2329 West Mall
Vancouver, BC V6T 1Z4

August 2, 2022

Sayra Gorgani
President, Innovate, Design, Sustain
University of British Columbia Okanagan
Kelowna, BC V1V 1V7

Dear Ms. Gorgani:

As discussed, here is the report about improving the understanding of waste sorting at the University of British Columbia Okanagan (UBCO). I have enjoyed gathering information about waste contamination at UBCO and potential solutions to the lack of understanding of waste sorting on campus.

The report's introduction establishes the significance of waste stream contamination at UBCO and proposes six initiatives to mitigate the knowledge gap. A feasibility and comparison analysis was used to evaluate the proposed initiatives. The data presented in the body of the report was collected from a survey of UBCO students, an informational interview with Jamie Armer, and a literature review. Recommendations for implementing the proposed initiatives are provided based on the data collected and the analysis results.

As you know from your work at Innovate, Design, Sustain, it can be challenging to implement changes on campus because of the scale of the waste management system. Therefore, to ensure the recommendations presented are practicable the analysis prioritized feasibility and efficacy.

I trust that the contents of this report meet your needs. Please do not hesitate to contact me via email at samanthakrieg08@gmail.com should you have any questions.

Sincerely,

Signature

Samantha Krieg

University of British Columbia

IMPROVING THE UNDERSTANDING OF WASTE SORTING AT THE UNIVERSITY OF BRITISH COLUMBIA OKANAGAN

Prepared for:

Sayra Gorgani, President, Innovate Design Sustain

Campus Waste Initiatives Team Lead, Innovate, Design, Sustain

Samantha Krieg

ENGL 301: Technical Writing

Dr. Erika Paterson

2022/08/04

TABLE OF CONTENTS

List of Figures

List of Tables

List of Acronyms

UBCO	University of British Columbia Okanagan
CWI	Campus Waste Initiatives
IDS	Innovate, Design, Sustain

ABSTRACT

By 2030, the University of British Columbia Okanagan (UBCO) has committed to reducing the waste sent from campus to landfills by 50% per capita compared to 2020. However, recent waste audits have identified a significant amount of contamination on campus. Contamination levels reached up to 38% in diversion waste streams and 88% in the garbage stream in 2022 and are due to limited awareness of proper waste sorting practices on the campus. Thus, implementing feasible and effective initiatives to improve the understanding of waste sorting is vital to reducing waste stream contamination. Table i presents four recommendations to improve the understanding of proper waste sorting practices at UBCO, along with brief plans for execution by the only sustainability focused-student organization on campus: the Innovate, Design, Sustain (IDS) Campus Waste Initiatives (CWI) team. The implementation of the recommendations will help IDS and UBCO meet their waste diversion targets.

Table i: Summary of recommended initiatives to improve the understanding of waste sorting at UBCO.

Recommended Initiatives	Description	Plan for Execution	Timeline
Educational seminars and events	Free seminars or events that teach students, faculty, and staff how to properly sort waste, waste diversion, and about the impacts of waste stream contamination.	Hosted by the IDS CWI team in collaboration with the UBCO Sustainability Office and Facilities Management.	Within 1 year
Educational signage	Placed strategically around campus to remind students, faculty, and staff of how to properly sort waste and about the impacts of waste stream contamination.	Designed and implemented by the IDS CWI team with the assistance of the UBCO Sustainability Office and Facilities Management.	Within 1 year
Improved signage near waste bins	Revising and standardizing the existing signage for clarity, accessibility, and potential to be interpreted quickly.	Designed and implemented by the IDS CWI team with the assistance of the UBCO Sustainability Office and Facilities Management.	Within 2 years
Waste bins with automated sorting	Replacing existing waste receptacles with waste bins that automatically sort all waste thrown into them into the appropriate waste stream using and AI-based system.	Designed, prototyped, and implemented by the IDS CWI team with the assistance of the UBCO Sustainability Office and Facilities Management. Pilot automated bins funded by the UBCO Innovation, Entrepreneurship & Impact Fund.	Begin planning immediately, pilot within 3 years

INTRODUCTION

Background Information

By 2030, the University of British Columbia Okanagan has committed to reducing the waste sent from campus to landfills by 50% per capita compared to 2020 (Armer). However, recent waste audits have shown that the diversion waste streams on campus have a significant amount of contamination (Mackintosh, 12-22; Green Step Solutions Inc., 31-36). Contamination is the presence of unaccepted or miscategorized materials in a waste stream. Contamination in diversion waste streams presents significant problems for diverting waste from landfills (Lyndsey). If there is considerable contamination in the diversion stream, all the waste goes to a landfill instead of being repurposed, recycled, or disposed of properly (Thoden van Velzen et al., 16). In addition, the presence of waste materials that could otherwise be recycled or repurposed in the garbage stream contributes to the expansion of landfills, a growing concern globally (Zelenika, 1-2). In 2022, contamination levels at UBCO reached up to 38% in diversion waste streams and 88% in the garbage stream (Green Step Solutions, 16-30). Reducing the significant waste stream contamination on campus is crucial to meeting the 2030 waste diversion target set by UBCO.

Waste management audits in 2018 and 2022 identified limited awareness of waste sorting practices as a significant contributing factor to the contamination at UBCO (Green Step Solutions Inc., 31-36; Mackintosh, 28-32). In addition, the recommendations in the audit reports highlighted the need for education and communication about proper waste sorting on campus. The results of a survey conducted by Innovate, Design, Sustain (IDS) in 2022 supported this finding by highlighting the lack of knowledge of proper waste sorting on campus (Gupta et al., 5-7). Improving the understanding of waste sorting at the University of British Columbia Okanagan is

vital to reducing waste stream contamination, thus increasing the amount of waste diverted from landfills.

