which pre-service teachers in Singapore possess accurate environmental knowledge (on plastic disposal/recycling) beyond their specific subject content areas. Additionally, it aims to find out more about these pre-service teachers' dispositions towards environmentalist causes, whether they adopt sustainable practices in their everyday lives (i.e. to see if there is a disjoint between beliefs) and behaviours). In other words, this study is interested to know how (the lack of) information about the environment as well as (the lack of) environmentalist mindsets may affect the intended teaching practice of pre-service teachers.

### **Methodology**

This study deployed an online quantitative survey which was modelled after the Sustainability Education Framework for Teachers (SEFT) (Arizona Board of Regents, 2014). Although SEFT was originally intended to elicit self-reflection and independent thinking about sustainability issues (Stibbe & Luna, 2009),

the categories (e.g. systems thinking, futures thinking) it devised were useful for and relevant to the design of this survey.

These survey questions pertained to the pre-service teachers' holistic knowledge about single-use plastics (associated with systems thinking) their attitudes about this issue (related to values thinking). They also inquired about pre-service teachers' intended teaching practice in time to come with respect to environmental education on plastic use (which were linked to futures and strategic thinking).

The anonymous survey was conducted online from March 2019 onwards, with 50 pre-service teachers undertaking the Bachelor of Arts or Science (Education) degree programme in the National Institute of Education as participants. The participants consisted of 20 Geography, 15 Biology and 15 Chemistry pre-service teachers. 3 participants (6%) were Year 1 students, 9 participants (18%) were Year 2 students, 26 participants (52%) were Year 3 students and 12 participants (24%) were Year 4 students. The survey comprised a mix of multiple choice, likert scale and open-ended questions. Survey responses were subjected to simple descriptive and cross-tab analyses.

### **Pre-service teachers are insufficiently informed about single-use plastics**

All the pre-service teachers surveyed were able to identify single-use plastics correctly. Nevertheless, their understanding of single-use plastics were not entirely accurate or holistic. When asked about whether single-use plastics could be recycled, 34 participants (68%) responded with either "Yes" or "I don't know", while the remaining 16 (32%) responded that single-use plastics cannot be recycled. In actuality, single-use plastics should not be

recycled due to the release of toxic chemicals, such as Polyvinyl Chloride (PCVs) when reused or broken down after many years (NRDC, 2020).

Participants were also quizzed about the recycling symbol accompanied by numbers ranging from 1-7 that would be commonly found at the bottom of plastic items (Figure 1). The number indicates the type of plastic that the item is made of and whether it can be recycled. When asked if they knew what the symbol meant, only 26 participants (or slightly more than half of them) responded definitively.

When asked about whether Singapore has official rules/regulations on single-use plastic consumption/disposal in Singapore, 6 participants (12%) thought so, while 33 (66%) indicated that they did not know. Only 7 participants were certain that Singapore does not have official regulations pertaining to this matter.

Figure 1: Common recycling symbol



When asked about whether Singapore has official regulations on single-use plastic consumption/disposal in Singapore, 6 respondents (12%) thought so, while 33 respondents (66%) indicated that they did not know. Only 7 respondents were sure that Singapore does not have official regulations pertaining to this matter.

Finally, when asked if they would teach about single-use plastics in future, 12 participants (24%) responded that they do not know if they would. Among these 12, 8 (67%) of them expressed a lack of confidence in teaching their future students about single-use plastics and their disposal.

Out of these 8 participants, only 3 of them were aware of the fact that single-use plastics would be mentioned in the subject syllabus that they would eventually be teaching.

### **Pre-service teachers' conflicting attitudes and daily practices**

The survey reflected the positive attitudes that pre-service teachers had towards managing single-use plastic consumption/disposal. A large majority (38 participants or 76%) perceived single-use plastic as a bane to the society/environment. All 50 participants conceded that Singaporeans used too much plastic. When asked if Singapore should pass new laws to cut down on plastic consumption, 20 (40%) and 22 participants (44%) indicated that they "agreed" and "strongly agreed" to the statement, respectively.

Unfortunately however, such positive attitudes were not translated into sustainable consumption habits. The survey showed that pre-service teachers did not pay much attention to the packaging of the products that they purchased. When asked about their choice of packaging when buying drinks, 15 participants (30%) selected plastic bottles while 21 (42%) were not conscious of their decisions. When asked how many plastic bags they used on average in a week, 35 respondents (70%) stated that they use less than 5 plastic bags a week, but this was not a mindful choice on their part. Taken together, this survey illustrated that the everyday practices of pre-service teachers did not quite gel with the environmentalist values that they wished to impart. The aforementioned knowledge gaps in plastic recycling and the disjuncture between their actions and their intentions would have to be addressed for a more successful values-driven environmental education. One step forward would be for pre and in-service teachers to

constantly assess themselves as eco-citizens as well as their competencies in ideally modelling and encouraging responsible sustainable practices especially where they work (see Merryfield, 2012).

