

How well do you sort? The impacts of Dalhousie University
student demographics on understanding proper waste sorting on campus
and in the Halifax Regional Municipality

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Abstract

The inability of students to properly sort their waste on Dalhousie's campus and in the Halifax Regional Municipality (HRM) resulting from improper waste management education creates barriers to achieving Dalhousie's sustainability goals. In Canada, there is a very high level of daily consumer waste created and a measured inefficiency of waste sorting practices established at many global post-secondary institutions. Furthermore, this project conducted research to determine the most influential factors in the missorting of municipal solid waste and understand the tools most likely to improve Dalhousie's undergraduate students' ability to manage their waste effectively. Utilizing qualitative and quantitative data collection, demographic-based questions were used to compare students' ability to accurately sort waste within a survey, followed by the relationship between these results and familiarity with current HRM waste sorting tools. It was found that the most significant factors in a student's ability to properly sort waste were how long they have resided in the HRM and their familiarity with current waste sorting information. Furthermore, student-provided feedback outlines future studies that could be conducted to determine the most impactful ways of disseminating waste management guidelines to educate Dalhousie's undergraduate student population effectively. Overall, a future analysis involving a greater data set will aid in implementing waste management tools on Dalhousie campuses that will effectively target the student demographics requiring further waste sorting education.

Keywords: Campus; Halifax Regional Municipality; Demographics; Practices; Students; University; Waste; Waste Management

Introduction

Background and Rationale

Avoidable waste is an increasingly growing problem worldwide as waste production has increased exponentially over the past century (Hoorweg et. al, 2013). In Canada, the total amount of solid waste generated has increased by 17%, or 5.3 million tonnes, between the years 2002 and 2020, reaching a production of 36 million tonnes of waste per year (Government of Canada). Of these 36 million tonnes, only an estimated 27.5% of it was diverted, while the remaining 72.5% was sent for disposal, leaving a total of 26.1 million tonnes of Canadian solid waste put in landfills or incinerated (Government of Canada). This establishes a production of around 687 kilograms of solid waste disposal per person per year. Studies from third-party sources yield similar results. A study of waste management in developing Asian Countries discovered that high-income countries like Australia, the USA, and Canada all produce around 2 kg of municipal solid waste (MSW) per person per day, and lower-income countries like Nepal and Bangladesh produce just under 0.5 kg of MSW per person per day (Aleluia, 2016).

On university campuses, waste management is equally as inefficient. A study at the University of British Columbia, in British Columbia, Canada, determined that students in residence areas generated 0.38 kg of waste per person per day, which is on pace to generate 138.7 kg of waste per year (Felder, 2001). A similar study at Universidad Jaume I analyses waste generation at 7 universities. Ultimately, these schools ranged from 120.45 kg of waste per person per year at Universidad Iberoamericana in Mexico to as low as 15.33 kg of waste per person per year at Massey University in New Zealand (Gallardo et. al, 2016). These previous studies

provide insight into how waste production and management vary depending on geographical location, further reinforcing the differences in waste production on different university campuses worldwide.

Municipal solid waste (MSW) tends to end up in one of two places. Anything that is not recycled or composted, including unsorted waste articles, will likely end up in either a landfill or an incinerator. The anaerobic decomposition of municipal solid waste that takes place at these landfills produces greenhouse gases (GHG), referred to specifically as landfill gas (LFG). Such LFGs are responsible for around three-quarters of total GHG emissions created during waste management (Mohareb et. al, 2011). A study conducted in 2007 found that these LFGs are responsible for 21 Megatonnes of GHG emissions in Canada, or around 3% of total GHG produced (Mohareb et. al, 2011). In the United States, this number reached 127 Megatonnes, or around 2% of their GHG inventory (Mohareb et. al, 2011). Moreover, Eunomia Research and Consulting found that by implementing mixed waste sorting (MWS) in our waste management systems, by 2030 we could be avoiding 464 million tonnes of CO₂ production per year globally (Eunomia, 2021). By adding efficient MWS to landfilling, we could be saving about 0.31 tonnes of CO₂ per tonne of input waste, and 0.35 tonnes of CO₂ for incineration waste (Eunomia, 2021).

The focus of this study is to determine trends in waste management habits at Dalhousie University, in Nova Scotia, Canada. Dalhousie University has over 21,000 students enrolled with 63% of them hailing from out of province, but still from Canada (Dalhousie University, 2021). A further 23% are international students, with representation from over 115 countries (Dalhousie University, 2021).

Regarding waste management practices, Dalhousie has implemented a four-bin system around campus, separating waste into four separate categories: Garbage, Recyclables, Organics,

and Paper (Dalhousie University, 2021). Despite this system, audits performed by the school have revealed that 40-60 percent of its disposed waste could have been reused, recycled, or composted (Dalhousie University, 2021). Moreover, the diverse student population at Dalhousie coupled with the previous studies establishing varying waste production and management by geography creates an environment with many different waste-sorting habits.

Project Definition

This research study aims to provide insight into how different demographics of university students correlate with their ability to sort waste following the Halifax Regional Municipality's (HRM) municipal solid waste guidelines. Given the large population of out-of-province and international students at Dalhousie, where students are from and their knowledge of waste management procedures are potential factors that could influence waste management on Dalhousie's campuses in the HRM. In addition to places of origin, factors such as a student's current living situation, the amount of time they've spent in the HRM, their year of study, their program of study, and their confidence in waste sorting procedures will also be taken into account. The scope of this project is restricted to undergraduate students who attend Dalhousie University at one of the campuses within the HRM (Studley, Carleton, and Sexton). Students from the Agricultural campuses, students from other institutes, graduate students, and non-students were not considered for this study.

Determining correlations between these demographics and their knowledge of waste sorting guidelines within the HRM will help determine which groups could benefit the most from increased education on the matter, and will allow for more targeted resource use by Dalhousie University in terms of waste management resources. The overall results will help determine if

the current waste sorting education resources (i.e., four bin system, waste bin signage) are beneficial and effective.

Overall, the research goal of this study is to determine whether or not there is a significant relationship between student demographics and waste sorting knowledge. We predict that knowledge of the waste sorting guidelines will be significantly higher in those who lived within the HRM before coming to Dalhousie compared to those who moved to Dalhousie, due to their familiarity with the guidelines. Additionally, it will be significantly higher in those living alone off campus compared to other living situations because they are most likely responsible for sorting their own waste. Also, knowledge will significantly increase with the year of study of students since they have been attending the school longer than their lower-year peers. We also predict knowledge to increase significantly as confidence in knowledge increases, and that knowledge will be significantly higher in the Science Faculty compared to other Faculties. Our null hypothesis for each of our variables will be that there is no significant difference between the demographics and the results, while alternative hypotheses do predict significant differences.

Methods

Data Collection and Justification

Our primary research method was to collect responses from students with a survey (Appendix A). The first section of the survey asked a series of demographic questions: faculty of study, year of study, number of years spent in Halifax, where they lived before attending Dalhousie, and their current living situation. We then asked students about their confidence in their waste sorting abilities and their familiarity with multiple waste sorting tools such as the

HRM search tool and a waste sorting infographic created by Dalhousie. The primary component of our survey was a series of questions intended to assess their familiarity with waste-sorting guidelines by presenting them with items to sort according to Dalhousie's 4-bin waste sorting system, and other questions such as what bag colours can or cannot be used for waste in waste collection scenarios. The responses per item allowed us to determine items which were commonly mis-sorted, and for each response, we calculated their final score as a value out of 17.

We chose a survey with primarily multiple choice questions because it was a far more effective method to receive responses from a large group of students than other methods such as a focus group or a series of interviews. It was also more consistent, ensuring students were presented with the same amount of background information about the 4-bin system before we asked them questions. If an interview method had been used, different interviewers may have had varying techniques which could have changed our results.

Survey Distribution

Our method of distribution was primarily virtual, as we shared our survey over social media and reached out to faculty members and professors to help us share our survey with other Dalhousie students using a poster (Appendix B). Our survey was open to responses from March 15 to March 26, a total of eleven days.

Data Analysis

For our analysis, we compared the waste sorting scores received to other differences, including demographics and self-reported levels of confidence. We performed ANOVA analysis between the scores of different demographics, and when the results were significant, we

continued with a series of unpaired t-tests assuming unequal variance to identify which demographics had significant differences between groupings.

For there to be a fair representation of the student population, 376 participants were needed to complete the survey. This value was determined using a sample size calculator with a confidence level of 95%, 5% margin of error, 50% population proportion and a population size of 16,895. The population size was shared by Dalhousie's Registrar's Office, last updated on December 1, 2023, for all undergraduate students.

Limitations

One limitation of our survey was our uncertainty relating to the total student population of Dalhousie undergraduates. We calculated our necessary sample size of 376 students based on values from December 1 of last year, but students may have since been unenrolled from school in a way that might affect this number. We were also limited in our sampling methods. To maximize our number of results, we relied heavily on word of mouth, social media, and sharing our survey with the faculty/courses we have taken. Because of this, we received more responses from third and fourth-year students, students living off campus, and those in the Faculty of Science, with very few responses coming in from first years, students in residence, and students from different faculties such as Architecture and Engineering. Although a probabilistic sampling technique may have been most effective for this study, a Snowball non-probabilistic technique was used to maximize the number of responses.

Results

At the end of our data collection, we received 80 responses, three of whom were excluded from our analysis because they were not undergraduate students at Dalhousie.

Comparison of selected demographics and the number of “points” survey respondents achieved during the “quiz section” of our survey. Each correct answer received a point, with a perfect score earning 17 points.

Residence Related Demographics

Current Living Situation

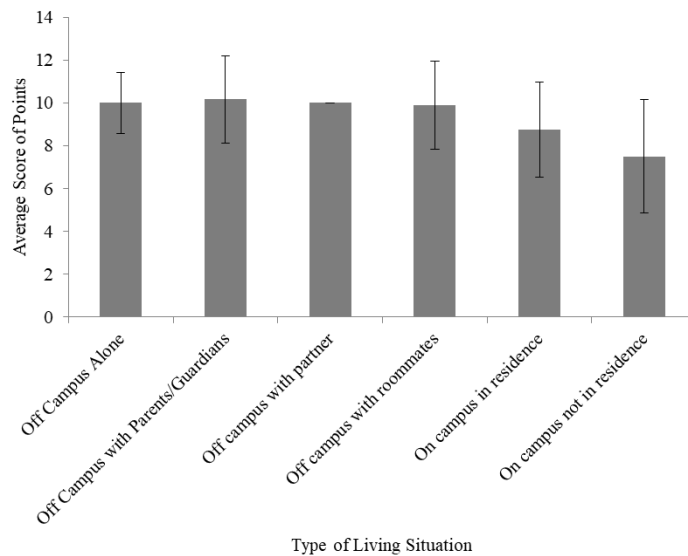


Figure 1 Mean (\pm SD) waste sorting scores of Dalhousie University Studley, Sexton, and Carleton campus undergraduate students by living situation (n=77). Data was collected in March 2024 in Halifax, NS, Canada.

The ANOVA analysis comparing the waste sorting scores by different living situations had no significant differences in waste sorting scores across any of these household types ($F_{5,71}=1.268$, $p=0.287$, Fig. 1). This means we fail to reject our null hypothesis.

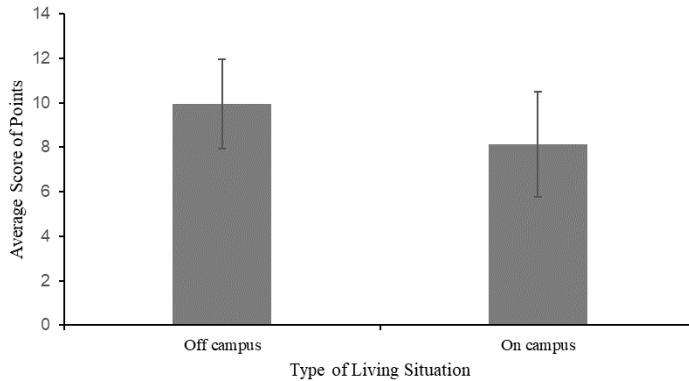


Figure 2 Mean (\pm SD) waste sorting scores of Dalhousie University Studley, Sexton, and Carleton campus undergraduate students living on and off campus ($n=77$). Data was collected in March 2024 in Halifax, NS, Canada.