As the only sustainability-focused student organization at UBCO, Innovate, Design, Sustain (IDS) understands the importance of meeting the sustainability targets set by the university. The IDS Campus Waste Initiatives (CWI) team's experience with similar projects and their close relationship with the UBCO Facilities Management and Sustainability Office prove their authority to act on the recommendations outlined in this report (Gupta et al., 1-7; Armer). The initiatives recommended in this report are intended to be implemented on campus by the IDS CWI team to improve the understanding of waste sorting on campus and meet the UBCO waste diversion target.

Statement of Problem

Diversion waste streams at the University of British Columbia Okanagan have a significant amount of contamination (Green Step Solutions Inc., 16-30). The presence of contaminants in diversion waste streams can prevent the materials from being properly repurposed, recycled, or disposed of (Thoden van Velzen et al., 16). Moreover, approximately 88% of waste found in the garbage stream could be redirected to diversion waste streams, eliminating its build-up in landfills (Green Step Solutions Inc., 30). The lack of understanding of waste sorting best practices at UBCO is a primary reason for the contamination (Gupta et al., 5-7; Green Step Solutions Inc., 31-36). Therefore, immediate changes are required to meet the IDS CWI team’s goal of improving waste diversion on campus and reaching UBCO’s target of a 50% reduction of landfill waste produced per capita by 2030 (Gupta et al., 1-2; Green Step Solutions Inc., 8). Implementing feasible and effective initiatives to improve the understanding of waste sorting at the University of British Columbia Okanagan is vital to reducing waste stream contamination.

Proposed Solutions

Based on a literature review and survey conducted in the spring of 2022 by IDS, this report proposes six initiatives to improve the understanding of waste management at the University of British Columbia Okanagan. Launching the initiatives on campus between 2022 to 2024, with the assistance of the UBCO Sustainability Office and Facilities Management departments, is recommended. Table 1 lists the proposed solutions and a brief execution plan. Detailed plans for coordination, organization, and implementation are based on discretion of the IDS CWI team and thus are not included in the scope of this report.

Table 1: Proposed initiatives to improve the understanding of waste sorting at UBCO.

Proposed Initiatives	Description	Plan for Execution
Educational Seminars and Events	Free seminars or events that teach students, faculty, and staff how to properly sort waste, waste diversion, and about the impacts of waste stream contamination.	Hosted by the IDS CWI team in collaboration with the UBCO Sustainability Office and Facilities Management.
Improved signage near waste bins	Revising and standardizing the existing signage (Figure 1) for clarity, accessibility, and potential to be interpreted quickly.	Designed and implemented by the IDS CWI team with the assistance of the UBCO Sustainability Office and Facilities Management.
Waste bins with automated sorting	Replacing existing waste receptacles with waste bins that automatically sort all waste thrown into them into the appropriate waste stream using and AI-based system. An example of this technology is shown in Figure 2.	Designed, prototyped, and implemented by the IDS CWI team with the assistance of the UBCO Sustainability Office and Facilities Management. Pilot automated bins funded by the UBCO Innovation, Entrepreneurship & Impact Fund (Faculty of Applied Science School of Engineering).
Educational signage around campus	To remind students, faculty, and staff of how to properly sort waste and about the impacts of waste stream contamination.	Designed and implemented by the IDS CWI team with the assistance of the UBCO Sustainability Office and Facilities Management.
Incentives for participation, achievement, or contribution	Incentives awarded to students, faculty, and staff who contribute to proper waste sorting on campus based on a point system.	Managed as a joint effort from the IDS CWI team, the Sustainability Office, and Facilities Management
Standardizing the colour coding system of the UBCO waste bins to match to provincial standard	Change mixed paper recycling to yellow, all other recycling to blue, and compost to green.	Designed and implemented by the IDS CWI team with the assistance of the UBCO Sustainability Office and Facilities Management.

Figure 1: Existing waste sorting signage at UBCO.

Figure 2: Example of an automated waste sorting bin with an AI-Based system (Greenwalt).

Working Definitions

Diversion Waste Stream: all waste streams that divert materials from landfills through recovery or recycling.

Waste Stream: "flows of a specific waste from its source through to recovery, recycling, or disposal" (Bourguignon).

Contamination: the presence of unaccepted or mis-categorized materials in a waste stream.

Waste Diversion: the redirection of waste from landfills through repurposing or alternative methods of disposal.

METHODOLOGY

Surveys

In the spring of 2022, the IDS Campus Waste Initiatives team surveyed UBCO students, faculty, and staff. The survey assessed the waste management and sorting knowledge, habits, and interest among the population (Gupta et al., 2-5). Findings showed that participants were willing to put in the effort necessary to sort waste properly but often lacked the knowledge or resources required (Gupta et al., 4-7). The results from the spring 2022 survey helped establish the proposed

initiatives to improve waste sorting at UBCO by determining the areas of most concern. Appendix A includes questions from the IDS CWI survey.

Eleven UBCO students responded to a voluntary and anonymous online survey from July 16 to 21, 2022. As one of the primary data sources for the analysis, the survey quantified students' opinions of the feasibility and efficacy of the proposed initiatives to improve the understanding of waste sorting on campus. In addition, it assessed respondents' interest in sorting waste and opinions on waste management on campus. This survey continued the survey done by the CWI team in the spring of 2022, focusing on the potential impacts of the proposed initiatives. Time and resource constraints limited the population surveyed to UBCO students; thus, it gathered no information from the campus faculty and staff. Students account for nearly 80% of the population of the Okanagan campus (University of British Columbia), and therefore their opinion of the proposed initiatives is crucial to successful implementation. Appendix B includes the July 2022 survey questions.