### **Pre-service teachers' intended teaching practice on single-use plastics**

20 pre-service teachers (40%) indicated that the topic of single-use plastics would be addressed in the subject(s) that they would be teaching. Out of these 20 participants, 8 were trained in Geography, with only 7 of them being cognizant of the fact that single-use plastics would not be explicitly addressed in the Geography syllabus. were not addressed in the current syllabus. 16 participants (80%) appreciated the importance of teaching their future students about single-use plastics and more than half of those (19 participants, 63%) who were not sure of whether plastics would be a syllabus requirement (30 participants) would teach about them regardless.

A year 2 Geography pre-service teacher conveyed the imperative of a values-driven eco-citizenship education for intergenerational justice and progressive social change. She stated that the over-consumption of single-use plastics would be "detrimental to the Earth (and would) affect every single one if such levels of consumption and disposal persists". He asserted that "educating the young" and "raising awareness on the (negative) effects (of over-consuming plastic disposables) can help with them "taking ownership of" this problem and enacting change.

Most of the pre-service teachers (35 or 70%) surveyed acknowledged the moral obligations tied to being an educator, hence their intentions to inform their future students about sustainable plastic consumption. 12 participants (24%)

expressed uncertainty over their future teaching proclivities mainly because they were unclear about “relevance of single-use plastics to the subject that they are teaching”.

Despite their inclination towards environmental education, these 35 pre-service teachers did have well-articulated plans for doing so, gesturing towards a lack of preparedness and “strategic thinking” on their part. 23 of these participants (66%) did not feel that they had adequate content knowledge to teach about the perils of single-use plastics.

### **Recommendations**

Based on the survey results, this paper attempts to make some recommendations for augmenting environmental education in public schools. The first obvious move would be to better equip pre-service teachers not just with content mastery but to also augment their core competencies necessary for teaching about sustainability, such as in systems, future and strategic thinking. Issues related to sustainability and sustainable development, including plastic consumption/disposal are complex and require a holistic, systems approach. Educators dealing with such topics are therefore required to be communicators of key subject matter as well as multiple varying perspectives.

Aside from mandatory inter-disciplinary under/graduate modules on environmental sustainability (with integrated subject content) for pre-service teachers, the professional development of in-service teachers are equally important. Digital platforms such as OPAL, the Teacher Learning Portal for teachers in Singapore could offer workshops on formal and informal sustainability education. Whereas modules/workshops are formal avenues of education for sustainability, informal ones

such as bottom-up consciousness raising campaigns and other BYO initiatives in schools or on campuses can motivate lifestyle changes (e.g. curbing a convenience culture) on a variety of scales too.

Since the Singapore Green Plan 2030 strives to make environmental education a lifelong process, the sustainable use of resources (i.e. environmental stewardship) such as plastic items ought to be given more weight in the public school curriculum, and not just within academic subject specific domains (Wong and Stimpson, 2004). For instance, practical means of (re)using resources sustainably vis-a-vis ‘Reuse, Recycle and Rescue/recover’ can be implemented in schools, especially under the auspices of Student Development Experiences, Values-In-Action (VIA) and Citizenship and Character Education (CCE) projects. The recent launch of the CCE (2021) syllabus for Secondary schools has become more attuned to contemporary issues stemming from (a lack of) sustainable development. In particular, bottom-up, student driven initiatives linked to the 3Rs are likely to meet several educational objectives simultaneously, such as those related to education for sustainability as well as self-directed learning. Meanwhile, CCE in Initial Teacher Programme (ITP) at the National Institute of Education, Singapore weaves in values-based workshops such as The Meranti Project and Group Endeavours in Service Learning (GESL). These present pre-service teachers with ample creative opportunities for experimenting with sustainability-related ideas and practices.

### **Conclusion**

This study examined the knowledge and attitudes that pre-service teachers had towards single-use plastic consumption/disposal in Singapore. The

results demonstrated that while most pre-service teachers had a heart for environmental education, they were either not well-equipped to address such issues or had yet to role model sustainable consumption. Recommendations to remedy such limitations in environmental education on plastics (both within teacher training institutions and in public schools) have been made.

### Acknowledgements

We would like to thank all the survey participants and wish to acknowledge the funding support for this project from Nanyang Technological University under the Undergraduate Research Experience Campus programme (URECA).

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