First-Year Residence Students' Perceptions of Single-Use Water Bottles

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SUSTAIN 4S06: Leadership in Sustainability

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Abstract:

This research aims to understand the attitudes and perceptions of first-year university students living in residence towards single-use plastic water bottles. The objective is to understand the attitudes and subsequent intentions leading to the students' behaviours and advocate for sustainable practices on campus. Employing a qualitative approach, we conducted 20 interviews to collect data from first-year McMaster University students living in residence. Following the interviews, we transcribed and analyzed the data to determine codes, which revealed two main themes: "Pros of Single-Use Bottles" and "Determinants Shaping Student Choices". These themes showcase that participants perceived single-use water bottles as convenient and are concerned about water quality at refilling stations. Participants also shared their thoughts on the accessibility of alternatives to single-use bottles and external factors influencing their behaviour. This study offers nuanced insights into student behaviour and provides a foundation for shaping effective campus policies that align with sustainability goals.

Keywords: Single-use plastic bottle, student perception, water refilling, thematic analysis, qualitative research, drinking water

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1.0 Introduction

1.1 Plastic Waste and Related Water Quality

Plastic waste is a major global environmental issue threatening the environment and public health. According to research published in the journal Nature Communications, rivers deliver 1.15 to 2.41 million tonnes of plastic into the ocean annually (Lebreton et al., 2017). Since majority of plastic bottles sold end up as waste, plastic pollution significantly affects marine environments (Bouhlel et al., 2023). Macro-plastics, microplastics, and other chemicals released from single-use plastic bottles have detrimental impacts on the environment and contaminate both human and animal food chains (Bouhlel et al., 2023). This excessive waste releases approximately 400 million tonnes of greenhouse gas emissions into the atmosphere yearly (Shershneva, 2021). Currently, plastic waste is increasing; over 380 million tonnes of plastic are generated annually, as of 2022, and if regulations remain the same, this quantity is predicted to triple by 2035 (OECD, 2022).

There is also a misconception that bottled water is inherently cleaner than tap water. To address this, it is important to highlight concerns around microplastics and overall water quality. By sampling bottled water, a study indicated that 93% of the samples analyzed contained microplastics, with some fragments large enough to be visible without magnification (Austin, 2022). Moreover, bottled water has been shown to contain mixtures of 38 different pollutants, including industrial chemicals and bacteria, challenging the notion of its quality standards maintained by bottled water companies (Environmental Working Group, 2008). These findings address the myth that bottled water is inherently cleaner and show that it may include chemicals that are harmful to health.

1.2 University Initiatives on Plastic Waste Reduction

Many universities across Canada and the United States have started implementing waste management strategies to reduce the amount of plastic waste generated on campus. In October 2010, Bishop's University became the first university in Quebec to ban the sale of single-use water bottles (Jerema, 2010). This decision was following the ban or potential ban of single-use plastic water bottles by other Canadian universities, including the University of Winnipeg, Brandon University, Queen's University, Toronto Metropolitan University, University of Ottawa, Memorial University of Newfoundland, and Trent University (Jerema, 2010). However, the gap in knowledge regarding the effects of the bans on campus still exists.

Washington University implemented a ban on single-use plastic water bottles in 2009 where they ceased the selling of water at retail locations and in vending machines on campus (Keaggy, 2016). Research from the Department of Sustainability showcased the purchase of soda, energy drinks, and juices decreased from 1,439,088 bottled beverages in the 2008-2009 academic year, to 871,776 bottles (Keaggy, 2016). This was a significant 39.4% decrease in the sale of all bottled beverages (Keaggy, 2016). The University of Washington attributes its success to following a three-step plan: 1. investing in alternative options to bottled water and adding more refill stations, 2. maintaining a positive culture for sustainability within the university, and 3. promoting positive nutrition education (Keaggy, 2016). Furthermore, the University of Toronto (Callendar, 2011), University of Winnipeg (Taylor, 2015), University of Ottawa (Darche, 2018), Simon Fraser University (Simon Fraser University, n.d.) and McGill University

(Litwin & Ling, 2019) have all banned the sale of single-use plastic water bottles in recent years. With the increase in action taken by institutions to reduce plastic waste, the proactive measures can be seen as a success as it not only increases awareness on the impact but provides measurable data to track progress. The success of these policy bans begs the question: Are the benefits greater than the consequences?

A different study conducted by Professor Rachel Johnson and her student Elizabeth Berman found that banning single-use plastic water bottles entirely on campus may not be the solution to effective waste management. In 2012, the University of Vermont implemented a policy stating that every eatery location on campus must have 30% of beverages be deemed healthy (Berman & Johnson, 2015). The following year, the university decided to ban the purchase of single-use plastic water bottles entirely while maintaining the 30% healthy beverage ratio (Berman & Johnson, 2015). It was found that despite eliminating bottled water, the university did not see a reduction in plastic bottle waste due to alternative beverage purchase (Berman & Johnson, 2015). Moreover, when comparing the results between Spring 2012 and Spring 2013, the number of bottles shipped per person on campus increased by 6% (shipment data was used as a proxy for consumption). Despite the University of Vermont investing hundreds of thousands of dollars in water refilling stations on campus, the initiative did not yield the intended results.

1.3 Research and Advocacy for Sustainable Practices at McMaster University

Since 2009, McMaster University has been working to address the environmental and Health impact of single-use plastic bottles (McMaster Okanagan Office of Health & Well-being, n.d.). The Bring Your Own Bottle (BYOB) campaign, started in 2022, addresses the environmental impact of single-use plastics and encourages the adoption of sustainable practices (Bring Your Own Bottle, 2022). A survey found that 80% of McMaster students living in residence purchase single-use water bottles frequently. To reduce the use of single-use water bottles on campus, BYOB implemented key initiatives, such as installing Elkay filtered water spigots, developing a comprehensive campaign website, and creating an interactive map of refill stations so students can find the nearest refilling stations (Bring Your Own Bottle, 2022). According to the annual report, there are approximately 200 water refill stations across campus (Bring Your Own Bottle, 2022).

A previous McMaster University SUSTAIN 4S06 student group aimed to explore the perspectives of first-year students regarding refilling reusable water bottles on campus, after the installation of filters in all residences. The study also assessed the outcomes of the BYOB initiatives implemented in previous years (Malik et al., 2023). Their focus was to find the underlying motivation of why students choose to refill (Malik et al., 2023). They found that participants were happy with the refilling stations that have been implemented around campus, highlighting the convenience and accessibility of water refill stations across various campus locations (Malik et al., 2023). However, their study involved data collection at an event where individuals who already utilized refilling stations attended. As their recommendation was to target student who did not refill, our study aims to fill this gap in research.