Informational Interview

On July 5, 2022, an informational interview was conducted with Jamie Armer, the Manager of Custodial and Waste Services at UBCO. This interview served as one of the primary data sources for the feasibility and comparison analysis. The responses established background information about waste contamination on campus, past and ongoing efforts to improve waste sorting, and the regulations surrounding waste management (Armer). Furthermore, they provided an understanding of the likelihood of the UBCO administration approving the implementation of the proposed solutions (Armer). Appendix C includes the questions asked during the informational interview.

Literature Review

A literature review served as a secondary data collection method for this report. The information gathered helped to establish the proposed initiatives to improve the understanding of waste sorting at UBCO. The recommendations included in the 2018 and 2022 waste audits conducted on campus were considered (Mackintosh, 28-32; Green Step Solutions Inc., 31-35). The following suggestions from the audits were incorporated into the proposed initiatives based on their presumed feasibility, efficacy, and compatibility with ongoing efforts on campus (Armer):

- "Standardise UBC waste sorting colours with provincial sorting colours" (Green Step Solutions Inc., 33).
- "Add messaging [to waste bin signage] to increase source-separation" (Green Step Solutions Inc., 33).
- "Create a short sustainability course" (Green Step Solutions Inc., 33).
- "Add no plastic bags, (plus other problem materials) messaging" (Green Step Solutions Inc., 33).
- "Standardize outdoor bins with similar signage to indoor sorting stations" (Green Step Solutions Inc., 33).
- "Encourage or host a competition between residence buildings to see who can recycle better. Add a prize as incentives" (Mackintosh, 32).

The information gathered during the literature review also provided supporting evidence for the feasibility and comparison analysis of the initiatives. Robinson stated that strategies to reduce waste stream contamination are most effective when they are simple, communicate a specific purpose, and focus on results (21). In addition, convenience was prioritized based on the analysis conducted by DiGiacomo et al. (311), which showed that the likelihood of proper waste sorting correlates to how easy it is to execute. Finally, the study of waste sorting at events at the

University of British Columbia Vancouver campus by Zelenika et al. found that standardized and clear signage is crucial for proper waste sorting (43-44). Therefore, the proposed initiatives to improve the understanding of waste sorting were determined based on their simplicity and clarity.

Regulation, Standard, and Policy Review

As part of the feasibility analysis, waste contamination regulations, standards and policies were researched. The limitations on contamination at UBCO are established by the companies contracted to manage and collect the waste; Cascades Canada ULC and Waste Management Canada (Armer). The standards set by these companies vary depending on the need of the contract holder and are not shared publicly (Armer). Thus, a comprehensive regulation review was not included in the scope of the feasibility and comparison analysis.

Feasibility and Comparison Analysis

A feasibility and comparison analysis was conducted using the information gathered from the July 2022 survey, informational interview, and literature review. The purpose was to determine the proposed initiatives with the highest potential to improve the understanding of waste sorting and that would be the easiest to implement at UBCO. The analysis focused on two primary categories: efficacy and feasibility. The efficacy of the proposed initiatives was based on their potential to improve the understanding of sorting at the University of British Columbia Okanagan. Feasibility was assessed based on the initiative's ease of execution. The analysis results were used to establish the recommendations outlined below and to provide the IDS CWI team with a starting point for their implementation.

COLLECTED DATA

Waste Stream Contamination

The interview with Jamie Armer, head of UBCO Facilities Management, gathered information on waste sorting at UBCO, including ongoing efforts to improve it, areas of concern, and contributing factors. UBCO is currently implementing the following initiatives to reduce waste stream contamination (Armer):

- Educational talks at incoming student onboarding events
- Regular audits of the waste management program
- Working with a waste management company that video records waste sorting and reviewing the results in monthly meetings
- Volunteer waste sorting assistants on campus

Areas of concern and factors that contribute to a lack of understanding of waste sorting identified by Jamie Armer during the July 5 interview include:

- Inconsistent signage and colour coding
- Unintelligible signage
- A lack out a clear explanation of proper waste sorting practices and their importance; teaching incoming first-year students must be prioritized but education is important for everyone on campus

The first half of the July 2022 student survey collected the participant's opinions on waste sorting at UBCO. Figure 3 indicates that none of the respondents found it very easy to sort waste on campus. Most found sorting waste on campus to be not at all or moderately easy, indicating a need for better communication and education. Over 45% of the population surveyed (5/11) indicated that they are very likely to sort their waste (Figure 4). This result demonstrates the significant interest in proper waste sorting on campus, indicating the potential for success of the

proposed initiatives. Figure 5 shows the third survey question, which assessed students' overall opinion of waste sorting on campus. The graph illustrates that the population surveyed has low to moderate confidence in the efficacy of the existing waste sorting at UBCO. The results of the July 2022 survey identified a need to improve the understanding of waste management on campus and are supported by the findings of Gupta et al. (5-7) in their spring 2022 survey of students, faculty, and staff.

Figure 3: The first survey question assessed students' opinion on the ease of sorting waste with five representing very easy, three representing moderately easy, and one representing not at all easy.