An unpaired t-test assuming unequal variance that compared waste sorting scores between students living on or off campus found the results had no significant differences ($t_8=2.306$, $p=0.0695$, Fig. 2). This means we fail to reject our null hypothesis.

Length of Residence in HRM

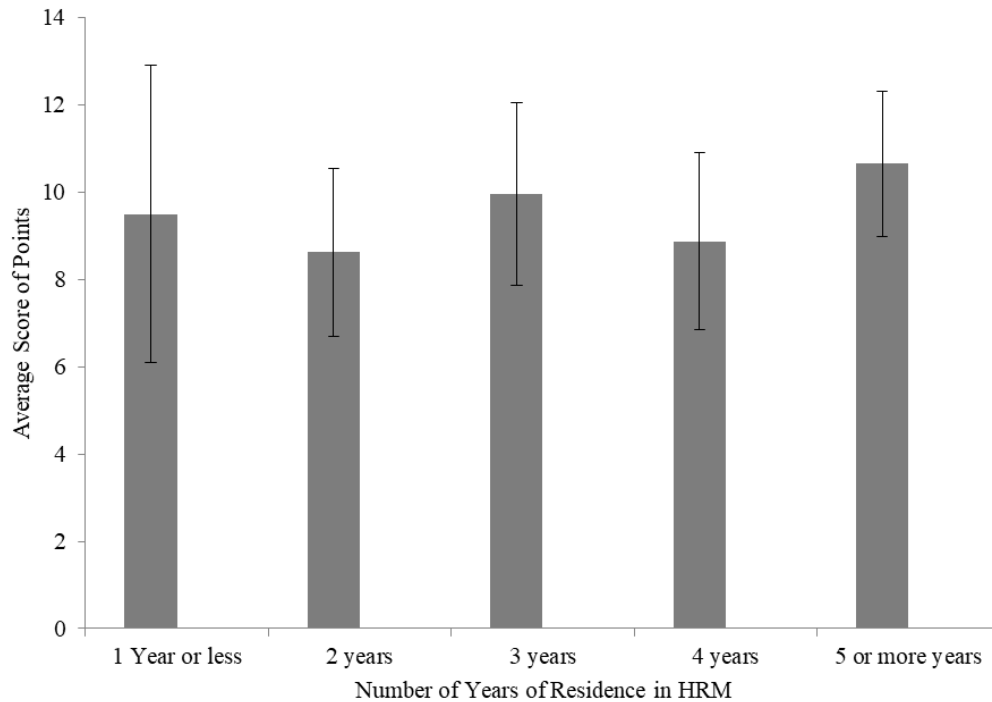


Figure 3 Mean (\pm SD) waste sorting scores of Dalhousie University Studley, Sexton, and Carleton campus undergraduate students by the length of time (years) spent living in the Halifax Regional Municipality ($n=77$). Data was collected in March 2024 in Halifax, NS, Canada.

We performed a single-factor ANOVA analysis to see if waste sorting scores were significantly different depending on the number of years students had spent living in the Halifax Regional Municipality (HRM). There were significant differences in waste sorting scores between some of the lengths of time ($F_{4,72}=2.888$, $p=0.0282$, Fig. 3). Ten unpaired t-tests with assumptions of unequal variance were performed for all possible combinations. It was found that students who had spent only two years in HRM had significantly lower scores than students who had been here for 5 or more years ($t_{29}=2.045$, $p=0.00193$, Fig. 3). Similarly, students who had been here for three years had significantly higher scores than those who had only been here for two ($t_{34}=2.032$, $p=0.0420$, Fig. 3).

Location of Previous Residence

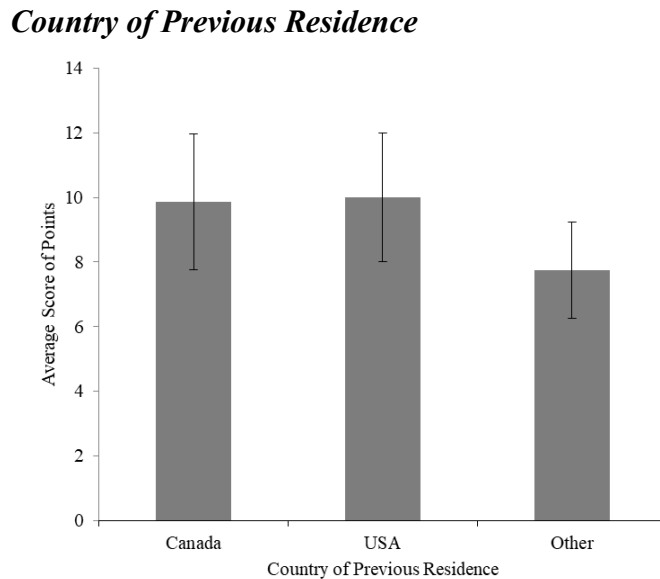


Figure 4 Mean (\pm SD) waste sorting scores of Dalhousie University Studley, Sexton, and Carleton campus undergraduate students by country of residence prior to attending Dalhousie; Canada, United States of America, or Other (includes China, United Arab Emirates, Thailand, and Jamaica) ($n=77$). Data was collected in March 2024 in Halifax, NS, Canada.

The next location-based demographic we collected was the country of the student's previous residence. We performed an ANOVA analysis on the data, and from this, we determined that there were no significant differences between a student's previous country of residence and their achieved waste sorting score ($F_{2,74}=1.968$, $p=0.147$, Fig. 4).

Province or Territory of Previous Residence

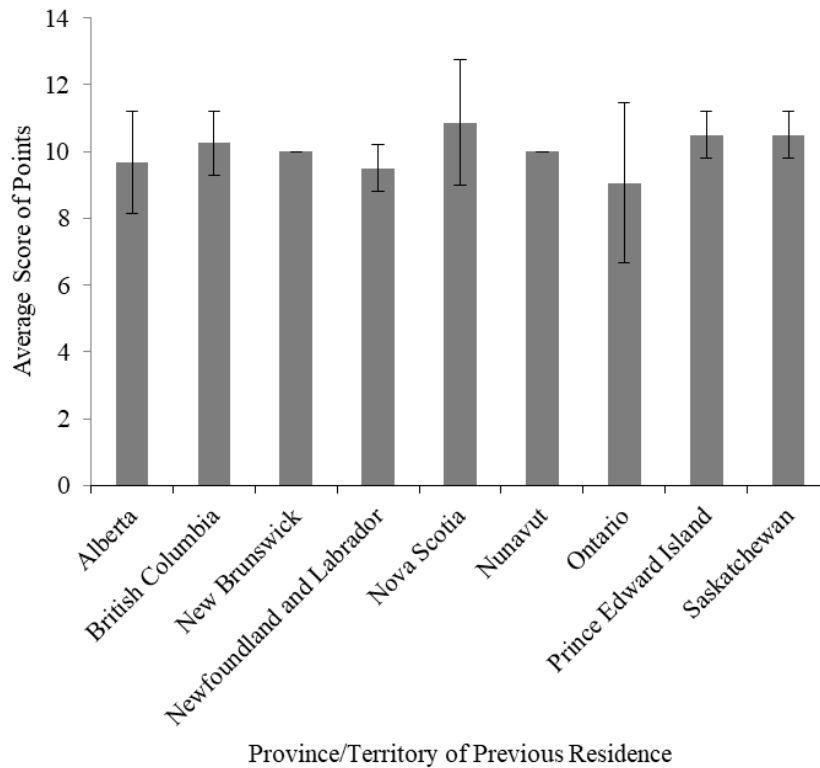


Figure 5 Mean (\pm SD) waste sorting scores of Dalhousie University Studley, Sexton, and Carleton campus Canadian undergraduate students by province or territory of residence prior to attending Dalhousie (n=77). No respondents from Manitoba, Quebec, or the Northwest Territories. Data was collected in March 2024 in Halifax, NS, Canada.

A further ANOVA analysis was done, to analyze whether there was a significant difference between the previous province/territory the student had resided in and their waste sorting score (Fig 5). We found no significant differences between the previous province/territory the student lived in and their waste sorting scores ($F_{8,61}=1.328$, $p=0.247$, Fig. 5).

Nova Scotia Region of Previous Residence

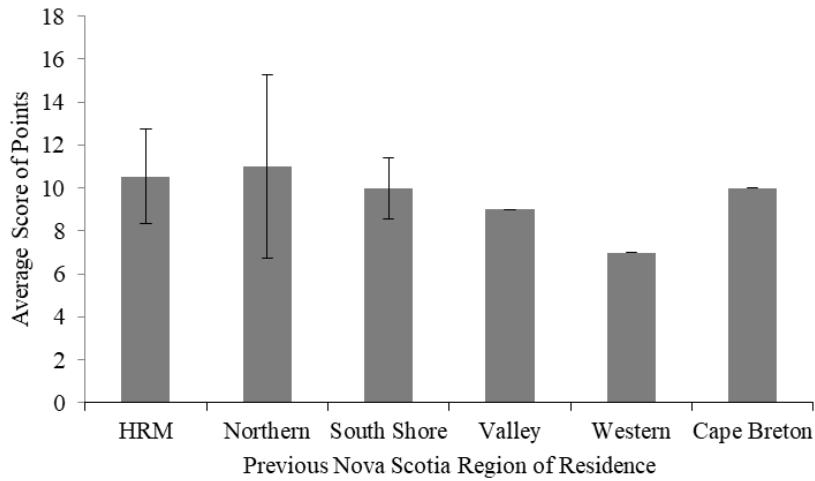


Figure 6 Mean (\pm SD) waste sorting scores of Dalhousie University Studley, Sexton, and Carleton campus Nova Scotian undergraduate students by previous region of residence before attending Dalhousie ($n=77$). No respondents from Eastern Nova Scotia. Data was collected in March 2024 in Halifax, NS, Canada.

The final location-based demographic we looked at was whether the region of Nova Scotia the student previously resided in had a significant impact on the score the student scored in our waste sorting quiz. Through an ANOVA analysis, we determined that there were no significant differences between what region a student previously resided in and their waste sorting scores ($F_{5,16}=0.534$, $p=0.748$, Fig. 6).

University Related Demographics

Year of Study

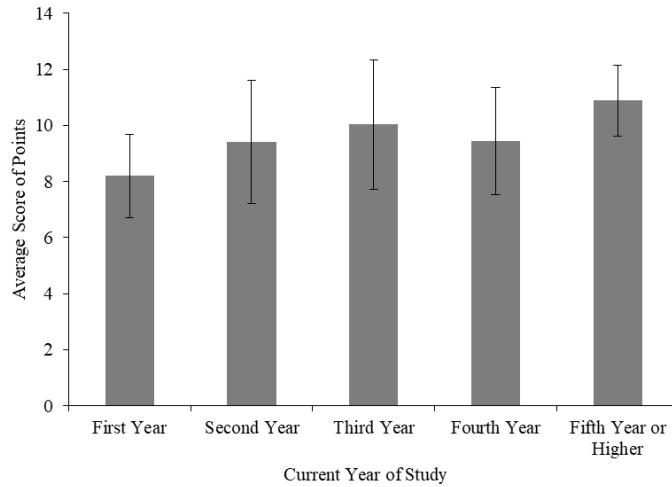


Figure 7 Mean (\pm SD) waste sorting scores of Dalhousie University Studley, Sexton, and Carleton campus undergraduate students by year of study ($n=77$). Data was collected in March 2024 in Halifax, NS, Canada.

Next, we analyzed the scores compared to university-related demographics, the first being the students' year of study. Through an Anova analysis, we determined that there were no significant differences between the year of study of the student and their waste sorting score ($F_{4,72}=1.738$, $p=0.151$, Fig. 7).