In the past, barriers, such as inconvenience and a lack of accessibility to the refilling stations had prevented students from refilling their water bottles. The implementation of more

refilling stations had led to a positive experience, since students were more motivated to opt for reusable water bottles, thereby reducing the use of single-use plastic bottles (Malik et al., 2023). However, SUSTAIN 4S06 student group discussed the need for more research to explore motivating factors, barriers, and optimal refill station locations (Malik et al., 2023). Thus, our project builds upon the work previously completed and aims to understand the perceptions of students regarding single-use water bottles and refilling stations, and overall accessibility.

Furthermore, much research has been conducted to understand the benefits of reusable bottles and to motivate students to shift from single-use plastic bottles to reusable ones. A study conducted by Matthew Bethurem and his colleagues evaluated the impacts of sustainability initiatives aimed at reducing the use of single-use plastic water bottles among students at Allegheny College (Bethurem et al., 2021). The study highlighted various factors influencing students' behaviours regarding the consumption of single-use water bottles, such as convenience, taste preferences, difficulties in cleaning reusable bottles. (Bethurem et al., 2021). However, the study did not investigate details on the reasons behind students' behaviours on these factors, due to the nature of the study being survey based. It further emphasized the need to understand the importance of these factors to reduce plastic waste effectively, providing a rationale for our study (Bethurem et al., 2021). Similarly, other studies mainly focus on the impact of single-use or how to promote sustainable alternatives for single-use water bottles, and they overlook the value of students' perceptions of single-use water bottles. Overlooking insights and not understanding students' attitudes toward single-use water bottles could lead to gaps in knowledge. This project provides a unique perspective as it investigates the attitudes behind single-use bottle usage and a comprehensive understanding of the motivations surrounding water consumption at McMaster University.

The purpose of this study is to understand the attitudes and perceptions of single-use water bottle use of McMaster University students living in residence in Hamilton, Ontario. The main objective is to gain a comprehensive understanding of the student community's stance on single-use water bottles, with our secondary objective being to advocate for sustainable practices on campus.

This report dives into the methodology approach used. It showcases a detailed study design that emphasizes an open-minded approach to data collection and analysis, aiming to reduce unconscious biases and ensure fairness. Through thematic analysis guided by Braun and Clarke (2006), we identified prevalent themes which are expanded upon in the Results section. Finally, the Discussion section compares our study’s findings with previous studies and proposes initiatives to be implemented at McMaster University.

2.0 Methods

2.1 Overview

As discussed in our Introduction, the study by Bethurem et al. (2021) assessed sustainability initiatives aimed at reducing the use of single-use plastic water bottles among students at Allegheny College. While it identified the factors influencing behaviours, it did not delve into the reasons behind these behaviours, highlighting a gap in the research. This gap is significant as it overlooks the perceptions of single-use water bottles among students. To understand the attitudes and perceptions of first-year McMaster University students living in

residence regarding single-use water bottle usage, we conducted 20 interviews. By conducting 20 interviews, we achieved a deep understanding of the topic. This prioritizes depth over breadth and aims to reach data saturation. Collecting data from a specific demographic at a certain point in time allowed us to obtain high-quality, detailed data that can provide meaningful insights into the research question rather than aiming for statistical generalization. Before data collection, we addressed unconscious biases to ensure all data were collected and interpreted fairly. Our underlying assumptions suggested a binary view of student behaviour concerning water bottle usage, implying that individuals fall into two distinct categories: those who favour reusable water bottles and those who opt for single-use bottles. Moreover, the assumptions posit that the choice of using reusable water bottles reflects an inherent concern for the environment. This perspective implies that individuals actively embracing reusable are environmentally conscious and prioritize sustainable practices. Conversely, those who rely on single-use water bottles may not prioritize environmental considerations, indicating a perceived lack of concern for sustainable living practices. Through this study, we sought to challenge our assumptions by examining how students' water bottle choices might not directly relate to their level of environmental consciousness, thereby contributing to a deeper understanding of sustainability attitudes within the McMaster University community. This study was reviewed and approved by McMaster's Research Ethics Board #6100, supported by our instructor, Dr. Kate Whalen, and undertaken with our Community Project Champions (CPCs), Monica Palkowski and Melissa Gallina.

2.2 Study Design

Recognizing the potential influence of the assumptions on our research, we ensured an open-minded approach to data collection and analysis. By employing open-ended questions, we encouraged the organic development of themes, emphasizing the unique perspectives in our study. Development of themes was guided by the paper by Braun and Clarke (2006). Another concern is that participants were solely motivated by the incentive rather than providing substantive interview responses. The incentive provided was a $10 Starbucks gift card. To address this, our process involved rigorous screening of potential participants meeting specific criteria: first-year McMaster University students living in residence who purchased single-use water bottles. We strategically advertised the recruitment event and the incentive on the McMaster Academic Sustainability Office's Instagram page four days before the event and through posters in the Mary E. Keyes Residence on the day of the event (Appendix A). We set up our event table in a high-traffic area near the East Meets West Bistro. At the table, we promoted the event by showcasing our posters, alongside McMaster Academic Sustainability Office stickers, pins, and snacks (Appendix B). In-person interviews were chosen over surveys for their ability to elicit nuanced responses from participants. This method fostered a comfortable atmosphere for open sharing and allowed for follow-up questions.

2.3 Data Collection

In preparation for the recruitment event, determining our interview questions was crucial. Our initial questions included, "What are your thoughts and feelings about single-use water bottles?", "What would encourage you to use reusable water bottles, instead of the single-use?", and "Within what situations do you feel single-use water bottles are more practical?". These

questions were broad, posing the risk of students' responses being general or influenced towards a specific viewpoint.

Recognizing the need for deeper engagement, we revised our questions to prevent bias in responses with guidance from Dr. Kate Whalen, and our CPCs. As outlined in Appendix D, our finalized questions reduced the possibility of leading responses and focused on the perceptions behind student's actions. Moreover, the transition to questions such as "Where do you purchase single-use water bottles?" and subsequent follow-ups encouraged participants to articulate specific experiences. Similarly, we asked about participants' thoughts on refilling stations and their specific experiences with them. This approach not only minimized the potential for a leading response but also encouraged participants to share their lived experiences.

The interviews were conducted on October 24, 2023, between 2:00 pm to 5:00 pm, in the lobby of the Mary E. Keyes Residence, and lasted five to ten minutes per participant. Each of the 20 participants reviewed a Letter of Information (LOI) explaining our study's goals and methods, agreed to its terms, consented to our questions, and received the incentive (Appendix C). They were asked about perceptions of single-use bottles and refilling stations (Appendix D), and answers were documented through audio recordings or handwritten notes, depending on the participants' preferences. Then, the interview audio files were permanently deleted once the transcripts had been transcribed and reviewed.

2.4 Thematic Analysis

The 2006 paper by Braun and Clarke, *Using Thematic Analysis in Psychology*, guided the approach for the interpretation of our data. To define what constitutes a theme, we emphasized the significance of prevalence in the data, focusing on patterns that demonstrated consistent and structured responses (Braun & Clarke, 2006). To understand the data comprehensively, we delved into the relationships between the identified themes, striving to grasp their interconnectedness and contributions to the broader research context. This comprehensive analysis provided valuable insights into the dynamics and interplay of the various themes, showing the underlying complexities of the research subject.