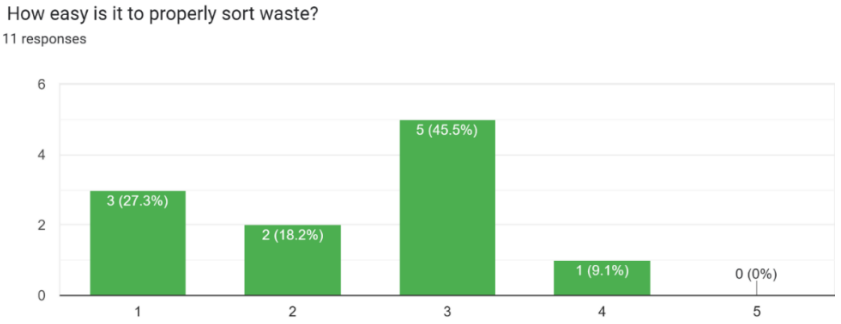


Figure 4: The second survey question assessed students' likelihood to sort waste with five representing very likely, three representing moderately likely, and one representing not at all likely.

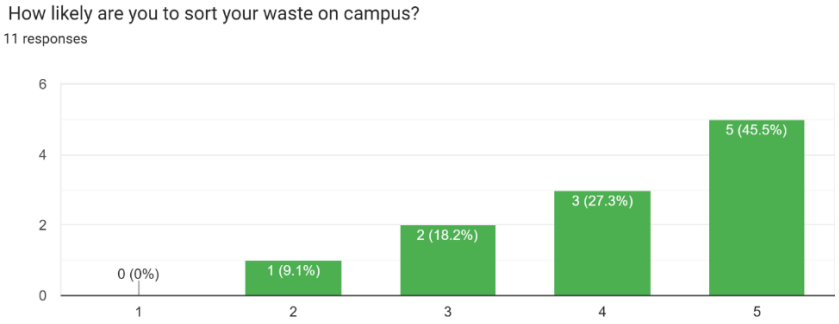
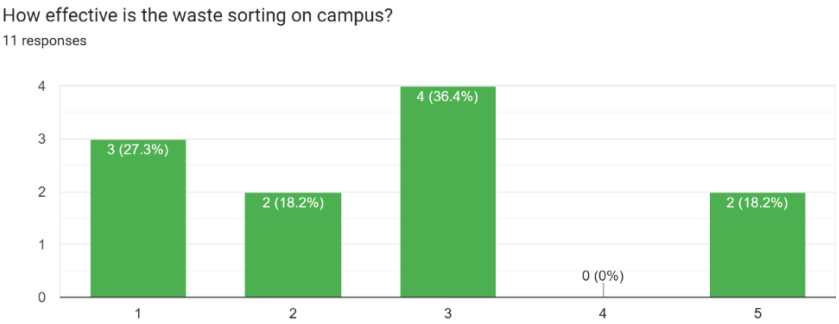


Figure 5: The third survey question assessed students' opinion on waste sorting at with five representing very effective, three representing moderately effective, and one representing not at all effective.



Efficacy of Proposed Initiatives

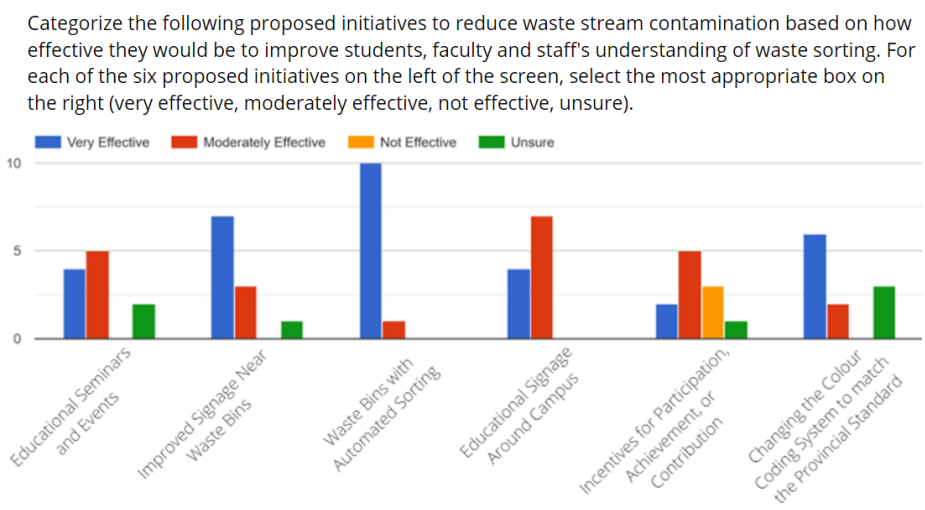
The potential of the proposed initiatives to improve the understanding of waste management on campus was determined from the July 2022 student survey and the informational interview. Table 2 categorizes the initiatives as very, moderately, and not effective based on the predominant survey response and opinion of Armer. Overall, the outcome is positive, with all of the initiatives categorized as moderately or very effective. For half of the proposed initiatives, there are discrepancies between the survey and interview results. These discrepancies may be due to varying perspectives or interests among students and the head of the facilities management department.

Table 2: Efficacy of the proposed initiatives.

Proposed Initiatives	Survey (Figure 6)	Informational Interview (Armer)
Educational Seminars and Events	Moderately Effective	Very Effective
Improved signage near waste bins	Very Effective	Very Effective
Waste bins with automated sorting	Very Effective	Very Effective
Educational signage around campus	Moderately Effective	Moderately Effective
Incentives for participation, achievement, or contribution	Moderately Effective	Very Effective
Standardizing the colour coding system of the UBCO waste bins	Very Effective	Moderately Effective

Figure 6 shows the responses to the fourth survey question, which gathered the respondent's opinions on the efficacy of the proposed initiatives. The waste bins with automated sorting had the most responses in the agreement, with all but one student out of eleven rankings this technology as very effective in improving the understanding of waste sorting. Although Armer agreed that the automated waste sorting bins are very effective, he emphasized the importance of educational solutions in creating long-term change since this technology is not commonplace in society. Revisions to the existing waste bin signage, including improved clarity and changing the colour coding, are also considered very effective by the survey respondents.