Program Faculty

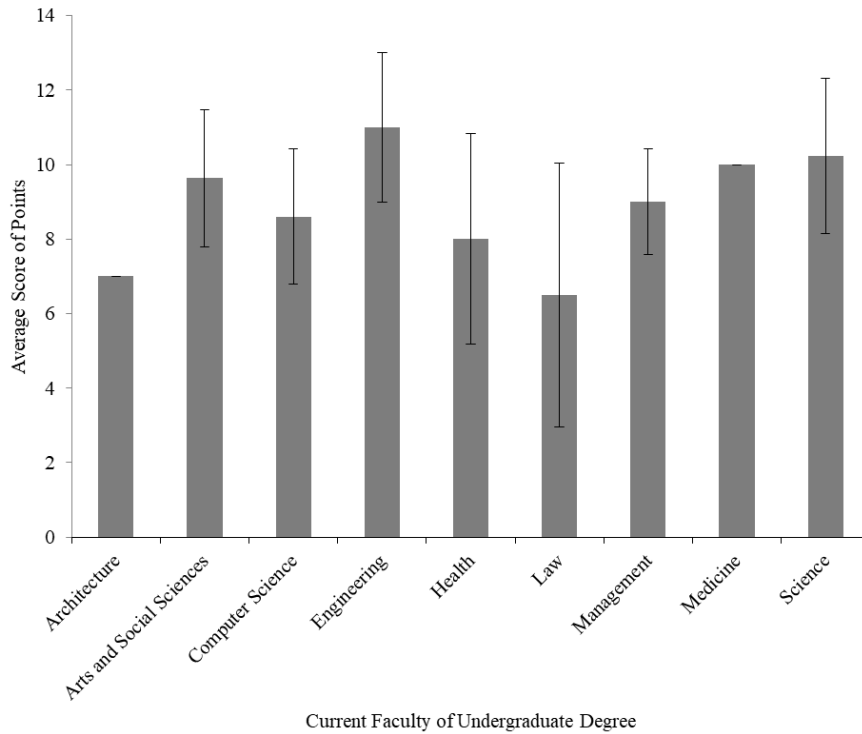


Figure 8 Mean (\pm SD) waste sorting scores of Dalhousie University Studley, Sexton, and Carleton campus undergraduate students by faculty. Data was collected in March 2024 in Halifax, NS, Canada.

The second university-related demographic we analyzed was the program faculty of the student. Through an ANOVA analysis, we determined that there were no significant differences between a student's program faculty and the sorting scores they achieved ($F_{8,68}=1.720$, $p=0.110$, Fig. 8).

Perceived Confidence

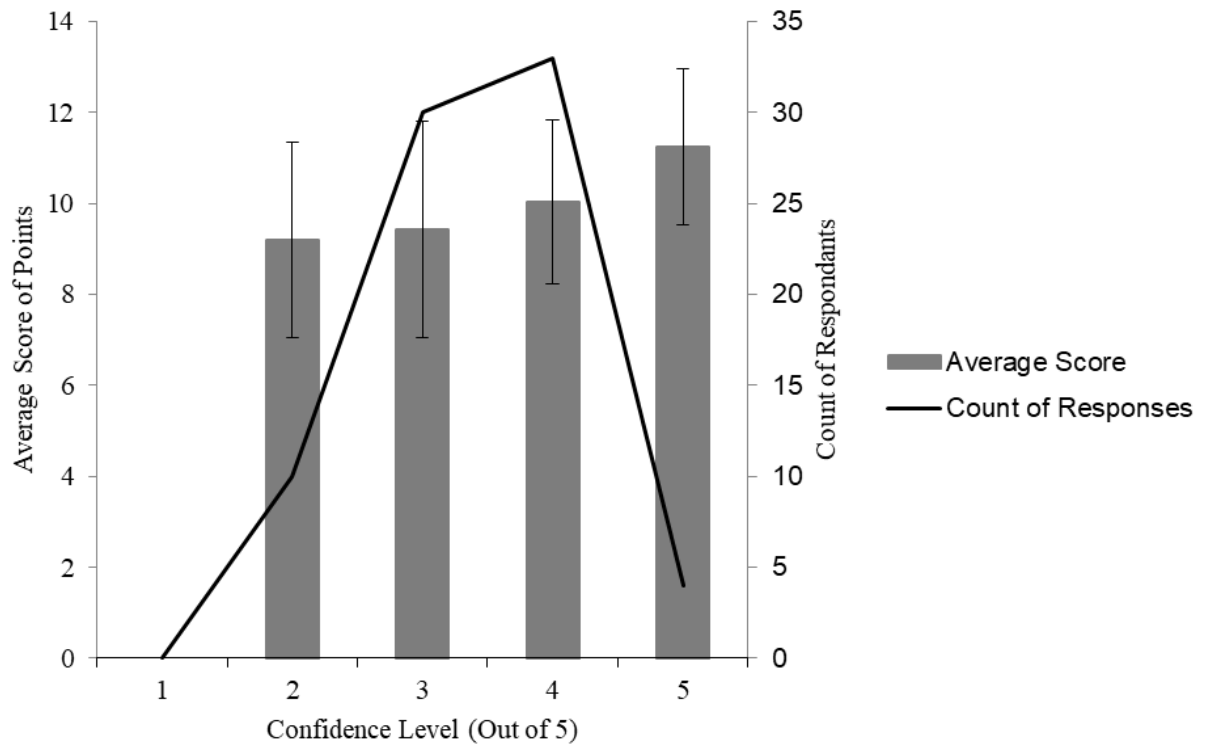


Figure 9 Mean (\pm SD) waste sorting scores of Dalhousie University Studley, Sexton, and Carleton campus undergraduate students by confidence level. The trendline represents the total count of responses per confidence level. Data was collected in March 2024 in Halifax, NS, Canada.

Outside of location and university-related demographics, we also wanted to explore if there was a connection between the confidence level a student graded themselves as having (perceived confidence score) and their waste sorting score. Using an ANOVA analysis we determined that there was no significant difference between their perceived confidence score and their waste sorting score ($F_{4,72}=0.996$, $p=0.416$, Fig. 9).

Familiarity with Waste Sorting Tools

HRM Search Engine

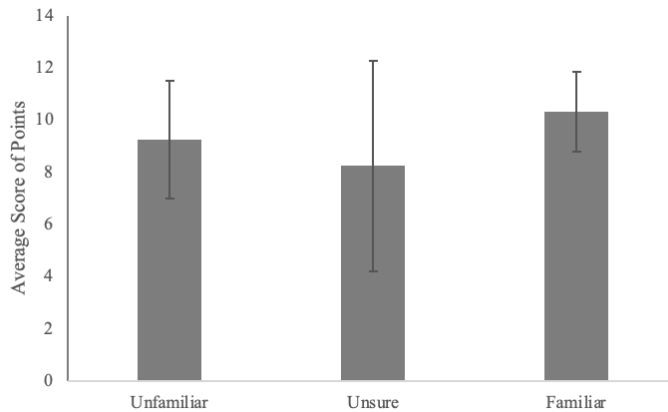


Figure 10 Mean (\pm SD) waste sorting scores of Dalhousie University Studley, Sexton, and Carleton campus undergraduate students by their familiarity with the HRM waste sorting search engine. Data was collected in March 2024 in Halifax, NS, Canada.

The next demographic data we looked at was a student's familiarity with two different waste sorting tools; the HRM search engine and the Dalhousie University four-bin system infographic. First, we looked at the HRM search engine and conducted an ANOVA analysis. The analysis revealed a significant difference between a student's familiarity with the search engine and their waste sorting score ($F_{2,74}=3.661$, $p=0.0305$, Fig. 10). Three supplementary t-tests found that the responses "Familiar" and "Unfamiliar" achieved significantly different waste sorting scores ($t_{57}=2.002$, $p=0.0233$, Fig. 10).

Dalhousie University Waste Sorting Infographic

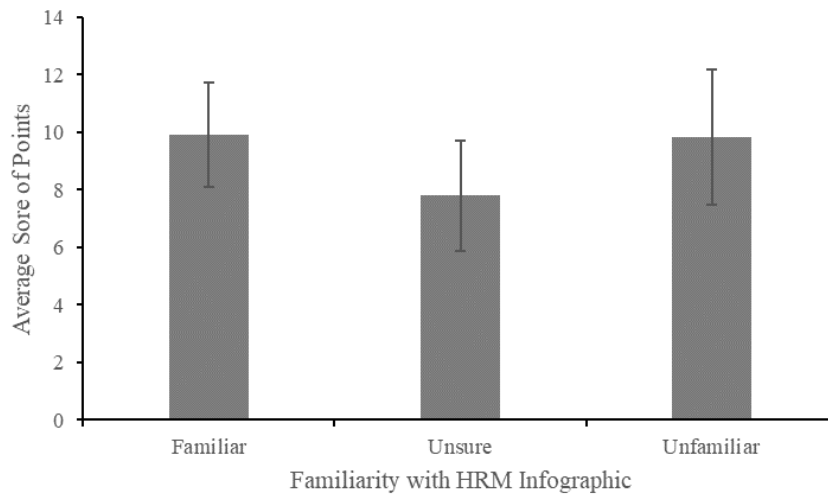


Fig 11 Mean (\pm SD) waste sorting scores of Dalhousie University Studley, Sexton, and Carleton campus undergraduate students by their familiarity with the Dalhousie University four bin system infographic. Data was collected in March 2024 in Halifax, NS, Canada.

The final demographic we looked at was the familiarity a student had with the Dalhousie University four-bin system infographic and whether that familiarity significantly affected their points scored on our waste sorting survey. However, the ANOVA analysis of this data revealed that there were no significant differences between the level of familiarity and the number of points scored ($F_{2,74}=2.402$, $p=0.0976$, Fig. 11).

Discussion

Brief Summary of Research Purpose

This study aimed to investigate the relationship between student demographic factors and their knowledge of waste sorting guidelines at Dalhousie University, Nova Scotia, Canada. By

analyzing variables such as students' previous primary residence, living situation, program of study, and duration of enrollment at Dalhousie, we aimed to identify patterns that could be used to develop more effective waste management education strategies on campus. The urgency to improve waste management practices globally and the diverse demographic makeup of Dalhousie's student body make understanding these dynamics important for developing effective environmental education strategies. In alignment with the global concern over escalating waste production identified by Hoornweg et al. (2013), our study aims to tackle the urgent need for improved waste management practices at Dalhousie University, reflecting the diverse waste production challenges highlighted in Aleluia's (2016) comparison of high and lower-income countries. The research was conducted to fill a gap in existing literature regarding the impact of demographic factors on waste sorting behaviours in higher education settings, particularly in a diverse student population similar to that of Dalhousie University.

Overview of Significant Findings

Our study aimed to investigate the factors that influence waste sorting knowledge among Dalhousie University students. Interestingly, we found no significant differences in waste sorting knowledge across various demographics and situational factors, including living arrangements, geographic origin, year of study, and faculty affiliation. This suggests that Dalhousie University students have a good waste management education and access to effective infrastructure. However, to improve waste sorting practices even further, we need to understand what drives these behaviours beyond the conventional demographic and situational predictors.

Our findings highlight the importance of looking into personal attitudes, the visibility and accessibility of waste sorting facilities, as well as the clarity of waste management guidelines. By

doing so, we can develop more effective strategies to promote sustainable waste management practices among the Dalhousie University community.