In terms of data interpretation, rich description provides contextualized accounts of qualitative data to offer a comprehensive understanding of the topic being studied (Braun & Clarke, 2006). On the other hand, detailed description involves thorough and nuanced accounts of qualitative data to capture the intricacies of the topic (Braun & Clarke, 2006). As a group we opted for a rich description of the dataset, aiming to comprehensively understand the broader context. As mentioned in the Introduction, there is limited research conducted on the benefits of single-use water bottles specifically.

As we were analyzing Braun and Clarkes inductive and theoretical thematic analysis, inductive thematic analysis involves deriving themes directly from the data without pre-existing theoretical frameworks, while theoretical thematic analysis utilizes existing theories to guide the interpretation of themes within qualitative data (Braun & Clarke, 2006). We followed a bottom-up inductive approach, reviewing previous literature was avoided to ensure that the themes identified were based on the data we found (Braun & Clarke, 2006).

Exploring themes, semantic involves capturing explicit meanings conveyed by participants, while latent themes involve uncovering underlying meanings beyond the surface

level (Braun & Clarke, 2006). We concentrated on semantic elements, primarily capturing explicit meanings conveyed by participants (Braun & Clarke, 2006). For example, if participants mentioned that they found single-use water bottles easy to carry, we interpreted this as convenient.

Finally, from an epistemological standpoint, essentialist-realist perspective in qualitative analysis focuses on understanding participants' experiences as reflective of an objective reality, while constructionist perspective emphasizes the role of social constructs in shaping individuals' realities (Braun & Clarke, 2006). Our study adopted an essentialist-realist epistemological approach to understand students' experiences surrounding the use of single-use water bottles. By analyzing the participants' responses, we sought to comprehend the underlying meanings and experiences of the participants' perspectives.

After adopting the following elements, we moved through the six phases outlined in Braun and Clarke's thematic analysis framework. Phase One involved immersing in the raw data to understand diverse narratives and perspectives (Braun & Clarke, 2006). The initial transcription allowed us to become familiar with the data, noting insights. Phase Two led us to the generation of initial codes and the breakdown of data into manageable units to detect potential patterns (Braun & Clarke, 2006). The transcribed data was rigorously coded three times. The process of coding consisted of analyzing the transcript to identify interesting and key components of the data that can be used in a meaningful way. Coding was conducted individually and as a group to ensure the analysis was done across the entire dataset.

Transitioning to Phase Three, we synthesized broader themes by clustering similar codes, and assessing their significance within our research context (Braun & Clarke, 2006). After coding the data, we searched for themes and defined them. This was done multiple times as a group to check if themes worked with the codes that were extracted. Our analysis focused on identifying recurring themes along with examining the frequency and significance of each theme to our research questions. Phase Four constituted a critical evaluation, revisiting identified themes to ensure their validity and coherence (Braun & Clarke, 2006). In Phase Five, we focused on defining and refining the identified themes, crafting a coherent narrative highlighting their relevance to the data (Braun & Clarke, 2006). Finally, Phase Six involved synthesizing our findings into a cohesive report aligned with our research questions, presenting a cohesive narrative summarizing the key insights (Braun & Clarke, 2006).

3.0 Results

Results suggest that students' attitudes and perceptions toward single-use plastic water bottles guide their behaviours and decision-making during purchasing. Two distinct themes were identified: pros of single-use plastic water bottles and determinants shaping student choices. Under the pros of single-use plastic water bottles, two sub-themes were identified: perceived water quality at refilling stations and convenience of single-use. Sub-themes under the determinants shaping student choice's theme include accessibility of alternatives to single-use bottles and external influences on purchasing behaviour.

Figure 1 illustrates the breakdown of the theme and sub-themes, derived from the students’ responses. Direct quotes from the students' responses are incorporated in the

descriptions below to support the themes. While multiple quotes were available, not all quotes were utilized, and some were paraphrased if several students expressed similar sentiments.

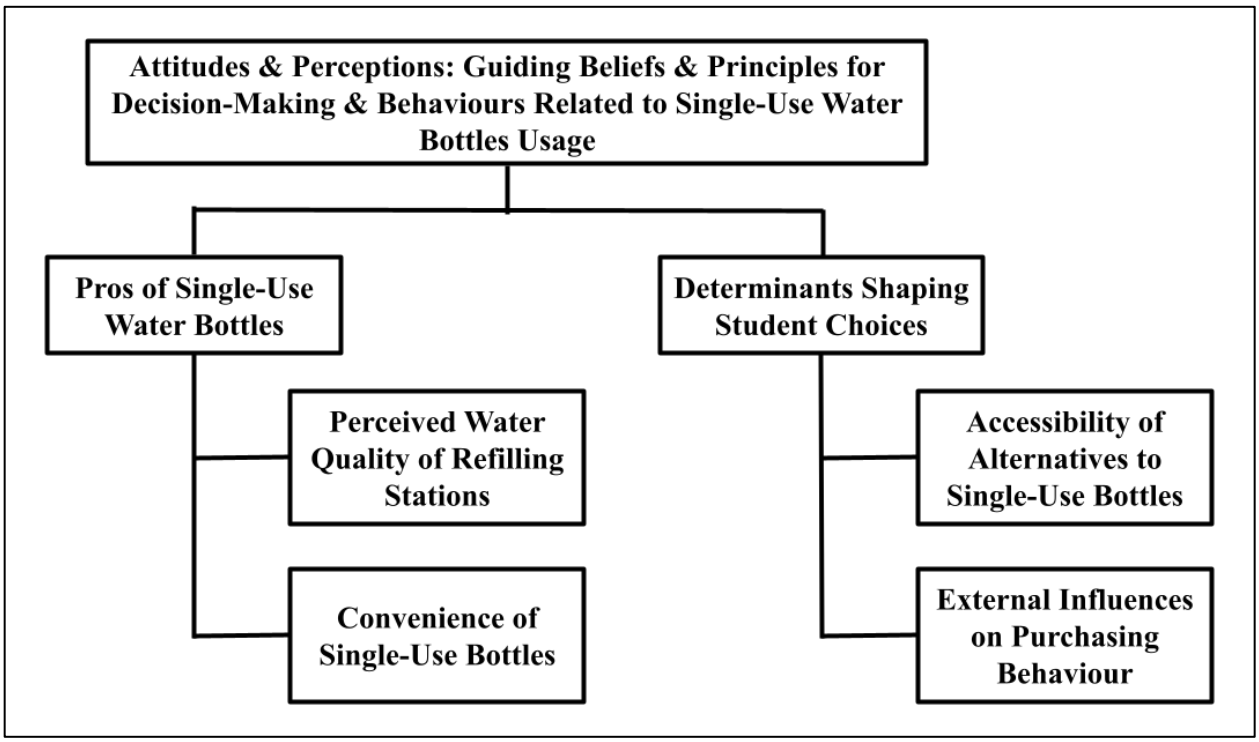


Figure 1. Thematic map of McMaster University students' attitudes and perceptions of single-use water bottles.