Figure 6: The fourth survey question which gathered the respondent's opinion on the efficacy of the proposed initiatives.



Feasibility of Proposed Initiatives

The ease of execution of the proposed initiatives was determined using the July 2022 student survey and the informational interview. Table 3 categorizes the initiatives as very, moderately, and not feasible based on the predominant survey response and perspective of Armer. Overall, the outcome is positive, with all initiatives categorized as moderately or very effective. There are discrepancies between most of the survey and interview results. These discrepancies may be due to varying perspectives or insight among students and the head of the facilities management department. In addition, a high-level cost approximation was included in the feasibility assessment during the informational interview but not during the survey.

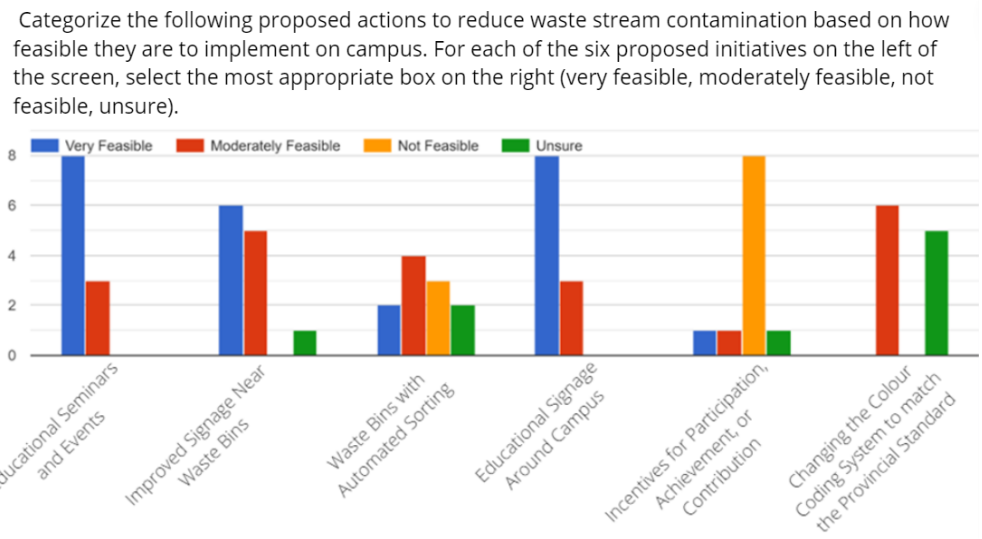
Table 3: Feasibility of the proposed initiatives.

Proposed Initiatives	Survey (Figure 7)	Informational Interview (Armer)
Educational Seminars and Events	Very Feasible	Very Feasible
Improved signage near waste bins	Very Feasible	Moderately Feasible
Waste bins with automated sorting	Moderately Feasible	Not Feasible*
Educational signage around campus	Very Feasible	Very Feasible
Incentives for participation, achievement, or contribution	Not Feasible	Moderately Feasible
Standardizing the colour coding system of the UBCO waste bins	Moderately Feasible	Not Feasible

* Based on immediate implementation across campus, moderately feasible to test as a pilot project (Armer).

Figure 7 shows the responses to the fifth survey question, which gathered the respondent's opinions on the feasibility of the proposed initiatives. The responses for the educational seminars, educational signage, and incentives for participation are generally in consensus. The spread in the survey responses for the waste bin with automated sorting may be due to the novelty and unfamiliarity of this technology. Overall, the survey and interview results indicate that the educational seminars and events, improved signage near waste bins, and educational signage around campus are the most feasible of the proposed initiatives.

Figure 7: The fifth and final survey question which gathered the respondent's opinion the feasibility of the proposed initiatives.



Feasibility and Comparison Analysis Results

The feasibility and comparison analysis determined which of the proposed initiatives the IDS CWI team should prioritize. The comparison of these initiatives was based on their potential to improve the understanding of waste sorting at UBCO and ease of execution. Table 2 indicates that improved signage and waste bins with automated sorting are the most effective; however, these initiatives are not feasible (Armer). Conversely, the educational seminars and events and the educational signage around campus are very feasible (Table 3) but are considered to be less

effective (Table 2). To meaningfully impact the understanding of waste sorting at UBCO in the near and long term, it is vital to consider the balance between feasibility and efficacy (Robinson, 21; DiGiacomo et al., 311; Zelenika et al., 43-44). Based on the findings of the feasibility and comparison analysis and supported by the literature, the IDS CWI team should implement the initiatives with the highest feasibility within a year and target those with high efficacy but moderate feasibility in the long term.

The colour coding standardization and incentives for participation ranked poorly compared to the other proposed initiatives (Table 2 and Table 3). Although the improvement of waste bin signage was considered moderately to very feasible, changing the colour coding would require the replacement of nearly all bins on campus, retraining of waste management staff, and education of students and thus would not be feasible (Armer). The significant challenges of changing all the waste management colour coding at UBCO to match the provincial standard negates the potential benefits (Armer). The incentives for participation, achievement, or contribution were ranked as not feasible and only moderately effective based on the July 2022 survey responses (Table 2 and Table 3). The analysis results indicate that students, who comprise nearly 80% of the population at UBCO (University of British Columbia), are likely not interested in this initiative. Therefore, it is not advisable to pursue changing the waste bin colour coding or introduce incentives for proper waste sorting.

Figures 6 and 7 show that some survey respondents indicated they were unsure of the efficacy and feasibility of the proposed initiatives; however, these responses were a small portion of the results and thus, do not have a significant impact. The respondent's uncertainty may be due to the conciseness of the survey questions or a lack of familiarity with the initiatives. Therefore, any further assessment should prioritize clarity and provide detailed explanations.