Impact of Time Spent in HRM on Waste Sorting Scores

Our findings reveal a significant relationship between students' time spent in the Halifax Regional Municipality and their waste sorting scores. Specifically, students with only two years in HRM demonstrated lower waste sorting scores than those who resided in HRM for five or more years. This trend suggests a learning curve where prolonged exposure to HRM's waste management system positively influences students' waste sorting knowledge and practices. In addition, students who had been in HRM for three years showed a notable improvement in their waste sorting scores over those in their second year, indicating that even an additional year in HRM can significantly enhance students' waste sorting capabilities. Our discovery of the positive impact of prolonged residency in HRM on waste sorting scores parallels Mohareb et al.'s (2011) findings on the influence of local environmental policies, suggesting that extended exposure to Dalhousie's waste management system and HRM's regulations can significantly enhance student waste sorting practices. This pattern may be attributed to several factors. Firstly, longer-term residents have had more opportunities to interact with HRM's waste management policies, potentially through university-led initiatives and municipal regulations. Secondly, accumulating local knowledge and social norms around sustainability could contribute to these students' higher proficiency in waste sorting. This finding is particularly relevant for universities in developing targeted educational interventions, suggesting a critical period during the first few years of students' residency where additional support and education could yield significant improvements in waste management behaviour.

Student Feedback on Communication Methods for Waste Sorting Rules

Student responses regarding the effectiveness of current waste-sorting communication methods at Dalhousie University provide insightful feedback for future improvements. While some students find the current methods effective, a notable demand exists for more engaging and diverse tools to enhance waste sorting education. Based on the survey results, most respondents concluded that Dalhousie's current waste sorting infographic and communication materials are too complicated, difficult to understand, and more likely to be overlooked by students. The mixed feedback from students regarding the effectiveness of current waste sorting communication indicates the need for a multi-channel approach. Researching the specifics of preferred communication methods can help create a strategy combining digital tools like apps and social media with traditional methods such as posters and workshops. Adapting the communication medium to suit students' consumption habits could significantly increase their engagement and retention of information.

Furthermore, the survey respondents expressed a desire for more visible waste sorting stations, as some current ones are difficult to locate. Placing waste sorting stations in high-traffic areas and ensuring they are clearly marked with easy-to-understand instructions could improve participation rates. Factors such as placement, accessibility, and design elements like colour and iconography play critical roles in effectively communicating and understanding information.

Moving Forward with Tailored Strategies

The respondents' suggestions range from more visual aids, like graphics and posters, to the adoption of modern technologies, such as apps and AI sorting systems on campus. The HRM recycle app, in particular, was highlighted as a valuable tool, suggesting that digital solutions may be a promising avenue for increasing engagement with waste management guidelines.

Moreover, feedback indicates a general confusion about waste sorting rules, exacerbated for students from different jurisdictions with varying waste management systems. This confusion highlights the need for clearer, more accessible communication strategies tailored to the diverse student body at Dalhousie University. Suggestions by students for improving communication effectiveness ranged from more visually engaging graphics and less text-heavy instructions to strategically placing waste sorting rules to ensure higher visibility. Technological solutions, such as social media apps and AI for sorting on campus, were also favoured, suggesting an inclination towards digital solutions for environmental sustainability challenges. Reflecting on student feedback, the demand for more engaging and diverse communication methods echoes Wang et al.'s (2018) findings on the effectiveness of digital tools in enhancing waste management education, pointing towards a broader trend of integrating technology to improve environmental sustainability practices. Finally, students wish for waste-sorting educational tools to be incorporated directly into their living environments through methods like fridge magnets or easily accessible lists for the four-bin system.

Furthermore, the study by Hao et al. (2018) highlights the impact of moral sense and knowledge on waste sorting behaviour among students in Beijing. Our findings complement this perspective, indicating that Dalhousie students who possess a stronger environmental ethic and a better understanding of waste management guidelines are more likely to engage in correct sorting practices. This supports the argument for integrating waste management education into the university curriculum to cultivate a sense of environmental responsibility among students. These insights underline the critical role of innovative communication and education strategies in fostering sustainable waste management practices. By embracing technology and enhancing educational content, Dalhousie University has the opportunity to lead its students towards a more

environmentally responsible future, deeply embedding sustainability principles into the campus culture.

Limitations of the Study

Our study provides valuable insights into waste sorting knowledge among students. However, it has some limitations that need to be addressed in future research. The cross-sectional design we used limits our ability to deduce causality between demographic factors and waste sorting knowledge. Additionally, our reliance on self-reported data may introduce the possibility of social desirability bias, where respondents might overestimate their knowledge or adherence to waste sorting guidelines to align with perceived social norms or expectations, which can affect the reliability of our findings.

Moreover, one of the primary limitations of our study is the relatively small sample size, which might not fully capture the diversity and complexity of waste-sorting behaviours and knowledge across the entire student body at Dalhousie University. As such, our research offers valuable insights into the relationship between student demographic factors and waste sorting knowledge, but the results should be interpreted with caution. Future studies should include a larger and more representative sample (of the student population (stratified sampling) to enhance the reliability and applicability of the findings.

Furthermore, we found that students in environmental science may already possess a higher baseline of waste sorting knowledge than those in unrelated fields. Identifying such patterns can help tailor educational programs that address specific gaps in knowledge across faculties. It's also important to note that while some students may report high confidence in their waste sorting knowledge, comparing these self-assessments with their ability to sort waste

correctly is essential. Misalignments between perceived and actual knowledge can identify overconfidence or underestimation among students, helping and guiding the development of educational materials that reinforce correct practices and address common misconceptions.

Our call for targeted educational interventions and longitudinal studies to better understand waste management behaviours over time is in line with the academic pursuit to refine sustainability education, building upon the foundation laid by Wang et al. (2018) and Hao et al. (2018) in exploring the long-term impacts of technological and educational innovations on environmental practices.

Conclusion

The study that we conducted to determine students' knowledge of waste management based on their demographics showed us the impact that the amount of time spent in Halifax had on this knowledge. The study found that the longer students have been in Halifax, the stronger their waste knowledge was.

Besides this specific demographic, no demographics established strong significance concerning students' waste management knowledge. Moreover, we are inclined to believe that Dalhousie's waste management education and sorting infographics are adequate in terms of the information they provide to students, leading them to sort waste properly. Overall, as only one demographic was found to be significant, we have determined that most variations in student demographics create few impacts on the waste management knowledge of Dalhousie students who attend campuses located in the Halifax Regional Municipality.

Recommendations

The completion of this study to determine if there is a relationship between student demographics and their ability to sort waste provided significant results. However, due to the highlighted limitations of this study, there are further actions that could be taken to improve the outcome of future waste sorting management campaigns at Dalhousie University.

Building from the understood relationship of students and their ability to sort waste established in this study, Dalhousie should expand upon this with their own studies. Completing studies with representative sample sizes of the population will provide a more encompassing understanding of student demographics with a larger data pool. Furthermore, achieving a broader data set will inform how to most accurately target campaigns towards student groups most requiring an increase in waste sorting knowledge.

In addition, longitudinal studies could assess changes in waste-sorting knowledge and behaviour over time, offering a deeper understanding of the impact of university-led waste-sorting education programs. Also, future studies could investigate the impact of external factors (eg. changes in waste management policies, and public awareness campaigns) on students' waste-sorting behaviour.

Moreover, conducting increased qualitative research could be an effective method to explore students' attitudes toward waste management, complementing this study's quantitative findings. Specifically, future studies could use focus group discussions or in-depth interviews to explore the reasons behind students' waste sorting behaviour, their perceptions of waste management education, and their suggestions for improvement. Tailoring programs that address not just the 'how' but the 'why' of waste sorting can deepen students' commitment to sustainable

practices. Such qualitative research could also shed light on the potential barriers or facilitators to implementing waste management education programs in higher education settings.

Overall, with a lack of consistency and unity in waste sorting knowledge among Dalhousie's undergraduate population, Dalhousie needs to implement programming that will effectively educate those on campus. Therefore, while understanding which demographic populations on campus need specific targeting based on their understanding of waste management in the HRM is important, the methods of disseminating this information are equally as important. Thus, from the recommendations provided by participants of this study, it is clear there is an increasing desire for more technological modes of waste sorting information. In addition, while students reinforced that they appreciated the infographics created by Dalhousie regarding proper waste management, they also revealed that less text and more visuals would improve the effectiveness of these tools. Ultimately, to further the development of more sustainable waste management strategies in higher education settings, engaging with a broader range of the student body and other stakeholders, such as faculty, staff, and local waste management authorities, can provide additional perspectives and contribute to a more holistic and well-informed understanding of waste management practices on campus. The data gathered in this study is an important first step, however, more in-depth data collection performed by Dalhousie will more accurately provide information about how to build the most effective waste management campaign for undergraduate students in the HRM.

Acknowledgements

We would like to first thank our incredible professor, Caroline Franklin and our TA Kayleigh, without them our report never would have gotten to the stage it is now. With their

constant support and help, they have made this report a feasible endeavour that at the beginning of the semester was a daunting herculean feat.

Furthermore, we would like to thank the 80 students who took the time to respond to our survey. Although we fell short of the ideal sample size, these fellow students gave us the data that allowed us to write this report, and we appreciate the time they took out of their day to answer our questions about their garbage!

Finally, we would like to thank each other. It is not easy to complete a semester-long research project with a group of students that we had never met before. 8:30 am classes are evil, and the semester has been tiring, but each group member's commitment, understanding, compassion, caffeine intake, and work ethic have resulted in a report we all can be proud of. So thank you to all of my group for setting their alarms for the crack of dawn every Tuesday and Thursday to get to campus to talk about garbage.

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Appendices

Appendix A: Survey

Survey Page 1: Consent

CONSENT FORM

[Anonymous Online Survey/No Signature Required]

The Relationship between Student Demographic Factors and Waste Sorting Knowledge at Dalhousie University Campus

You are invited to take part in a research study being conducted by, The Environmental Protection Pack a group of undergraduate students in the environmental science/ sustainability departments at Dalhousie University. The purpose of this research is to understand the relationship between the demographics of students studying at any of Dalhousie's Halifax campuses (Studley, Sexton, and Carleton) and their ability to properly sort waste according to Halifax Regional Municipality (HRM) waste sorting policies. We will be surveying this student population and then determining the effectiveness of waste management education in HRM based on the results of the survey. The study has required no funding but is a part of the ENVS/SUST 3502 Campus as a Living Lab course offered at Dalhousie.

If you choose to participate in this research, you will be asked to answer questions in an anonymous online survey on personal information such as year/ program of study and questions regarding your residence. Additionally, there will be questions to test your knowledge of proper waste management practices in the HRM. The survey should take approximately 10-15 minutes.

Your participation in this research is entirely your choice. You do not have to answer questions that you do not want to answer (by selecting prefer not to answer), and you are welcome to stop the survey at any time if you no longer want to participate. All you need to do is close your browser. We will not include any incomplete surveys in our analyses. If you do complete your survey and you change your mind later, we will not be able to remove the information you provided as we will not know which response is yours.

Your responses to the survey will be anonymous. This means that there are no questions in the survey that ask for identifying details such as your name or email address. All responses will be saved on a secure Dalhousie server. Only the Environmental Protection Pack will have access to the survey results.

We will describe and share the general findings of this research in a report in addition to a presentation. We will destroy all information in April 2024.

The risks associated with this study are no greater than those you encounter in your everyday life.

There will be no direct benefit to you in participating in this research. The research, however, might contribute to new knowledge on waste management education on Dalhousie Campuses and in the surrounding community.

You should discuss any questions you have about this study with The Environmental Protection Pack and Caroline Franklin. Please ask as many questions as you like before or after participating. My contact information is jr670669@dal.ca.

This research has been approved by the Department of Earth and Environmental Sciences at Dalhousie University.