3.1 Theme: Pros of Single-Use Plastic Water Bottles

This theme encompasses sub-themes that highlight the perceived advantages of using single-use plastic water bottles over alternative options like reusable bottles or water from refilling stations. It also highlights the challenges that student face with refilling stations and water quality. Pros of single-use plastic water bottles is defined based on their convenience and the water quality available at refilling stations.

3.11 Sub-theme: Perceived Water Quality of Refilling Stations

Water quality is a term that measures the suitability of water for particular use based on physical, chemical, and biological characteristics (Cordy, 2014). This subtheme was mentioned in 13 interviews, with a total of 22 mentions. The subtheme consists of four main codes: guaranteed quality in single use plastic water bottles, cleanliness of refill stations, characteristics of the dispensed water in refilling stations, filter status in refilling stations.

The perception of guaranteed quality in single use plastic water bottles was mentioned in eight interviews, with nine specific references to it. Students expressed a desire to purchase single-use plastic water bottles due to the perceived higher quality compared to the water from campus refilling stations. Participant #20 explains their motivation of purchasing single-use plastic water bottles because they believe campus residences lack proper filtering facilities.

> "We are all provided with [Brita filters] here, which sometimes aren't really too good at cleaning out the tap water…I think me and other people might think that single-use water bottles might provide cleaner water."

The cleanliness of refilling stations was mentioned in five interviews, with five specific references to it. Participants expressed a preference for single-use plastic water bottles due to concerns regarding the hygiene of refilling stations. Participant #19 describes the lack of cleanliness of refilling stations and uncertainty regarding their safety regulations.

> "I don't know if they are properly maintained or cleaned. For example, the water fountains, some people might…put their mouths on it…And sometimes…I don't know what the source of water is. Whereas if I just purchase a bottle of water, I know it has passed certain safety regulations and everything."

The characteristics of the dispensed water in refilling stations itself was mentioned in four interviews, with five specific references to it. Students expressed concerns regarding the unusual taste, temperature, and potential chemicals found in refilling stations and how it was a motivator in buying single-use plastic water bottles. Participant #1 expresses their concern about the presence of chemicals in the water of campus refilling stations.

> "I personally believe the water has fluoride and a lot of chemicals. If I'm going to drink water it's gonna be from plastic bottles from brands I know that don't use too many chemicals. The water refilling stations definitely have something in the water, it's why I don't drink those."

Filter status in refilling stations was mentioned in two interviews, with three specific references to it. Students expressed reluctance in using refilling stations on campus and instead chose to purchase single-use plastic water bottles. These concerns stem from the broken filters within the refilling stations. Participant #15 describes how visual indication of the colours on the filter status affect their willingness to use the refilling stations.

> "I guess one inconvenience is that not all the filters are up to date. You can see that in the colours…Sometimes they will show when the filter was last updated."

Participant #9 describes how unfiltered water refilling stations are unsettling and lead to avoidance of those stations.

> "There are some places where the filters have a bad status so that's a little scary sometimes."

Participants overall expressed their concerns with taste, temperature, and chemicals found at refilling stations. They further stressed their concerns with unfiltered stations along with their perception that water quality is better in single-use bottles.

3.12 Sub-theme: Convenience of Single-Use Bottles

Convenience is defined as a quality or situation that makes a task easy or useful for an individual as it reduces the amount of effort or time to complete (The Britannica Dictionary, n.d.). The theme convenience was mentioned in 8 interviews with 12 specific references to it.

When asked to further expand on the word, students referred to single-use water bottles as timesaving, easy to dispose, easy to carry, and having greater accessibility and availability. Based on that, we expand on the sub-theme convenience into different codes.

There were several ways in which single-use water bottles were considered convenient, based on the participants' responses. The time-saving aspect was important for some participants as they highlighted the simplicity of single-use bottles, viewing them as convenient options when forgetting their reusable bottles. Participants shared that single-use water bottles are quick to use, and they do not waste time on refilling them. Also, some discussed and explained how they see it as timesaving, such as participant #16.

> "...it's easier, more efficient... you can just pick it up, open it up... you don't have to go through the hassle of like filling it up and stuff."

Carrying these bottles was also considered convenient and easily disposable by participants, such as participant #10.

> "I'd say like convenient... like easily disposable, and...easily accessible"

Similarly, in addition to single-use bottles being easily disposable, participant #3 mentioned how they are easy to carry as well.

> "Easily disposable. So, if I am walking in public I can just get rid of it if I don't have something that I can really carry it with"

The accessibility and availability factors were highlighted by many participants, emphasizing the readiness of single-use bottles. Some individuals noted that in instances, where they were eating their food, they found it convenient to grab a water bottle alongside the food. Also, some participants, such as #6 mentioned how they could buy a 24 pack of bottled water for a cheaper price.

> "Very convenient. Like if I realize that…I don't have any drinks on me, I will go to Bistro or like Centro and…buy one... I also do sometimes have…the 24 pack in my room."

Several factors contribute to the convenience of single-use water bottles, such as timesaving, ease of disposing and carrying, accessibility and availability. These factors play a significant role in students' behaviours.

3.2 Theme: Determinants Shaping Student Choices

The next theme explores the factors influencing students' decisions regarding using single-use water bottles on campus. It delves into the obstacles students may encounter when deciding on methods of water consumption, thus affecting their behaviours.

3.21 Sub-theme: Accessibility of Alternatives to Single-Use Bottles

This subtheme relates to the environmentally friendly options available for students to consume water and how their accessibility influences student behaviour. Within the 20 interviews conducted, the subtheme was mentioned 18 times in 13 interviews. Alternatives to single-use water bottles can be broken down into two codes: refilling stations on campus and additional options in the dining halls on campus.

When answering the question regarding universities phasing out the sale of single-use bottles, Participant #15 shared that they would carry a reusable water bottle and recognized the need for additional options for students.

> "I think the big thing is…if we're gonna transition out of not having single use water bottles, I do feel like there should be an increase in refill sites."

While sharing their thoughts on refilling stations, Participant #7 reflected on the role of refilling stations in reducing the purchase of single-use water bottles. They also highlighted their personal preference for the refilling sites.

> "I feel like [refilling stations are] better because it obviously reduces the purchase of single-use plastic water bottles… I only buy [single-use plastic water bottles] when I absolutely need it. Otherwise, I use the refilling stations."

Participants also describe the options available to students when eating on campus. When asked about students' reactions if universities were to phase out single-use water bottles on campus, Participant #10 shared following the change, the university should invest in providing sustainable alternatives to increase accessibility.

> "Dining halls have…reusable plates, reusable cutlery everything so they could just have a reusable cup as well, and then they have reusable stations in there. So, phase in that, as you're phasing out single-use."