CONCLUSION

Summary of Findings and Recommendations

Recent audits of waste management at UBCO have found diversion waste stream contamination and the presence of waste materials that could otherwise be recycled or repurposed in the garbage are a significant concern (Mackintosh, 12-22; Green Step Solutions Inc., 31-36). In 2022, Green Step Solutions Inc. (31-36) and Gupta et al. (5-7) identified a lack of understanding of proper waste sorting as a primary reason for the contamination. UBCO is targeting a 50% reduction in landfill waste produced per capita by 50% by 2030 compared to 2020 (Green Step Solutions Inc., 8). As a sustainability-focused student organization, IDS is interested in reducing waste stream contamination and meeting the university's target. Implementing feasible and effective initiatives to improve the understanding of waste sorting at the University of British Columbia Okanagan is vital to reducing waste stream contamination, thus increasing the amount of waste diverted from landfills.

Based on the feasibility and comparison analysis, the IDS CWI team should consider the following initiatives to improve the understanding of waste sorting on campus (Table 4). The suggested timelines for implementation maximize the impact of the initiatives by prioritizing feasibility in the near term and efficacy in the long term. The recommended initiatives will improve the understanding of waste sorting at UBCO and thus reduce waste stream contamination.

Table 4: Recommendations to improve the understanding of waste management at UBCO.

Recommended Initiative	Timeline for Implementation
Educational seminars and events	Within 1 year
Educational signage around campus	Within 1 year
Improved signage near waste bins	Within 2 years
Waste bins with automated sorting	Begin planning immediately, pilot within 3 years

WORKS CITED

Armer, Jamie. Personal Interview. 5 July 2022.

Bourguignon, Didier. *Understanding waste streams: Treatment of specific waste*. European Parliamentary Research Service. Jul. 2015. Web. Jun. 2022. www.europarl.europa.eu/EPRS/EPRS-Briefing-564398-Understanding-waste-streams-FINAL.pdf

DiGiacomo, Alessandra, et al. "Convenience Improves Composting and Recycling Rates in High-Density Residential Buildings." *Journal of Environmental Planning and Management*, vol. 61, no. 2, 2017, pp. 309–31. *Crossref*, doi.org/10.1080/09640568.2017.1305332.

Faculty of Applied Science School of Engineering. "Innovation, Entrepreneurship and Impact Fund." *The University of British Columbia Okanagan*, engineering.ok.ubc.ca/student-resources/innovation-and-impact-dean-fund. Accessed 23 July 2022.

Green Step Solutions Inc. "UBC Okanagan waste audit." May 2022. Report.

Gupta, Aruhndathi, et al. "IDS Campus Waste Survey Summary." 3 Jul. 2022. Report.

Mackintosh, Andrea. "UBC Okanagan waste audit." Nov. 2018. Green Step Solutions Inc., Kelowna. Report.

Lyndsey. "What Happens to My Recycling: A Closer Look." *Recycle BC*, 19 May 2020, recyclebc.ca/what-happens-to-my-recycling-blog.

Robinson, Susan. "The Changing Waste Stream." 2014. www.epa.gov/sites/default/files/2015-09/documents/changng_wste_stream.pdf

Thoden van Velzen, Ulphard, et al. Issue paper: Recycling of different waste streams. Wageningen Food & Biobased Research, 2021. doi.org/10.18174/555442

University of British Columbia. “Facts and Figures - UBC's Okanagan Campus.” *The University of British Columbia Okanagan*, 27 May 2022, ok.ubc.ca/about/facts-and-figures.

Zelenika, Ivana, et al. “Toward Zero Waste Events: Reducing Contamination in Waste Streams With Volunteer Assistance.” *Waste Management*, vol. 76, 2018, pp. 39–45. *Crossref*, doi.org/10.1016/j.wasman.2018.03.030.

APPENDIX A: INNOVATE, DESIGN SUSTAIN CAMPUS WASTE INITIATIVES SURVEY QUESTIONS

IDS Campus Waste Survey

We want to hear what you think about waste services on campus and gather information on how they can improve! The results from this survey will guide Innovate, Design, Sustains (IDS) existing projects and inform our future goals.

Complete the survey and enter your email at the end to be entered in a draw for one of four $25 Amazon gift cards! Your email is recorded separate from the survey responses, so your answers will remain anonymous. Please answer honestly to help us have a meaningful impact on campus waste services.

Interested in learning more about IDS or becoming a member? Check out our Instagram page for giveaways, events, and project updates and find the new member form in the linktree: https://www.instagram.com/idsubco/?hl=en

This survey was brought to you by IDS and will help further UBCO's goal of becoming a more environmentally friendly campus.

* Required

1. What is your role at UBCO? *

Mark only one oval.

- ◯ Undergraduate Student
- ◯ Graduate Student
- ◯ Faculty member
- ◯ Staff member

2. What faculty are you in?

Mark only one oval.

- ◯ Faculty of Arts and Social Sciences
- ◯ Faculty of Creative and Critical Studies
- ◯ School of Education
- ◯ School of Engineering
- ◯ Faculty of Health and Social Development
- ◯ Faculty of Management
- ◯ Faculty of Science
- ◯ Faculty of Medicine
- ◯ Graduate Studies
- ◯ Other: _____

3. What is your registered year of study? *

Mark only one oval.

- ◯ First Year
- ◯ Second Year
- ◯ Third Year
- ◯ Fourth
- ◯ Fifth+ or graduate student
- ◯ I am a staff or faculty member

4. Please indicate your gender.

Mark only one oval.