1. *Do you consent to the information you provide being used for data analysis? All information you give will be anonymous.
 1. Yes
 2. No (Survey Ends)

Survey Page 2: Student Status

1. Are you currently an Undergraduate Student attending Dalhousie at the Studley, Sexton and/or Carleton Campuses?
 1. Yes
 2. No, (If no is selected then the survey ends)

Survey Page 3: Demographic Factors

2. What is your current year of study at Dalhousie University?
 1. 1
 2. 2
 3. 3
 4. 4
 5. 5+
 6. Prefer not to answer
3. What is your faculty of study? (Primary Major)
 1. Architecture
 2. Arts and Social Sciences
 3. Computer Science
 4. Dentistry
 5. Engineering
 6. Health

7. Law
 8. Management
 9. Medicine
 10. Open Learning & Career Development
 11. Science
 12. Prefer not to answer
4. *What best describes your current living situation?
 1. On Campus, in residence (Sherriff, Howe, etc)
 2. On Campus, not in residence
 3. Off-Campus, not with other people
 4. Off-Campus, with other people (excluding parents/ guardians)
 5. Off-Campus, with parents/guardians
 6. Other (Please Specify):
 5. *How long (in years) have you resided in the Halifax Regional Municipality?
 1. Less than 1 year
 2. 1 year
 3. 2 years
 4. 3 years
 5. 4 years
 6. 5 years or longer
 6. *In what country did you reside immediately before attending Dalhousie?
 1. Canada
 2. Other (Please specify (Skips ahead to Page 6)

Survey Page 4: Province

1. In what province/territory did you reside immediately before attending Dalhousie? (All responses except Nova Scotia skip ahead to Page 6)
 3. Alberta
 4. British Columbia
 5. Manitoba
 6. New Brunswick
 7. Newfoundland and Labrador
 8. Northwest Territories
 9. Nova Scotia (Takes respondent to Page 5)
 10. Nunavut
 11. Ontario
 12. Prince Edward Island
 13. Quebec
 14. Saskatchewan
 15. Yukon

Survey Page 5: Regions of Nova Scotia

7. Which region of Nova Scotia are you from? (use the provided map to determine the region)

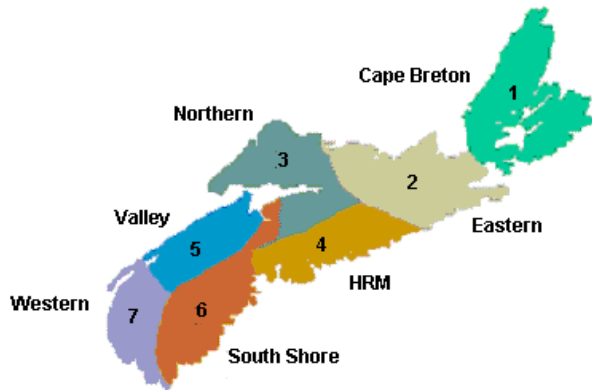


Photo: novascotia.ca

1. Cape Breton
2. Eastern
3. Northern
4. Halifax Regional Municipality (HRM)
5. Valley
6. South Shore
7. Western

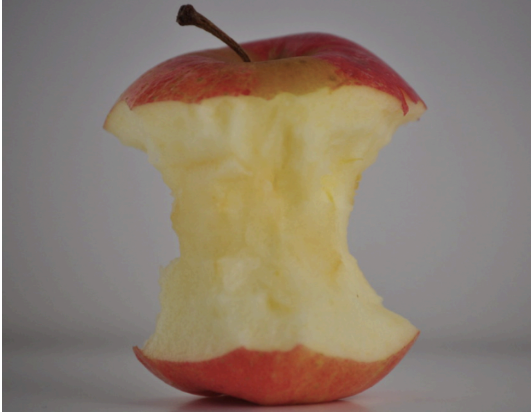
Survey Page 5: On-Campus Waste Sorting

If you were on campus and were told to sort the following items according to Dalhousie's 4-bin waste sorting system, where would you place the following items? See the 4-bin system here:



Photo: Danny Abriel, Dal News

1. Apple core (Photo: Tom Shockey, 2016)



1. Paper
 2. Recyclable
 3. Organics
 4. Garbage
 5. None of the above
2. Plastic cutlery (Photo: Marco Verch, 2019)



1. Paper
 2. Recyclable
 3. Organics
 4. Garbage
 5. None of the above
3. Dirty napkins (Photo: Nataliia Chubakova, 2019)



1. Paper
 2. Recyclable
 3. Organics
 4. Garbage
 5. None of the above
4. Clean napkins (Photo: Marco Verch, 2019)



1. Paper
 2. Recyclable
 3. Organics
 4. Garbage
 5. None of the above
5. Coffee cup lid (Photo: Christopher, 2007)



1. Paper
2. Recyclable
3. Organics
4. Garbage
5. None of the above
6. Coffee cup (Photo: Patrick Rich, 2019)



1. Paper
2. Recyclable
3. Organics
4. Garbage
5. None of the above
7. Coffee cup sleeve (Photo: Majiscup, 2007)



1. Paper
 2. Recyclable
 3. Organics
 4. Garbage
 5. None of the above
8. Styrofoam (Photo: Wonderlane, 2009)



1. Paper
 2. Recyclable
 3. Organics
 4. Garbage
 5. None of the above
9. Batteries (Photo: Hideki, 2023)



1. Paper
2. Recyclable
3. Organics
4. Garbage
5. None of the above

10. Magazine (Photo: Physicgypsy, 2006)



1. Paper
2. Recyclable
3. Organics
4. Garbage
5. None of the above

11. Plastic Bottles (Photo: Larry Jacobsen, 2007)



1. Paper
 2. Recyclable
 3. Organics
 4. Garbage
 5. None of the above
12. Bottle cap (Photo: Muhammad Usman, 2008)



1. Paper
2. Recyclable
3. Organics
4. Garbage
5. None of the above

Survey Page 7: Off-Campus Waste Sorting

1. According to HRM waste guidelines, what colour bag(s) should be used for recyclable materials, such as plastic cans, plastic wrap etc.? (select all that apply)
 1. Clear bags
 2. Black bags

3. Blue bags
 4. Paper bags
 5. None of the Above
2. According to HRM waste guidelines, what colour bag(s) can NOT be used for garbage?
(select all that apply)
 1. Clear bags
 2. Yellow bags
 3. Black bags
 4. Blue bags
 5. Paper bags
 6. Red bags
 7. All of these bags could be used
 3. According to HRM waste guidelines, which of the following can be done with yard waste such as raked-up leaves? (select all that apply)
 1. Green bin
 2. Garbage bags
 3. Recycling bags
 4. Paper bags
 5. Leave it on your lawn to decompose
 6. None of the above
 4. According to HRM waste guidelines, what should be done with grass clippings?
 1. Green bin
 2. Garbage bags
 3. Recycling bags
 4. Paper bags
 5. Leave it on your lawn to decompose
 6. None of the above
 5. According to HRM waste guidelines, what can you do with items of furniture?
 1. Call someone who collects waste to come pick it up
 2. Drop it off at a waste management facility or a location that will resell it
 3. Leave it at the curb with other waste
 4. None of the above

Survey Page 8: HRM Waste Sorting resources

1. *Are you aware of the HRM waste sorting search tool available on the municipality website? <https://www.halifax.ca/home-property/garbage-recycling-green-cart/recycling>
 1. Yes
 2. No
 3. Unsure
2. *How confident are you in your understanding of the waste sorting rules in the HRM?

1 - I am completely unsure

2

3

4

5 - I am very confident

3. Have you seen the following waste sorting infographic before?

DALHOUSIE UNIVERSITY
DALHOUSIE GUIDE TO WASTE MANAGEMENT ON CAMPUS
Look for the four-bin system around campus designated for paper, recyclables, organics and garbage

PAPER/CARDBOARD
Paper should be dry and clean. Flatten cardboard boxes and place inside paper bin.

RECYCLABLES
Remove caps & rinses from containers. Materials should be clean and dry.

ORGANIC WASTE
No liquids.

GARBAGE
Reinforce all waste for potential reuse before discarding.

HAZARDOUS WASTE
Dalhousie Environmental Health & Safety Office
Halifax: 902.494.7365
AC Run: 902.494.4340

UNIVERSAL WASTE
Dalhousie Facilities Management
Office of Environmental Services
Halifax: 902.494.6306
AC Run: 902.885.8670

EXCESS GOODS
Instead of sending unwanted belongings to the landfill, see if someone else can reuse it.

HOW TO USE YOUR LAB BIN SYSTEM:
Lab paper, recyclables and organics bins should be used as "transport bins". Use the bins to collect waste in the lab. Once full, the transport bins should be emptied by lab users into the appropriate streams at the four-bin sorting station in the hallway. Garbage will be collected from the lab by custodial staff.

HOW TO USE YOUR OFFICE/RESIDENCE SUITE BIN SYSTEM:
Collect recyclables and paper in the blue bin and place garbage in the black side-saddle bin. When full, the blue and black bins should be emptied into the four-bin sorting station in the hallway residence recycling room. All organics should be taken to the four-bin sorting station daily. This is to prevent organic materials from remaining in the office/residence space for longer than one day.

HAZARDOUS WASTE: Chemical Waste, Biological Waste, Radiactive Waste.

UNIVERSAL WASTE: Fluorescent bulbs, Batteries, Compressed gases, Tissue cultures, Microbial cultures, Contaminated gloves, sharps, plastic ware.

EXCESS GOODS: Employees should contact Purchasing with excess university goods. Goods will be advertised internally and then externally. People can list or excess goods for reuse. Visit dal.ca/procurement/suppliermaterials.html or contact Procurement at 902.494.6376, or procurement@dal.ca.

1. Yes

2. No

3. Unsure

4. *Do you find the above infographic an effective tool to practice proper waste sorting practices on Dalhousie Campuses?

1. Yes

2. No

3. Prefer not to answer

5. Optional, do you think the current method of communicating waste sorting rules to students is effective? If not, what communication tools would be helpful for you?

Appendix B: Survey Poster

Approved by the Department of Earth and Environmental Science at Dalhousie University
ENVS/SUST 3502

WASTE SURVEY!

MARCH 2024



**Are you a current
Dalhousie Student?**

**Do you sort your
garbage?**

If so, fill out this short
survey and help us learn
more about the waste
sorting skills of Dalhousie
Students!



To respond to survey scan QR
code or go to: [website name](#)

If you have any questions about our survey or
research, connect with us at sr972410@dal.ca

Appendix C: ANOVA Results

Table 1 ANOVA analysis results from excel of mean (\pm SD) waste sorting scores of Dalhousie University Studley, Sexton, and Carleton campus undergraduate students by different living situations. Data collected March 2024 in Halifax, NS, Canada.

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	27.56168831	5	5.512337662	1.267614491	0.2874938483	2.343679681
Within Groups	308.75	71	4.348591549			
Total	336.3116883	76				

Table 2 T-test analysis results from excel of mean (\pm SD) waste sorting scores of Dalhousie University Studley, Sexton, and Carleton campus undergraduate students who live on or off campus. Data collected March 2024 in Halifax, NS, Canada.

	<i>Off campus</i>	<i>On campus</i>
Mean	9.942028986	8.125
Variance	4.026001705	5.553571429
Observations	69	8
Hypothesized Mean Difference	0	
df	8	
t Stat	2.094574567	
P(T<=t) one-tail	0.03476086406	
t Critical one-tail	1.859548038	
P(T<=t) two-tail	0.06952172812	
t Critical two-tail	2.306004135	

Table 3 ANOVA analysis results from excel of mean (\pm SD) waste sorting scores of Dalhousie University Studley, Sexton, and Carleton campus undergraduate students by length of residence in HRM. Data collected March 2024 in Halifax, NS, Canada.

ANOVA						
<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	46.50775855	4	11.62693964	2.888641484	0.0281594972	6
Within Groups	289.8039298	72	4.02505458			2.498918583
Total	336.3116883	76				

Table 4 ANOVA analysis results from excel of mean (\pm SD) waste sorting scores of Dalhousie University Studley, Sexton, and Carleton campus undergraduate students by country of previous residence. Data collected March 2024 in Halifax, NS, Canada.

ANOVA						
<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	16.99025974	2	8.49512987	1.968673425	0.1468878201	3.120348511
Within Groups	319.3214286	74	4.31515444			
Total	336.3116883	76				

Table 5 ANOVA analysis results from excel of mean (\pm SD) waste sorting scores of Dalhousie University Studley, Sexton, and Carleton campus undergraduate students by province or territory of previous residence. Data collected March 2024 in Halifax, NS, Canada.