Participant #17 emphasized how providing increased alternatives at several locations across campus would reduce any pushback from students.

> "Are they providing fountain drinks with maybe paper cups that would be more eco-friendly…If there are not replacing those single-use water bottles with anything, then I think that people would…be upset about that."

Overall, when interviewing participants, a popular alternative to single-use water bottles were refilling stations with greater accessibility and quality. According to the viewpoints shared, the availability of refilling stations and other alternatives influences student behaviour and attitudes towards single-use plastic bottle consumption.

3.22 Sub-theme: External Influences on Purchasing Behaviour

Students expressed varying degrees of agency regarding their choices to purchase single-use water bottles. Within the 20 interviews conducted, the subtheme was mentioned five times in five interviews. The influence of habit, water quality and convenience also played a significant role, with many students citing instances where they opted for single-use bottles out of habit or in moments of convenience, such as when they forget their reusable, or their parents are concerned about the water quality.

When asked about the phasing out of single-use water bottles by other universities and how they would feel if McMaster University were to place the ban, Participant #15 expressed the lack of control they have when it comes to the purchase of single-use bottles.

> "I don't really like plastic water bottles... My dad just won't stop buying them..."

Similarly, Participant #18 mentioned the influence their parents have behind the use of single-use water bottles.

> "…The main reason I technically bring them is cause my mother bought a bulk of them beforehand, so I think she was mostly the one…worried about the…water quality here…[she] bought…stacks of water bottles…even though…I'm fine using the filtered water here, she's like, "no, bring a bottle!"

Other participants mentioned how their meal plan card influence their choice behind purchasing of single-use water bottles, as Participant #19 tends to purchase a single-use water bottle because of it.

> "The [fountain] water kind of tastes funny…I have my meal card anyways so I might as well buy you know water bottles. It's just convenient to be honest."

Similarly participant #2 mentioned that when they buy food, especially those that come with a combo, they get a drink for free or with a discount, which leads them to buying single-use water bottles.

> "…a lot of the times I just go in aiming to…buy food usually when I'm hungry…And a lot of the times…you always just want a drink beside it. Either I just get… a soda drink

… Or like the alternative is I just get a water bottle. So, I don't really have much to choose from."

While some participants indicated a preference for more sustainable alternatives and welcomed initiatives to phase out single-use bottles on campus, others felt constrained by external factors such as parental influence or perceived lack of viable alternatives.

4.0 Discussion

4.1 Overview

As detailed in our Results, our study found that students who purchased single-use plastic water bottles perceived them as convenient, compared to reusable bottles. Additional factors influencing water consumption behaviours include parental intervention, mistrust in municipal water systems, perception of water treatment chemicals, and lived experiences. While these additional factors are important, they are systemic issues outside the scope of our current recommendations. However, interviews indicate a perceived lack of viable alternative options for students. Therefore, we propose three data-driven, scientifically proven recommendations to address this and build upon current communications: policy nudges, social cues, and education and awareness.

4.2 Nudge Policy: Establishing Water Refilling as the Norm

Nudge policy is a subtle approach to influencing behaviour without limiting choices, focusing on making healthier or beneficial behaviours easier to choose through behavioural economics principles (Murayama et al., 2023). It has proven effective in public health domains, evidenced by systematic reviews and meta-analyses showing significant positive impacts on behaviours (Arno & Thomas, 2016; Hummel et al., 2020; Murayama et al., 2023; Rivers et al., 2017; Verkhivker, 2017). As evidence has shown nudge policies increasing healthier dietary behaviour by up to 15.3%, we propose using this strategy, aligned with the objectives of Hospitality Services: Student Affordability (cheaper meal plans) and Inclusive Excellence (diverse nutrional menu), to revise the current combo meal system (Arno & Thomas, 2016; Hospitality Services, n.d.-a). Bistro-2-Go offers a combo deal to any main dish. Currently, the combo addition consists of a side of fries and a choice of a bottled beverage for $4.99 (Hospitality Services, n.d.-b). The fries itself cost $4.09, making the bottled beverage a mere $0.90. Comparatively, a bottle of water purchased individually ranges between $2.49 to $3.19, depending on the brand (Appendix E). We propose a modification of the combo option to remove the discounted bottled beverages while still providing those options at their true retail cost. To further nudge students, we propose providing a carafe of chilled, filtered water that students can refill using pre-set glasses made available at their table.

4.3 Social Cues: Creating a Socially Acceptable Culture for Drinking Water

To nudge away from single-use plastic bottles and towards socially accepted behaviour, we suggest the incorporation of social cues. Social cues are subtle, nonverbal indicators that guide social interactions, to help convey emotions, intentions, and responses, significantly impacting how we understand and relate to one another (Jones, 2024). In a study by Dorigoni

and Bonini (2023), social cues were an effective strategy where bottled water sales decreased by 12%. In alignment with the objective of Hospitality Services: Inclusive Excellence, we recommend that dining locations such as Centro and Bistro market fruit-infused water (Hospitality Services, n.d. -a). This has been successfully implemented at the Chopped Leaf location on campus. We hypothesize that there is a perceived notion that paying for water represents better quality, and fruit-infused water is an elevated experience requiring additional costs and human resources to provide. We propose two pilot studies for future sustainability student projects. We suggest that Hospitality Services introduce fruit-infused water, branded as "diced water", and create a socially and culturally conducive environment for drinking water and refilling behaviour. We anticipate a significant demand for this product at dining locations, and a small fee would ensure that the associated costs would be covered to ensure financial sustainability. For the first study, we propose that this water be sold for a price; however, it would be interesting to observe in the second study if the demand changes if it is offered for free. Creating a socially accepted environment for diced water will be a popular choice among students, as it has been proven before that students are willing to pay for it. This recommendation can be combined with dining establishments on campus introducing attractive glassware and eco-friendly straws to further create an inviting environment and promote culturally appropriate behaviour of encouraging sustainable water consumption. Dining halls can also include signs such as "two in three students use refilling stations to drink water" and markings on the floor that lead to the nearest refilling station, as a free and socially-acceptable option. These are additional methods of implementing social cues to influence students' behaviours.

4.4 Empowering Tomorrow: Educating the Next Generation

Education and awareness are one of the most common approaches to behaviour change. Our study found a need for more refilling stations on campus, not in quantity, but in visibility and communication. As first-year students may have yet to learn where the stations are when they first move into residence, we suggest posting messages at key points of sales and dining halls, such as La Piazza and Centro, indicating the closest refill station. We aim to build upon current digital QR codes and have posters stating, "Nearest Refilling Station 10 metres away"! This recommendation will bridge the communication gap regarding refilling stations and drive students towards more sustainable behaviours. Additionally, there should be increased awareness regarding the status of water filters and on the cleanliness of refill stations and campus drinking water. This is a crucial step, as our results presented a misconception amongst students that water from refilling stations on campus are not safe, when in reality there are specific procedures in place to test the water to ensure they meet the Ontario Drinking Water Standards (McMaster Okanagan Office of Health & Well-being, n.d.). A positive example can be seen at the Beaty Water Research Centre facility at Queen's University. This institution is dedicated to furthering research, education and outreach about water related issues (Beaty Water Research Centre, 2023). We believe that social media is also highly important for knowledge translation to effectively demonstrate that water itself is a chemical, and chlorine is commonly added to drinking water to kill parasites, bacteria, and viruses, and quite safe to consume (CDC, 2020). Utilizing tools such as Instagram Reels can be a powerful resource for education and reaching the wider McMaster community.