- ◯ Female
- ◯ Male
- ◯ Non-binary
- ◯ Prefer not to say
- ◯ Prefer to self-describe (type your answer for the 'Other' option)
- ◯ Other: _____

5. Where do you live? *

Mark only one oval.

- ◯ On-campus residence
- ◯ Off-campus

6. Do you have any visual impairments? *

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Prefer not to say

Personal Habits

This section explores your personal habits when you come to campus. This information will help us to better implement our projects to reflect personal habits, ultimately creating more impact.

7. Please indicate your interest in sustainability on campus. *

Mark only one oval.

	1	2	3	4	5	
Not Interested	◯	◯	◯	◯	◯	Very Interested

8. What are some of the common items that you throw away into the bins on campus? Select all that apply. *

Check all that apply.

- ☐ Coffee cups and lid
- ☐ Bio-containers from food services (white recyclable boxes you get your food in on campus)
- ☐ Food waste and organics
- ☐ E-waste
- ☐ Glass containers and jars
- ☐ Plastic bottles
- ☐ Paper
- ☐ Metal cans
- ☐ Other: _____

9. How often do you buy food on campus? *

Mark only one oval.

- ◯ Everyday, multiple times
- ◯ Everyday, once
- ◯ Every few days
- ◯ Once a week
- ◯ Every couple weeks
- ◯ Rarely
- ◯ Never

10. Which campus food service(s) do you use the most? Select all that apply. *

Check all that apply.

- ☐ The Well
- ☐ Fusion Express
- ☐ Green Bean
- ☐ Koi Sushi
- ☐ The Pritchard
- ☐ Comma
- ☐ Tim Hortons
- ☐ Subway
- ☐ Starbucks
- ☐ Rocket
- ☐ Sunshine
- ☐ Food Trucks
- ☐ Other: _____

11. Which campus building(s) do you spend the most time in? Select all that apply. *

Check all that apply.

- ☐ Arts (ART)
- ☐ Sciences (SCI)
- ☐ Arts and Sciences (ASC)
- ☐ Engineering, Management and Education (EME)
- ☐ Library (LIB)
- ☐ Commons (COM)
- ☐ Administrative (ADM)
- ☐ University Centre (UNC)
- ☐ Creative and Critical Studies (CCS)
- ☐ Fipke (FIP)
- ☐ Reichwald Health Services (RHS)
- ☐ University Residence
- ☐ Gym
- ☐ Other: _____

General Knowledge

This section seeks insight on how well you know how to sort your waste properly. The correct answers to this section, as well as your score, will be provided at the end of the survey.

12. Which waste bins are available to the general public (not including labs, restricted areas) on campus? Select all that apply. * 5 points

Check all that apply.

- [ ] Returnables
- [ ] Clothes
- [ ] Recycling
- [ ] Glass
- [ ] E-waste
- [ ] Compost
- [ ] Liquids
- [ ] Garbage

13. Which bin colour represents the returnables (cans, bottles) bin? * 1 point

Mark only one oval.

- ◯ Blue
- ◯ Orange
- ◯ Green
- ◯ Yellow
- ◯ Grey
- ◯ Red

14. Which bin colour represents the compost (organic and food waste) bin? * 1 point

Mark only one oval.

- ◯ Blue
- ◯ Orange
- ◯ Green
- ◯ Yellow
- ◯ Grey
- ◯ Red

15. Which bin should you throw an empty and clean coffee cup in? * 1 point

Mark only one oval.

- ◯ Recycling
- ◯ Garbage
- ◯ Compost
- ◯ Returnables
- ◯ E-waste
- ◯ I don't know

16. When you have liquid waste (example: coffee leftover in your cup), what is the best way to dispose of it? * 1 point

Mark only one oval.

- Keep the liquid in its container and put the container in the recycling bin
- Keep the liquid in its container and put the container in the garbage bin
- Pour the liquid down the nearest drain, then put the cup in the garbage bin
- Pour the liquid down the nearest drain, rinse it, then put the cup in the recycling bin

17. Did you know that if you put a non-recyclable item in the recycling bin, the entire contents has to go to the landfill? This is known as contamination. *

Mark only one oval.

- I had heard that before but was not sure if it was true
- Yes, I knew that
- No, I did not know that

18. Should you recycle your coffee cup if it still has liquid in it or has not been rinsed? * 1 point

Mark only one oval.

- Yes
- No
- I don't know

19. If you live in residence, would you be able to identify the nearest appropriate e-waste disposal bin? *

Mark only one oval.

- I do not know where the nearest one is
- Yes, I know where the nearest bin is
- I did not know we had e-waste bins
- I do not live in residence

Waste Management on Campus

This section of the survey explores what you think about the waste management system on campus.

20. How confident are you in how well you sort your waste? *

Mark only one oval.

	1	2	3	4	5	
Not Confident						Very Confident

21. What would you like to change about the current waste system on campus? If you have any other suggestions, please type your answer in the textbox. *

Check all that apply.

- [ ] Increase awareness about waste management and sorting
- [ ] Offer more reusable items on campus
- [ ] Allow people to bring their own reusable containers
- [ ] Introduce student ambassadors for sustainability and waste management
- [ ] Other: _____

22. Do the current visuals/graphics near the bins help you pick the right bin to throw your waste in? *

Mark only one oval.

- ◯ I do not notice the graphics
- ◯ I occasionally look at the graphics if I am unsure which bin to use
- ◯ I check the graphics every time I dispose of my waste
- ◯ I already know how to sort my waste so I do not look at the graphics
- ◯ I do not think the graphics are helpful
- ◯ I am unable to look at the graphics
- ◯ Other: _____

23. Have you faced any difficulty in finding the right bin on campus? *

Check all that apply.