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	45.18885281	8	5.648606602	1.328404584	0.246865327	4 2.094286108
Within Groups	259.3825758	61	4.252173373			
Total	304.5714286	69				

Table 6 ANOVA analysis results from excel of mean (\pm SD) waste sorting scores of Dalhousie University Studley, Sexton, and Carleton campus undergraduate students by Nova Scotian region of previous residence. Data collected March 2024 in Halifax, NS, Canada.

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	14.63030303	5	2.926060606	0.5336280741	0.7479043577	2.852409165
Within Groups	87.73333333	16	5.483333333			
Total	102.3636364	21				

Table 7 ANOVA analysis results from excel of mean (\pm SD) waste sorting scores of Dalhousie University Studley, Sexton, and Carleton campus undergraduate students by year of study. Data collected March 2024 in Halifax, NS, Canada.

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	29.61168831	4	7.402922078	1.7378884	0.1510408285	2.498918583
Within Groups	306.7	72	4.259722222	57		
Total	336.3116883	76				

Table 8 ANOVA analysis results from excel of mean (\pm SD) waste sorting scores of Dalhousie University Studley, Sexton, and Carleton campus undergraduate students by faculty. Data collected March 2024 in Halifax, NS, Canada.

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	56.5977023	8	7.074712787	1.719901376	0.1095228836	2.077782627
Within Groups	279.713986	68	4.113440971			
Total	336.3116883	76				

Table 9 ANOVA analysis results from excel of mean (\pm SD) waste sorting scores of Dalhousie University Studley, Sexton, and Carleton campus undergraduate students by confidence level. Data collected March 2024 in Halifax, NS, Canada.

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	17.62532468	4	4.406331169	0.9955111996	0.4156932436	2.498918583
Within Groups	318.6863636	72	4.426199495			
Total	336.3116883	76				

Table 10 T-test analysis results from excel of mean (\pm SD) waste sorting scores of Dalhousie University Studley, Sexton, and Carleton campus undergraduate students who have lived in the Halifax Regional Municipality for two years or five or more years. Data collected March 2024 in Halifax, NS, Canada.

	<i>2</i>	<i>5 or more</i>
Mean	8.625	10.65217391
Variance	3.716666667	2.782608696
Observations	16	23
Hypothesized Mean Difference	0	
df	29	
t Stat	-3.410631268	
P(T<=t) one-tail	0.000963184786	
t Critical one-tail	1.699127027	
P(T<=t) two-tail	0.001926369573	
t Critical two-tail	2.045229642	

Table 11 T-test analysis results from excel of mean (\pm SD) waste sorting scores of Dalhousie University Studley, Sexton, and Carleton campus undergraduate students who have lived in the Halifax Regional Municipality for two years or three years. Data collected March 2024 in Halifax, NS, Canada.

	<i>2</i>	<i>3</i>
Mean	8.625	9.961538462
Variance	3.716666667	4.358461538
Observations	16	26

Hypothesized Mean Difference	0
df	34
t Stat	-2.113451526
P(T<=t) one-tail	0.02098937698
t Critical one-tail	1.690924255
P(T<=t) two-tail	0.04197875396
t Critical two-tail	2.032244509

Appendix D: REB Application

RESEARCH ETHICS BOARDS APPLICATION FORM

Prospective Research

This form should only be used if new data will be collected. For research involving only secondary use of existing information (such as health records, student records, survey data) or previously collected biological materials, use the *REB Application Form – Secondary Use of Information for Research*.

Instructions to complete this form are provided in the [Guidance for Submitting an Application for Research Ethics Review](#).

This form makes reference to the TCPS2. It is [linked here](#) for convenience.

SECTION 1. ADMINISTRATIVE INFORMATION

[File No:

office

only | v 2023]

Suggest the preferred Research Ethics Board to review this research:

Health Sciences OR Social Sciences and Humanities

Project Title: The Relationship between Student Demographic Factors and Waste Sorting Knowledge at Dalhousie University Campus

1.1 Research team information

Lead researcher (at Dalhousie):	Name:	Jordan Matthews		
	Email (@dal.ca):		Phone:	
	Banner #:		Department:	SUST
Lead researcher's primary affiliation with Dalhousie:				

<input type="checkbox"/> Faculty <input type="checkbox"/> PhD Student <input type="checkbox"/> Master's student <input checked="" type="checkbox"/> Undergraduate student <input type="checkbox"/> Medical student				<input type="checkbox"/> Postdoctoral Fellow <input type="checkbox"/> Medical Resident <input type="checkbox"/> Staff <input type="checkbox"/> Medical Staff <input type="checkbox"/> External to Dalhousie			
Co-investigator names, affiliations, and email addresses		<ul style="list-style-type: none"> - Sarah Clements, group member, sr972410@dal.ca - Abbie Targett, group member, ab420983@dal.ca - Justin Baird, group member, js874478@dal.ca - Yana Yadegardjam, group member, yanayad@dal.ca 					
Contact person for this submission (if not lead researcher)	Name:		n/a				
	Email:		n/a		Phone: n/a		
	Banner # if applicable:		n/a				
Study start date:	February 16, 2024		Study end date:		April 10, 2024		

1.2 For student/learner submissions (including medical residents and postdoctoral fellows)			
Degree program		Environmental Science and Sustainability	
Supervisor name and department		Caroline Franklin	
Supervisor Email (@dal)		Caroline.Frankin@dal.ca	Phone: n/a
Code for the course in which credit will be received as a result of this research (e.g., REGN 9999): <input type="checkbox"/> Not Applicable			SUST3502/ENVS3502

Department/unit ethics review (if applicable). Undergraduate minimal risk research only
Attestation: <input type="checkbox"/> I am responsible for the unit-level research ethics review of this project and it has been approved.
Authorizing name:
Date:

1.3 Other reviews		
Other ethics review (if any) for this research	Where?	n/a
	Status?	n/a
Scholarly/scientific peer review (if any)	n/a	
Is this a variation on, or extension of, a previously approved Dal REB submission?	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes Dal REB file # _____	
<p>If yes, describe which components of the current submission are the same as the previously approved submission (list section numbers), and which components are different from the previously approved submission (list section numbers). You may also use highlighting to clearly indicate revised text.</p>		

1.4 Funding		
Applicable		<input checked="" type="checkbox"/> Not
Funding (list on consent form)	Funder	n/a
	Award Number	n/a
	Institution where funds are/will be held	<input type="checkbox"/> Dalhousie University <input type="checkbox"/> Other: _____

1.5 Attestation(s). The appropriate boxes *must* be checked for the submission to be accepted by the REB

- I am the **lead researcher** (at Dalhousie) named in section 1.1. I agree to conduct this research following the principles of the Tri-Council Policy Statement *Ethical Conduct for Research Involving Humans* (TCPS2) and consistent with the University [Policy on the Ethical Conduct of Research Involving Humans](#).

I have completed the TCPS2 Course on Research Ethics ([CORE](#)) online tutorial.

- Yes No

For Supervisors (of student, postdoc, resident research projects):

- I am the **supervisor** named in section 1.2. I have reviewed this submission, including the scholarly merit of the research, and believe it is sound and appropriate. I take responsibility for ensuring this research is conducted following the principles of the TCPS2 and University [Policy](#).

I have completed the TCPS2 Course on Research Ethics ([CORE](#)) online tutorial.

- Yes No

SECTION 2. PROJECT DESCRIPTION

2.1 Lay summary

2.1.1 In plain language, describe the rationale, purpose, study population, and methods to be used. Include a summary of background information or literature to contextualize the study. What new knowledge, or public or scientific benefit is anticipated? Is this a pilot study or a fully developed study? [maximum 500 words]

This research project investigates the correlation between undergraduate students' understanding of waste sorting guidelines within the Halifax Regional Municipality (HRM) and their demographic backgrounds. The study will be conducted at Dalhousie University in Nova Scotia, Canada, with a diverse student body and a comprehensive four-bin waste separation system. The primary goal of this pilot study is to assess the level of awareness and understanding among Dalhousie University students in adhering to HRM's waste sorting guidelines. The secondary objective is to determine how demographic variables, such as a student's home region before attending the university, length of residence in HRM, living arrangements, responsibility for sorting recyclables, field of study, and academic standing, affect their waste sorting behaviour.

To accomplish these objectives, the researchers will administer a survey to undergraduate students at Dalhousie's campuses. The survey will collect data on students' demographic backgrounds, confidence levels in waste sorting, and ability to sort waste correctly as per the university's guidelines. The researchers aim to collect data from at least 377 respondents to achieve statistically significant insights into the waste-sorting habits of the student population.

As a pilot study, this research will provide preliminary insights into the effectiveness of current waste management education and the need for tailored informational campaigns to address identified gaps. The study's anticipated outcome is to generate new knowledge on the correlation between students' demographic backgrounds and waste sorting practices. This knowledge will benefit the public and scientific communities by informing targeted waste management strategies at Dalhousie University and potentially serving as a model for other institutions facing similar challenges. Moreover, by improving waste sorting practices, this study aims to contribute to the reduction of improperly sorted waste, thereby supporting environmental sustainability and reducing unnecessary landfill accumulation.

By identifying the gaps in knowledge and practice regarding waste sorting among students, this research project can help enhance waste management on campus, ultimately contributing to the

university's sustainability goals. It can also address the urgent need to reduce avoidable waste, which is a growing problem worldwide due to the inefficiencies in waste management practices, particularly in academic environments.

2.1.2 Phased review. If a phased review is being requested, describe why this is appropriate for this study, and which phase(s) are included for approval in this application. Refer to the [guidance document](#) before requesting a phased review.

Not applicable

2.2 Research question

2.2 State the research question(s) or research objective(s).

To better understand the relationship between undergraduate students' familiarity with the Halifax Regional Municipality's (HRM) waste sorting guidelines and specific demographic factors.

2.3 Study Population

2.3.1 Identify the study population(s) and describe and justify the inclusion and exclusion criteria for participants.

The study population will include Dalhousie undergraduate students attending all campuses located within the HRM. This will provide an encompassing understanding of the target populations' waste management habits and knowledge. Graduate students will be excluded due to increased variables within that phase of life. Dalhousie campuses outside of the HRM will be excluded from this study as the municipal waste sorting guidelines will differ.

2.3.2 How many participants are needed to answer the research question or achieve the research objectives? Provide a target range that includes the maximum number of participants for each participant category and data collection method (e.g.: *Interviews with nurses: 10-15. Surveys with farmers: 90-100*). Provide a scholarly rationale (e.g. sample size calculation) for how these numbers were determined.

For there to be a fair representation of the student population, 376 participants will need to complete the survey. This value was determined using a sample size calculator with a confidence level of 95%, 5% margin of error, 50% population proportion and a population size 16,002. Population size was established via 2021 statistics of Dalhousie's student population.

2.4 Recruitment

2.4.1 Will you require the cooperation, assistance, or approval of a third party to recruit or access potential participants?

- No, I can do all recruitment without cooperation, assistance or approval from anyone outside the research team.
- Yes, in order to inform potential participants about the study, I will need to work with a third-party to assist with recruitment or approve the study. If yes, describe the required cooperation, assistance, approvals or agreements needed and append written confirmation of their agreement to assist with recruitment and/or their approval of the research (required) and label the corresponding appendices here.
These must be secured and appended before your project will be considered for ethical review.

2.4.2 What methods will be used to recruit participants? Check all that apply. Append final versions of all materials that will be used during recruitment.