4.5 Conclusion

In conclusion, future research should assess the effectiveness of these recommendations. Addressing these problems must be nonlinear due to the complexity surrounding the sale of single-use plastic bottles stemming from systemic issues, perceptions, and lived experiences. We recommend continuing these studies in future sustainability student projects.

5.0 Acknowledgements

We would like to extend our gratitude to our Community Project Champions, Monica Palkowski and Melissa Gallina for their continuous support, guidance and encouragement throughout this sustainability project. We also want to thank our instructor, Dr. Kate Whalen, for her providing us with the tools and guidance with conducting interviews, data analysis, and research report writing. In addition, we also thank Madison Mote for being our teaching assistant and supporting us throughout the course. Thank you to the BYOB Working Group for providing us a platform to share our findings and recommendations. Finally, we thank all our participants for sharing their thoughts with us. The project would not have been possible without them.

References

Arno, A., & Thomas, S. (2016). The efficacy of nudge theory strategies in influencing adult dietary behaviour: a systematic review and meta-analysis. BMC Public Health, 16(1). https://doi.org/10.1186/s12889-016-3272-x

Austin, D. (2022, September 16). *All The Convincing You'll Need To Ditch Bottled Water For Good.* HuffPost. https://www.huffpost.com/entry/bottled-water-chemicals-health-risk_l_630d11bfe4b065bfc4b11085

Berman, E. R., & Johnson, R. K. (2015). The Unintended Consequences of Changes in Beverage Options and the Removal of Bottled Water on a University Campus. *American Journal of Public Health*, *105*(7), 1404–1408. https://doi.org/10.2105/AJPH.2015.302593

Bethurem, M., Choate, B., & Bramwell, S. (2021). Stop Piling on: Assessing Efforts to Reduce Single-Use Water Bottles at Allegheny College. *Sustainability, 13*(16), 8864. https://doi.org/10.3390/su13168864

Bouhlel, Z., Köpke, J., Mina, M., and Smakhtin, V. (2023). *Global Bottled Water Industry:A Review of Impacts and Trends United Nations*. United Nation University Institute for Water, Environment and Health. https://inweh.unu.edu/wp-content/uploads/2023/03/UNU_BottledWater_Report_F.pdf

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77-101. https://doi.org/10.1191/1478088706qp063oa

Bring Your Own Bottle. (2022). *Annual Report: Bring Your Own Bottle Campaign.* McMaster

Okanagan Committee.

https://okanagan.mcmaster.ca/app/uploads/2023/04/BYOB_2022_AnnualReport.pdf

Callendar, J. (2011, September 13). *Management and Marketing.* University of Toronto.

https://www.utoronto.ca/news/canadas-largest-university-goes-bottle-free#:~:text=As%20the%20academic%20year%20begins%2C%20bottled%20water%20will

Cordy, G. E. (2014, February 18). *A Primer on Water Quality*. USGS.

https://pubs.usgs.gov/fs/fs-027-01/

Darche, L. (2018, March 20). *Defending the right to water a bottle at a time.* University of Ottawa. https://www.uottawa.ca/en/news-all/defending-right-water-bottle-time#:~:text=The%20University%20of%20Ottawa%2C%20a%20pioneer%20among%2

Dorigoni, A., & Bonini, N. (2023). Water bottles or tap water? A descriptive-social-norm based intervention to increase a pro-environmental behavior in a restaurant. Journal of Environmental Psychology, 86, 101971. https://doi.org/10.1016/j.jenvp.2023.101971

Environmental Working Group. (2008, October 15). *Harmful Chemicals Found in Bottled Water.* https://www.ewg.org/news-insights/news-release/harmful-chemicals-found-bottled-water

Hospitality Services. (n.d.-a). *Holistic Student Experience.* McMaster University.

https://hospitality.mcmaster.ca/our-strategy/holistic-student-experience/

Hospitality Services. (n.d.-b). *Bistro-2-Go Menu*. McMaster University. https://hospitality.mcmaster.ca/locations/our-locations/bistro-2-go-menu/

Hummel, D., Maedche, A., & Collett, N. (2020, August 20). How Effective Is Nudging? The Decision Lab. https://thedecisionlab.com/insights/policy/how-effective-is-nudging

Jerema, C. (2010, October 08). *The end of bottled water*. Macleans. https://macleans.ca/education/uniandcollege/bishops-bans-bottled-water/

Jones, H. (2024). *Understanding Different Types of Social Cues.* Verywell Health. https://www.verywellhealth.com/social-cues-5204407

Keaggy, D. T. (2016, April 20). *Water bottle ban a success; bottled beverage sales have plummeted*. The Source Washington University in St. Louis. https://source.wustl.edu/2016/04/water-bottle-ban-success-bottled-beverage-sales-plummeted/

Lebreton, L. C. M., van der Zwet, J., Damsteeg, J.-W., Slat, B., Andrady, A., & Reisser, J. (2017). River plastic emissions to the world's oceans. *Nature Communications, 8*(1), 15611. https://doi.org/10.1038/ncomms15611

Litwin, K. & Ling, S. (2019, March 22). *McGill receives international accolades for "Ban the Bottle" project.* McGill Reporter. https://reporter.mcgill.ca/mcgill-receives-international-accolades-for-ban-the-bottle-project/

Malik, M., Rathod, M., Vujicic, M., Dhanvanthry, N., Wu, L. (2023, April 06). *Understanding*

residence students' motivations to water bottle refilling and reuse at McMaster University. McMaster University's Academic Programs Sustainability Office. https://asp.mcmaster.ca/app/uploads/2023/11/Final-Report-4S06-Water-bottles.pdf

McMaster Okanagan Office of Health & Well-being. (n.d.). *Bring Your Own Bottle.* McMaster University. https://okanagan.mcmaster.ca/initiatives/byobottle/#tab-content-our-journey

Murayama, H., Takagi, Y., Tsuda, H., & Kato, Y. (2023). Applying Nudge to Public Health Policy: Practical Examples and Tips for Designing Nudge Interventions. *International journal of environmental research and public health*, *20*(5), 3962. https://doi.org/10.3390/ijerph20053962

OECD. (2022, February 22). *Plastic pollution is growing relentlessly as waste management and recycling fall short, says OECD*. https://www.oecd.org/environment/plastic-pollution-is-growing-relentlessly-as-waste-management-and-recycling-fall-short.htm