- [ ] Yes, compost bins
- [ ] Yes, E-Waste bins
- [ ] Yes, recycling bins
- [ ] Yes, garbage bins
- [ ] Yes, returnables bins
- [ ] No
- [ ] Other: _____

24. What barriers do you face in terms of throwing out waste properly? *

Check all that apply.

- [ ] I cannot find the right bins for my waste
- [ ] The bins are often full or over-flowing
- [ ] I am unsure of which items go in which bin
- [ ] Sorting my waste is too time consuming
- [ ] I have to walk too far to find the right bin for my waste
- [ ] Other: _____

25. If there is a QR code on the bins with more sorting information, how likely are you to scan it if you are confused about how to dispose of your waste? *

Mark only one oval.

	1	2	3	4	5	
Not Likely	◯	◯	◯	◯	◯	Very Likely

26. What would best motivate you to sort your waste properly? *

Check all that apply.

- [ ] Incentives or prizes
- [ ] Better graphics and posters around the bins
- [ ] More accessible bins
- [ ] Better knowledge of campus waste management and disposal
- [ ] None of the above
- [ ] Other: _____

27. Have you seen any interesting waste management strategies elsewhere that can be implemented on our campus? If so, please describe the strategies.

_____

_____

_____

_____

_____

APPENDIX B: JULY 2022 UBCO STUDENT SURVEY QUESTIONS

Feasibility Analysis for Improving the Understanding of Waste Sorting at the University of British Columbia Okanagan

This anonymous and voluntary survey will gather information on the interest students at the University of British Columbia Okanagan (UBCO) in proposed efforts to improve their understanding of waste sorting. The data will be used to conduct a feasibility analysis on the proposed efforts as part of a formal report for an undergraduate technical writing class at UBC. The formal report will be addressed to the Campus Waste Initiatives Team at Innovate, Design, Sustain (IDS) to inform their current and future projects. IDS is the first sustainability-focused student organization at UBCO, and the Campus Waste Initiatives Team works towards improving waste management and diversion on campus.

The survey has two sections, waste sorting practices and education, with a total of six questions. It will take approximately five minutes to complete. Participation is voluntary and anonymous. Thank you for your time and interest.

* Required

1. How easy is it to properly sort waste? *

Mark only one oval.

	1	2	3	4	5	
Not at all easy	◯	◯	◯	◯	◯	Very easy

2. How likely are you to sort your waste on campus? *

Mark only one oval.

	1	2	3	4	5	
Not at all likely	◯	◯	◯	◯	◯	Very likely

3. How effective is the waste sorting on campus? *

Mark only one oval.

	1	2	3	4	5	
Not at all effective	◯	◯	◯	◯	◯	Very effective

Initiatives to Improve the Understanding of Waste Sorting On Campus

The initiatives proposed in this section are intended to reduce waste contamination at UBCO by improving the understanding of waste sorting practices on campus.

Waste contamination is the presence of unaccepted materials in a waste stream and presents significant problems in diverting waste from landfills. If there is considerable contamination in the waste collected, all of it is sent to a landfill instead of being repurposed or disposed of properly.

4. Categorize the following proposed initiatives to reduce waste stream contamination based on how effective they would be to improve students, faculty and staff's understanding of waste sorting. For each of the six proposed initiatives on the left of the screen, select the most appropriate box on the right (very effective, moderately effective, not effective, unsure).

Check all that apply.

	Very Effective	Moderately Effective	Not Effective	Unsure
Educational seminars and events	☐	☐	☐	☐
Improved signage near waste bins	☐	☐	☐	☐
Waste bins with automated sorting	☐	☐	☐	☐
Educational signage around campus	☐	☐	☐	☐
Incentives for participation, achievement, or contribution	☐	☐	☐	☐
Changing the colour coding system of the UBCO waste bins to match the provincial standard	☐	☐	☐	☐

5. Categorize the following proposed actions to reduce waste stream contamination based on how feasible they are to implement on campus. For each of the six proposed initiatives on the left of the screen, select the most appropriate box on the right (very feasible, moderately feasible, not feasible, unsure).

Check all that apply.

	Very Feasible	Moderately Feasible	Not Feasible	Unsure
Educational seminars and events	☐	☐	☐	☐
Improved signage near waste bins	☐	☐	☐	☐
Waste bins with automated sorting	☐	☐	☐	☐
Educational signage around campus	☐	☐	☐	☐
Incentives for participation, achievement, or contribution	☐	☐	☐	☐
Changing the colour coding system of the UBCO waste bins to match the provincial standard	☐	☐	☐	☐

APPENDIX C: INFORMATIONAL INTERVIEW QUESTIONS

Informational Interview Questions
Improving Understanding of Waste Sorting at the University of British Columbia Okanagan
ENGL 301 Final Report

Waste Contamination

1. What are the consequences of waste stream contamination?
2. Which waste streams at UBCO have the most contamination?
3. Which waste bin locations have the most contamination?
4. Has UBCO set any goals or targets for reducing waste stream contamination?
5. Is UBCO currently taking any steps to reduce waste stream contamination?
6. What regulations, standards, or policies does UBCO have to abide by for waste sorting and contamination?
7. How many waste streams are there at UBCO? Has the number of waste streams changed in recent years?

Waste Sorting

1. What factors contribute to the lack of understanding of waste sorting at UBCO?
2. On a scale from one to five, how feasible are the following proposed efforts to reduce waste stream contamination:
3. On a scale from one to five, how effective are the following proposed efforts to reduce waste stream contamination:
4. What departments or organizations at UBCO can help reduce the waste sorting knowledge gap? Are there specific areas to which they can contribute?