- Posters
- Social Media
- Email or listserv
- Online advertising
- Subject pool (e.g. SONA)
- Word of mouth / in person
- Syllabus or online learning platform
- Phone
- Presentation
- Letter
- Other. Describe:

2.4.3 Who will conduct recruitment? Please specify by name or position (e.g. research assistant). What will they do?

The research team (Environmental Protection Pack), comprising Sarah, Abbie, Jordan, Justin, and Yana, will undertake the recruitment efforts. These efforts will include the strategic placement of posters in key campus buildings, utilization of social media and university platforms to disseminate survey links as well as collaborating with Dalhousie's College of Sustainability to increase awareness and engagement among students. The collaboration with Dalhousie's College of Sustainability is particularly significant as it aligns with the academic and environmental interests of a substantial portion of the target demographic, potentially leading to higher participation rates. The team will also liaise with student societies to further promote survey participation, ensuring a broad and diverse participant pool.

2.4.4 What actions will participants take to express interest in the study?

Potential participants will express their interest by engaging with the survey through various entry points advertised by the research team. These entry points include scanning QR codes on physical posters, clicking on links shared via social media, and accessing the survey through announcements on Brightspace.

2.4.5 Describe how participants will be screened to determine eligibility for the study.

Append any materials that will be used in screening. If participants will self-screen, state that here.

The Initial question in the survey will screen for eligibility, ensuring participants are undergraduate students at Dalhousie University who consent to participate. This self-screening approach simplifies the process, allowing immediate determination of eligibility without the need for additional steps or materials.

2.5 Informed consent process

2.5.1 Describe the informed consent process by completing each of the following sections. Append copies of all consent information/forms that will be used (e.g. written consent document, oral consent script, assent document/script, etc.) and identify the corresponding appendices.

A) How, when and by whom will the study information be conveyed to prospective participants? How will the researcher ensure prospective participants are fully informed?

Prospective participants will receive an overview of the study and information at the beginning of the online survey. This information will outline the study's purpose, the nature of participation, the anonymity of responses, and how the data will be used and protected. The research team will ensure that this section is clear, up to date and detailed, facilitating informed consent.

B) Describe how consent will be documented (e.g. written signature, audio-recorded, etc.).

Consent will be documented through participants' affirmative response to a specific question regarding their agreement to participate, based on the information provided. This approach ensures a clear, documented consent process integrated within the survey.

C) If third-party consent will be used, describe who will provide consent for the participant. Describe the process for obtaining assent from the participant.

Not applicable. Participants will consent for themselves.

D) For longitudinal studies, describe how ongoing consent will be confirmed. Address the possibility that a participant's capacity to consent may develop, diminish, or fluctuate and how this will be handled (see TCPS2 Articles 3.9 and 3.10).

Not applicable, participants only participate at a single time point.

2.5.2 If the data/materials collected from this research will be kept by the researcher or in a data repository/biobank for potential re-use in future research, describe how participants will be given the opportunity to consent or not consent to potential future use of their data/materials (see TCPS2 Article 3.13) separately from their consent to participate in the research. (Note: participants must be allowed to participate in this research even if they do not want their data/materials stored for future research purposes).

Not applicable. Data/biological materials collected from participants will not be used in future research.

2.5.3 Discuss how participants will be given the opportunity to withdraw their participation and/or their data and/or their biological materials and any limitations on this (such as time, identifiability of data, progress through stages of research, etc.). If participants will not have opportunity to withdraw their participation and/or their data and/or their biological materials, explain why.

Participants have the option to withdraw from the study at any time prior to the submission of their survey responses. The survey will inform participants of their right to discontinue their participation at any stage before they submit their answers. Due to the anonymous nature of the survey, it is important to note that once the survey is submitted, withdrawal is not possible. This is because responses are not linked to individual identities, making it impossible to extract or delete specific sets of responses after submission.

2.5.4 If an alteration/exception to the requirement to seek prior informed consent is sought, address the criteria in TCPS2 Article 3.7A. If the alteration involves deception or nondisclosure, also complete section 2.5.5.

Not applicable.

2.5.5 Describe and justify any use of deception or nondisclosure. Explain how participants will be debriefed (TCPS2 Article 3.7B).

Not applicable.

2.6 Methods, data collection and analysis

2.6.1 This section is about the research methods and the tasks participants will be asked to complete.

A) Where will participants be located during their participation? (If the study takes place online, specify that it is an online study.)

Participants will engage with the study remotely, completing an online survey designed to assess their waste sorting knowledge and practices.

B) What tasks will participants be asked to do and what research instruments will be used to collect the data? Append all instruments and identify the corresponding appendices here.

The survey will include both demographic questions and practical scenarios requiring participants to apply HRM waste sorting guidelines, simulating real-life sorting decisions.

C) How much of the participant's time will participation in the study require (including consent and screening processes, debriefing, member-checking, etc.)?

The survey is designed to be concise yet comprehensive, requiring approximately 10-15 minutes to complete. This estimate includes the time needed for reading the consent information, answering demographic and sorting scenario questions, and submitting the survey.

D) If biological samples will be provided by participants, please describe what samples will be provided, how much/many, and the associated process(es) for collecting them.

Not applicable. No biological samples will be taken as part of this research.

2.6.2 Will the participants be audio- or video-recorded during data collection?

No

Yes. If yes:

- State if the recordings are audio only, video only, or a combination.
- Explain why recordings are necessary for the research.
- Identify the tool or software that will be used.
- Explain if participants can opt-out of recording and if they can, what modifications to the data collection process will be needed.

2.6.3 If recordings will be transcribed, state who will do the transcribing and/or if transcription will be done by a computerized program or software (name the program/software). Specify if transcription programs or software are used in the cloud or on a local device only. If a transcriptionist will be hired, append the confidentiality agreement they will be asked to sign and identify the corresponding appendix here.

N/A. Transcription is not required for this study.

2.6.4 Briefly describe the data analysis plan. Indicate how the proposed data analyses address the study’s primary objectives or research questions. Describe and justify the use of all information collected from participants (for example, demographic variables) in the analysis plan.

The analysis will involve scoring participants' sorting choices and comparing accuracy across demographic variables to identify significant correlations. We will compare these scores using an unpaired, two-sided t-test. This approach will directly address the research objectives by highlighting demographic factors that influence waste sorting knowledge and behaviors.

2.6.5 Describe any incentives that will be offered to participants and how this will be handled for participants who do not complete the study (see TCPS2 Article 3.1 for guidance on incentives). Discuss any expenses participants are likely to incur and whether/how these will be reimbursed.

n/a

2.7 Privacy and confidentiality

2.7.1 This section is about how participants’ data and information will be managed, and how identifiable participants and their data will be during and after this research.

A) Describe who will have knowledge of participants’ identities at any point in the research process.

Only the members of the Environmental Protection Pack research team—Sarah, Abbie, Jordan, Justin, and Yana—and the instructors teaching the SUST3502 course will have access to any identifiable information about the participants during the research process. The anonymity of the survey ensures that participants' identities remain unknown throughout the research process. This confidentiality is necessary, both to encourage candid responses and to adhere to ethical standards concerning privacy and data protection.

B) Describe the level of identifiability of the study documents (including screening and consent forms and other administrative documents) and data (anonymous, anonymized, de-identified/coded, identifying) (see TCPS2 Chapter 5A – types of information for definitions) at the following timepoints:

- during recruitment, screening, and consent
- during collection
- during analysis and preparation of results
- during long-term storage

To ensure the privacy and confidentiality of our study's documents, participant data, and any associated materials throughout the various phases of our study, we've adjusted our security measures to reflect the use of Google Forms for data collection and storage. Given this setup, all study-related digital information will be stored directly within Google Forms, which benefits from Google's robust security infrastructure, including encryption and secure data centers. Moreover, access to the data collected via Google Forms will be strictly limited to our research team members. We will manage access through Google's built-in permission settings, ensuring only authorized team members can view or download the responses. This approach eliminates the need for physical transportation or data sharing, highly reducing the risk of unauthorized access. As Google Forms encrypts data in transit and at rest, we are confident in the platform's ability to protect participant information. However, we will take additional steps to enhance security, such as using strong passwords for our Google accounts, and enabling two-factor authentication. Since all data will be digital and stored on Google's servers, this study will not need hard copy documents or physical storage of materials. This digital approach simplifies the security protocol and ensures high data protection throughout the study lifecycle, from pre-study activities through data collection and analysis. Through these measures, the Environmental Protection Pack is committed to maintaining the utmost privacy and confidentiality of all study-related information.

C) Specify which members of the research team (or others) will have access to participants' data and/or biological materials and for what purpose.

n/a

D) Describe measures to ensure privacy and confidentiality of study documents, participant data and biological materials during the pre-study (e.g. recruitment, screening, consent), data collection and analysis phases. *[Note that plans for long term storage will be covered in 2.7.2]*. Specifically address the following:

- Where data/recordings/documents will be stored and the security of such storage.
- How study data/recordings/documents will be securely shared and/or transported between team members.
- If data collection software is used, describe the security measures of that software and if others outside the research team (e.g. a survey company) will have access to the data.
- If a key-code will be maintained, describe how it will be kept secure and separate from study data.
- Confirm that any identifiable data will be encrypted.
- For hard copy documents and biological materials, describe physical security measures and specify storage location.

Our study prioritises privacy, utilising Google Forms for encrypted data collection accessible only to our team. All information is given anonymously, and we are not collecting any personal data that could be used to identify these individuals. Sharing and transport of data occur securely within Google Workspace. Key-codes, if used, are stored separately and securely. All identifiable data is encrypted, ensuring participant information is protected throughout the study, with no hard copies involved.

2.7.2 This section is about plans for retention and long-term storage of study documents (signed consent forms, screening documents, key-codes, etc.), data, and/or biological materials.

Will all documents/data/biological materials eventually be destroyed?

No, not all documents/data/biological materials will not be destroyed (if 'no', complete section 2.8).

Yes. If yes:

A) State when they will be destroyed and provide a rationale for the proposed retention period:

The data and any related materials will be destroyed at the end of April, following the completion of the SUST3502 course. This timeline allows sufficient time for the research team to thoroughly analyze the survey data and draw meaningful conclusions. Retaining the data until the end of the course ensures that the team can respond to any feedback, make necessary revisions, and incorporate the data into final presentations and reports. This retention period is designed to balance the need for comprehensive analysis with the commitment to ethical standards and privacy considerations, ensuring that personal data is not kept longer than necessary.

B) Where will they be stored when the study is over (after analysis and dissemination of findings) but before they are destroyed?

If our survey is conducted using an online platform like Google Forms, the collected data and any associated materials will be stored securely on the platform's servers, which are protected by strong security measures. This approach ensures that the data remains accessible only to authorized members of the research team during the analysis phase and until the end of April, when the course concludes, and the data is scheduled for destruction. This storage strategy is aligned with best practices for data security and privacy, ensuring that sensitive information is adequately protected while in our hands.

C) How will they eventually be destroyed (i.e., method of destruction) and by whom?

The research team will delete all data from Google Forms and any related materials across our storage platforms. We'll manually remove everything, and then Google will automatically permanently erase it from their servers after 30 days. This ensures an extra layer of data security. We'll also wipe any backups or printouts tied to the study, making sure nothing can be retrieved. Our method guarantees that all information is securely and completely destroyed, safeguarding participant privacy.

2.7.3 Describe if/how participant confidentiality will be protected when research results are reported by answering the following:

A) For quantitative results - In what form will study data be disseminated?

- Only aggregate data will be presented.
- Individual de-identified, anonymized, or anonymous data will be presented.
- Other. If “other”, briefly describe dissemination plans with regard to identifiability of data:
 - Not applicable, only qualitative data will be presented (complete part B).*

B) For qualitative results - Will identifiable data be used in research presentations/publications? If participants will be quoted, address consent for this and indicate whether quotes will be identifiable or attributed.

- Not applicable, only quantitative data will be presented (complete part A).*

2.7.4 Address any limits on confidentiality, such as a legal duty to report abuse or neglect of a [child](#) or [adult in need of protection](#), and how these will be handled. Ensure these are clear in the consent documents. (See the [guidance document](#) for more information on legal duties and professional codes of ethics).