Rivers, N., Shenstone-Harris, S., & Young, N. (2017). Using nudges to reduce waste? The case of Toronto's plastic bag levy. Journal of Environmental Management, 188, 153–162. https://doi.org/10.1016/j.jenvman.2016.12.009

Shershneva, E. G. (2021). Plastic waste: global impact and ways to reduce environmental harm. *IOP Conference Series: Materials Science and Engineering, 1079*(5). https://doi.org/10.1088/1757-899X/1079/6/062047

Simon Fraser University. (n.d.). *Ban the Bottle SFU*. https://www.sfu.ca/pwrc/research-and-

projects/ban-the-bottle-sfu.html

Taylor, P. (2015, August 18). *Campus bans on bottled water strain the thirst for knowledge*. The Globe and Mail. https://www.theglobeandmail.com/opinion/campus-bans-on-bottled-water-strain-the-thirst-for-knowledge/article25991698/

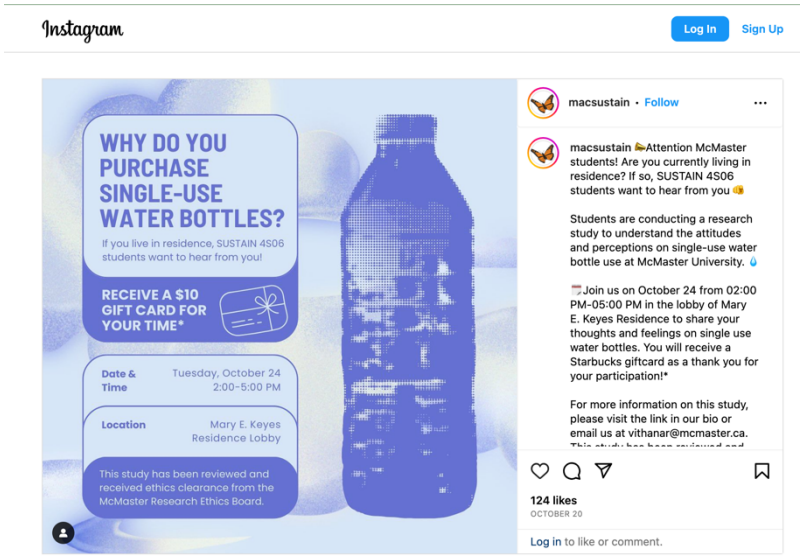
The Britannica Dictionary. (n.d.). *Convenience Definition & Meaning* | Britannica Dictionary. https://www.britannica.com/dictionary/convenience#:~:text=Britannica%20Dictionary20definition%20of%20CONVENIENCE,available%20for%20the%20shoppers%27%20

Verkhivker, A. (2017, October 9). Why Policy Makers Should Nudge More. The University of Chicago Booth School of Business. https://www.chicagobooth.edu/review/why-policy-makers-should-nudge-more

Appendix A

Promotional materials for the recruitment event on October 24, 2023

1. **Instagram Post on McMaster's Academic Sustainability Programs Office page with the McMaster Residence Life Instagram tagged.**



Caption:
Attention McMaster students! Are you currently living in residence? If so, SUSTAIN 4S06 students want to hear from you

Students are conducting a research study to understand the attitudes and perceptions on single-use water bottle use at McMaster University.

Join us on October 24 from 02:00 PM-05:00 PM in the lobby of Mary E. Keyes Residence to share your thoughts and feelings on single use water bottles. You will receive a Starbucks

participation!*

For more information on this study, please visit the link in our bio or email us at vithanar@mcmaster.ca. This study has been reviewed and received ethics clearance from the McMaster Research Ethics Board.

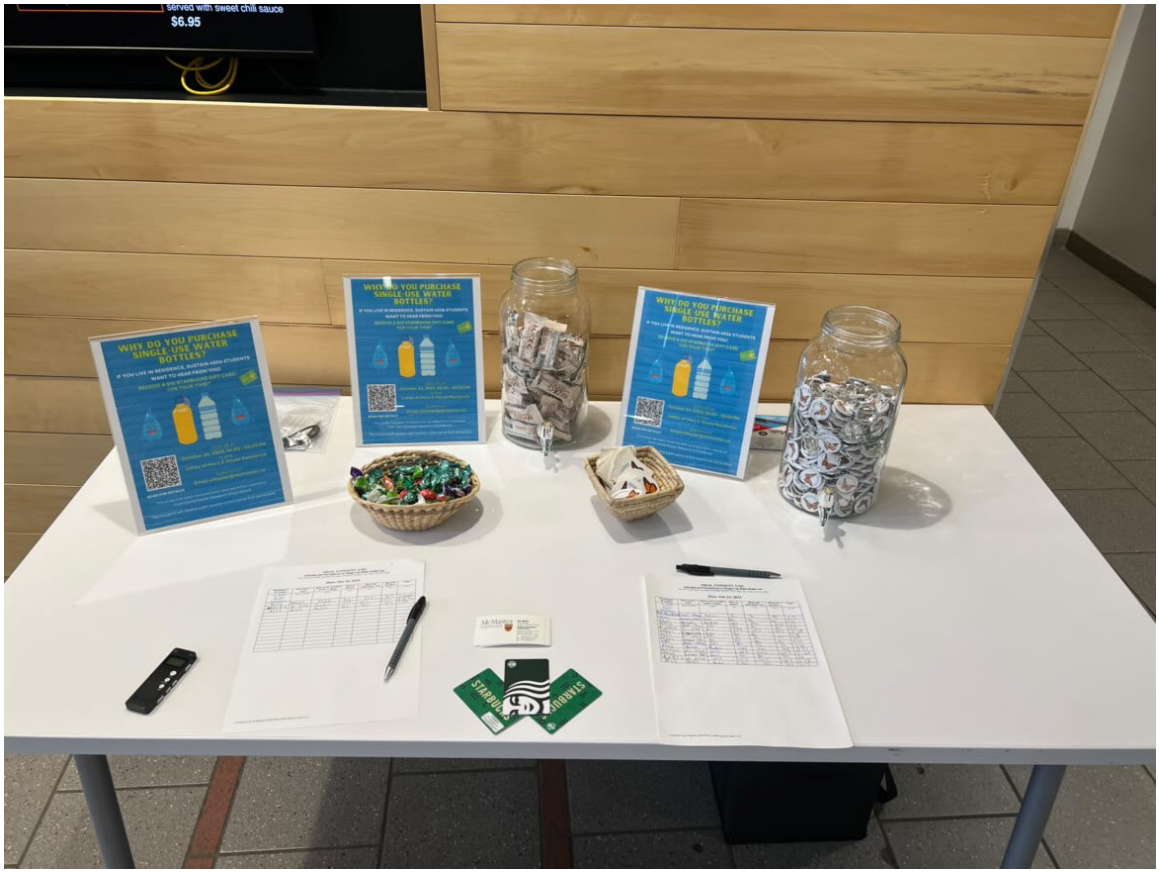
*Participants will receive a giftcard on a first-come-first-serve basis.

2. **Posters set up in the lobby of the Mary E. Keyes Residence.**


WHY DO YOU PURCHASE SINGLE-USE WATER BOTTLES?
IF YOU LIVE IN RESIDENCE, SUSTAIN 4S06 STUDENTS WANT TO HEAR FROM YOU!
RECEIVE A $10 STARBUCKS GIFT CARD FOR YOUR TIME!*
$$$
SCAN FOR DETAILS!
JOIN US on
October 24, 2023, 02:00 - 05:00 PM
in the
Lobby of Mary E. Keyes Residence
Questions?
Email vithanar@mcmaster.ca
This study has been reviewed and received ethics clearance from the McMaster Research Ethics Board.
*Participants will receive a gift card on a first-come-first-serve basis

Appendix B

Picture of the table set up in the lobby of Mary E. Keyes Residence



Appendix C

Letter of Information (LOI) was reviewed by all student participants in the study.

Letter of Information

Faculty Supervisor:
Kate Whalen, PhD
Academic Sustainability Programs Office, McMaster University
whalenk@mcmaster.ca | 905-541-0645

Student Investigators:
[Muhammad Rafih; Armaan Kotadia; Randil Vithanage; Ali, Zead, Areeb Iqbal]
vithanar@mcmaster.ca

Purpose of the Study: Attitudes and perceptions on single-use water bottle use at McMaster University. As a member of McMaster University community we are inviting you to participate in an interview so that we can learn about your attitudes and perceptions on single-use water bottles. The interview is optional but taking part will support our sustainability course work and McMaster's effort towards sustainable action.

Procedures involved in the research:

- The interview will last approximately 10-15 minutes.
- We will ask you questions like "what are your thoughts and feelings on single-use water bottles?", but we just want to have a conversation to hear your thoughts on the topic.
- The interviews will take place at a semi-private area at Mary Keyes on McMaster campus. While we will aim to remain at a distance so others cannot overhear our conversation, there is a risk that others might hear what is said. If you are concerned about this, we can try to find another spot or stop the interview at any time.
- We will audio record the interview. If you prefer, we will take notes by hand.
- Audio files will be transferred to a secure drive hosted by McMaster called 'OneDrive', and then securely deleted from the recorder. Hand-written notes will be manually typed into a file on OneDrive and then shredded.
- Audio recordings will be manually transcribed in writing into OneDrive within one week of this interview and then the audio recording will be securely deleted from OneDrive.
- Interview transcripts will be analyzed for key themes, which will be communicated into both a summary report and a research report, which we plan to publish online.

Potential Harms, Risks or Discomforts:

The risks in the study are low. However, you may feel uncomfortable sharing your thoughts and feelings, or you may be worried that what you share with me may impact your relationships within the McMaster community.

With respect to any concerns you may have about sharing your thoughts with us, we want you to know that your feedback, both positive and critical, is important to us and we value your honest opinions. None of your feedback will negatively affect your reputation within the McMaster community because every effort will be made to protect your confidentiality and privacy, as described below.

Confidentiality:

- Your identity will be known to the student researchers, but we will store your data using a unique ID, rather than your name.
- However, we are often identifiable by the stories we tell, and our community is small enough that others may be able to identify you based on what you say. We plan to publish our research findings with some direct quotes, but you can choose not to be quoted.
- Audio recordings can be personally identifying; however, the researchers will securely delete the recording within one week of your interview. We will store the transcription file on the university's OneDrive platform, which will only be accessible by members of the research team. The transcript file will be securely deleted from OneDrive on March 26, 2024.
- Only summery results will be published, which will not include any identifiable information.

Participation and Withdrawal:

- Your participation in this study is voluntary.
- You can stop the interview, and you can still keep the incentive.
- You can choose not to have your quotes used in our research reporting.
- You can withdraw from making your interview available for research purposes for whatever reason, even if you had originally agreed and up until approximately 15 minutes following your interview, which is the amount of time that your interviewer would reasonably be able to remember which recorded interview was yours and to delete it.

Potential Benefits*:*
This research may benefit you by contributing to McMaster's understanding of attitudes and perceptions on single-use water bottles, because we will learn and share the information about thoughts and opinions of community members, with McMaster University Administrators. While not benefiting you directly, taking part in this interview will also contribute to our learning as community-engaged and sustainability-minded students, community members, and possible future researchers.

Information about the Study Results:
We expect to have this study completed by approximately late March 2024. Our reports will be available online at https://asp.mcmaster.ca/experiential-learning-projects/past-projects/

Questions about the Study:
If you have questions or need more information about the study itself, please contact our course instructor, Dr. Kate Whalen at whalenk@mcmaster.ca or 905-541-0645.

This study has been reviewed and received ethics clearance from the McMaster Research Ethics Board.

For concerns or questions about your rights as a participant or about the way the study is conducted, contact:

McMaster Research Ethics Secretariat

Telephone: (905) 525-9140 ext. 2406

c/o Research Office for Administrative Development and Support

E-mail: ethicsoffice@mcmaster.ca

To be confirmed orally with interview before starting the interview

- **Do you agree to participate in this study?** Yes/No
- **Do you agree for our interview to be audio recorded?** Yes/No
- **Do you agree for my team members and me to select and quotes from this interview, which will NOT be identifiable to you in any way, for use in our research report that we plan to publish online?** Yes/No

Appendix D

Interview questions for this study

Perceptions of Single-Use Water Bottles:

1. You mentioned that you purchase single-use water bottles, can you tell us what you find desirable about single-use water bottles?
    - *Follow up (based on the answer on Q1):* You mentioned that they are [easy to carry, convenient, etc.], what are some of the other benefits of single-use water bottles?

2. Where do you purchase single-use water bottles?
    - *Follow up:* Can you describe your thought process when going into *[location mentioned in first part]* and choosing to purchase them?

3. What are your thoughts on refilling stations on campus?
    - *Follow up (based on the answer given for #3):* Can you tell me more about what you like/dislike about the refilling stations? What are some barriers to using them?

Community:

4. *Reflect on where the participant purchase their single-use water bottle from.*

If they say somewhere on campus: Some universities are phasing out the sale of single-use water bottles. If you went to buy one from the *[LOCATION]* and found out that there weren't any available for purchase, what would you do?

If they purchase the bottles outside of campus: Some universities are phasing out the sale of single-use water bottles. How do you think this would affect students you purchase single-use water bottles on campus?

- *Follow up for #4:* What would you resort to (e.g., reusable bottles, alternative drinks etc)?

Final thoughts:

5. Thank you for sharing your insights, is there anything else you feel is valuable for me to know before we conclude this interview that you think would be useful to this research?

Appendix E

Prices for Single-Use Plastic Water Bottles at Bistro-2-Go