- Not applicable.*

2.7.5 Will any information that may reasonably be expected to identify an individual (alone or in combination with other available information) be *accessible* outside Canada? And/or, will you be using any electronic tool (e.g. survey company, software, data repository) to help you collect, manage, store, share, or analyze personally identifiable data that makes the data accessible from outside Canada?

- No.
- Yes. If yes, refer to the University [Policy for the Protection of Personal Information from Access Outside Canada](#), and describe how you comply with the policy (such as securing participant consent and/or securing approval from the Vice President Research and Innovation).

2.8 Indefinite retention of research data/biological materials

If study documents/data/biological materials will not be destroyed **and/or** there are possible plans for re-use of the data, complete this section (and ensure section 2.5.2 is complete):

Not applicable. The documents/data/materials generated from this study will only be used for this specific research and will be destroyed after this research is complete.

2.8.1 Discuss the risks and potential benefits of storing documents/data and/or human biological materials long-term for future unspecified research.

2.8.2 Who will be the keeper of the documents/data/biological materials?

- The lead researcher on this project.
- A data repository (identify the repository):
- Other (describe):

2.8.3 If the custodian/steward becomes unaffiliated with Dalhousie (retires, leaves their position, dies, graduates, etc.), what will happen to the documents/data/materials?

- N/A, the data/materials are **only** being stored in a repository/biobank.*

2.8.4 Describe the repository/biobank where the data/materials will be deposited. Indicate the protective measures in place to ensure participants' data are securely managed.

- Not Applicable – the researcher will manage all data indefinitely.*

2.8.5 Who will be able to access the data/materials for future use and under what circumstances?

2.8.6 Describe the type, identifiability, and amount of data and/or human biological materials being stored for potential re-use in the repository. Identify all fields and materials that will be included in the final data set (include as an appendix).

2.9 Risk and benefit analysis

2.9.1 Discuss what risks or discomforts are anticipated for individual participants, how likely risks are and how risks will be mitigated. Risks to privacy from the collection/use of identifying information should be addressed.

No direct negative impacts are expected for the participants from engaging in this study. The survey is designed to collect information in a manner that respects participants' confidentiality and anonymity, ensuring that no sensitive personal information is at risk of exposure. The questions are structured to gather data on waste sorting behaviors and attitudes without causing psychological discomfort or stress to the participants. To further mitigate any potential indirect discomfort, the research team will ensure that all communication about the survey and its purpose is clear and transparent, providing participants with the necessary information to make an informed decision about their participation.

2.9.2 What people, groups, or communities other than participants in this study might be negatively impacted by the conduct of the research and/or dissemination of research results? How will the researcher mitigate these potential negative impacts? Describe any community engagement that may occur as part of a mitigation strategy.

It's important to consider potential negative impacts while conducting a waste management study at Dalhousie University. The waste management staff might feel undue pressure or blame if the research highlights inefficiencies in the current waste system. Additionally, if the findings suggest that students from specific areas are less compliant with waste sorting guidelines, this could have a negative impact on the local communities, leading to stigmatization of those regions as less environmentally conscious. Moreover, the university administration may face reputational risks if the research points out shortcomings in the institution's waste management education and infrastructure.

To avoid these potential negative impacts, the researchers must engage directly with the university's waste management staff and incorporate their insights into the research design. The focus should be on constructive improvements rather than attributing blame. The reporting of results should be sensitive, prioritizing positive aspects and collective improvement opportunities. It is important to avoid stigmatizing any community or group. Collaboration with the university administration is key to framing the study as an opportunity for the institution to enhance its sustainability leadership. Engaging the wider university community will also be crucial, promoting an inclusive sustainability and waste management dialogue. The goal is to empower all campus members to contribute to solutions and pinpoint the gaps in knowledge to enhance Dalhousie's sustainability leadership.

This research involves Indigenous communities (complete section 2.13).

2.9.3 Identify any direct benefits of participation to participants (other than compensation), and any indirect benefits of the study (e.g. contribution to new knowledge).

The study offers direct benefits to the participants through increased awareness and understanding of waste sorting practices. The participants will have the opportunity to reflect on their waste sorting habits, compare them with HRM guidelines, and identify areas needing improvement. This enhanced awareness can lead to better environmental practices at an individual level, contributing to a more sustainable lifestyle. Moreover, participants engaging with the survey might become more conscientious of their waste management habits, which can foster a sense of responsibility towards reducing their environmental footprint. Lastly, participation in this study benefits the individual participants and contributes to the generation of new knowledge in the field of waste management. By participating in this study, participants help researchers gain insights into waste sorting practices and identify areas where improvement is needed. This information can be used to develop better waste management policies and practices, leading to a more sustainable future.

2.10 Provision of results to participants and dissemination plans

2.10.1 The TCPS2 encourages researchers to share study results with participants in appropriate formats. Describe your plans to share study results with participants and discuss the process and format.

n/a

2.10.2 Will individual results be returned to participants?

Not applicable.

No.

Yes. If yes, explain the format in which results will be given (and append a template for communicating results to participants). Describe how individual results will be shared in a secure and confidential manner. Explain how/if the research team will ensure the individual results are understandable to participants. Discuss any risks to participants of receiving individual results, and how these will be mitigated.

2.10.3 If applicable, describe how participants will be informed of any material incidental findings – a discovery about a participant made in the course of research (screening, data collection, or analysis) that is outside the objectives of the study, that has implications for participant welfare (health, psychological or social). (See TCPS2 Article 3.4 for more information.)

Not applicable.

2.10.4 If providing genetic results/information to participants, communities, or groups, discuss the plans for providing genetic counselling (TCPS2 13.4)

Not applicable.

2.10.5 Describe plans for dissemination of the research findings (e.g. conference presentations, journal articles, public lectures etc.).

n/a

2.11 Research Team

2.11.1 Describe the role and duties of each research team member (including students, RAs and supervisors) in relation to the overall study.

In our research project, each team member plays a vital role, contributing to various phases of the study to ensure its success. Sarah is tasked with developing an engagement campaign for the survey, designing posters for online distribution and physical posting around the Dalhousie campus by February 26th. This role is critical for ensuring the survey reaches a wide audience, maximizing participant engagement. The survey's release requires a collective effort from all team members. This collective responsibility ensures that the survey is administered efficiently and effectively. Jordan and Justin jointly tackle the background and methods sections of the final report in the first week of March. The survey closure is managed by the team member who "owns" the Google Form in the second week of March, with the possibility of adjusting the timeline based on participant engagement. The task of cleaning and analyzing the survey results falls to Yana and Sarah in the week following the survey's closure. This phase may evolve into a team-wide effort depending on the volume and complexity of the data collected. Yana and Sarah are also responsible for completing the conclusion of results by the third or early fourth week of March, synthesizing the data analysis into actionable insights. Each team member is also individually responsible for creating an infographic by April 8th, contributing visual elements to our final report that effectively convey our findings. As we approach the project's culmination, the entire team will engage in editing the final report in the last week of March and practice for the Pecha Kucha presentation on March 26th and 28th, preparing to share our findings with the class. Finally, the entire team must submit the final report by April 8th. This structured approach ensures that each member's duties are clearly defined, contributing to the study's overarching goals.

2.11.2 Briefly identify any previous experience or special qualifications represented on the team relevant to the proposed study (e.g. professional or clinical expertise, research methods, experience with the study population, statistics expertise, etc.).

Our research team is uniquely qualified to carry out the proposed study, thanks to a combination of specific educational backgrounds and practical experience. Some members of the Environmental Protection Pack have taken statistics and data analytics courses, which are critical for effectively analyzing survey results and extracting insightful conclusions. Kayleigh, our teaching assistant, has successfully completed SUST/ENVS3502, significantly enhancing our team's skill set. This course has equipped her with a strong understanding of tools and methodologies essential for carrying out our research successfully. Caroline, the professor for the SUST/ENVS3502 course, adds another layer of expertise. Her extensive experience overseeing projects and conducting research equips our team with a solid foundation in research design, methodology, and project management. Her guidance ensures that our study is undertaken efficiently and meets the highest academic and ethical standards.

2.12 Conflict of interest

2.12 Describe whether any dual role or conflict of interest exists for any member of the research team in relation to potential study participants (e.g. TA, fellow student, teaching or clinical relationship), and/or study sponsors, and how this will be handled. Please provide copies of contracts between researchers, institutions and industry sponsors and relevant budgetary information related to this research (TCPS2 12.20).

Not applicable.

2.13 Research involving Indigenous peoples

Consult TCPS2 Articles 9.1 and 9.2 in determining whether this section is applicable to your research.

Not applicable – go to 2.14.

2.13.1 If the proposed research is expected to affect the welfare of an Indigenous community, or communities, to which prospective participants belong, describe the plan for community engagement (per TCPS2 Articles 9.1 and 9.2). If community engagement is not sought, explain why the research does not require it, referencing TCPS2 articles 9.1 and 9.2. Append applicable finalized research agreements.

2.13.2 State whether ethical approval has been or will be sought from [Mi'kmaw Ethics Watch](#) and if not, why the research does not fall under their purview. If the research falls under the purview of other Indigenous ethics groups, state whether ethical approval has been or will be sought.

2.13.3 Describe plans for returning results to the community and any intellectual property rights agreements negotiated with the community with regard to data ownership (see also 2.11.4 if applicable).

2.13.4 Does this research incorporate OCAP (Ownership, Control, Access, and Possession) principles as described in TCPS2 Article 9.8?

- Yes. Explain how:

- No. Explain why not:

2.14 Clinical trials

Not applicable – go to 2.15.

2.14.1 Will the proposed clinical trial be registered?

- No. Explain why not:

- Yes. Indicate where it was/will be registered and provide the registration number:

2.14.2 If a novel intervention or treatment is being examined, describe standard treatment or intervention, to indicate a situation of clinical equipoise exists (TCPS2 Chapter 11). If placebo is used with a control group rather than standard treatment, please justify.

2.14.3 Clearly identify the known effects of any product or device under investigation, approved uses, safety information and possible contraindications. Indicate how the proposed study use differs from approved uses.

Not applicable.

2.14.4 Discuss any plans for blinding/randomization.

2.14.5 What plans are in place for safety monitoring and reporting of new information to participants, the REB, other team members, sponsors, and the clinical trial registry (refer to TCPS2 Articles 11.6, 11.7, 11.8)? These should address plans for removing participants for safety reasons, and early stopping/unblinding/amendment of the trial. What risks may arise for participants through early trial closure, and how will these be addressed? Are there any options for continued access to interventions shown to be beneficial?

2.15 Use of personal health information

Not applicable.

2.15.1 Research using health information may be subject to Nova Scotia's [Personal Health Information Act](#) or a similar piece of legislation in the jurisdiction where the participants reside. Describe the personal health information (definition explained in the guidance document) required and the information sources, and explain why the research cannot reasonably be accomplished without the use of that information. Describe how the personal health information will be used, and in the most de-identified form possible.

2.15.2 Will there be any linking of separate health data sets as part of this research?

No

Yes. If yes:

A) Why is the linkage necessary?

B) Describe how the linkage will be conducted (it may be helpful to append a flow diagram).

C) Does that linkage increase the identifiability of the participants?

2.15.3 Describe reasonably foreseeable risks to privacy due to the use of personal health information and how these will be mitigated.

SECTION 3. APPENDICES

Appendices Checklist. Please label and append all relevant material to this application in the order they will be used. This may include:

Reference list

Permission or support/cooperation letters (e.g. from anyone whose cooperation you need to recruit participants or conduct research)

Research agreements (required for research involving Indigenous communities)

Recruitment documents (posters, oral scripts, online postings, invitations to participate, etc.)

Screening documents

Consent/assent documents or scripts

Research instruments (questionnaires, interview or focus group questions, etc.)

- Contracts, data transfer agreements, material transfer agreements (finalized versions)
- Debriefing and/or study results templates
- List of data fields included in data repository
- Confidentiality agreements

Consent Form Templates

Sample consent forms are provided on the [Research Ethics website](#) and may be used in conjunction with the information in the *Application Instructions* document to help you develop your consent form.