

An Evaluation of the 3 / 4 Bin System at Dalhousie University

Group Project ENVS 3502

Presented to: Karen Harper

4/6/2008



Dalhousie Greenfoot Team:

Jonathan Carty

Noel Coultice

Susan Kesebi

Meghan Shields

Table of Contents

1. Abstract.....	4
2. Acknowledgments	4
3. Introduction.....	5
3.1. Problem	5
3.2. Purpose	6
3.3. objectives.....	7
3.4. Research Question	8
3.5. Hypothesis	8
3.6. Significance	8
4. Literature review	9
5. Literature review	11
5.1. Proposed research methods	11
5.2. Procedures	12
5.3. Limitations/Delimitations.....	13
6. Results.....	14
6.1. Waste audit results	14
6.2. Sign survey results	16
6.3. Results of recycling questionnaire	17
7. Discussion.....	23
7.1. Sign Survey	24
7.2. Questionnaire and Garbage audit	24
8. Conclusion	26
9. References	27
10. Appendix.....	29

Figures and Tables

Introduction

Table 1.1: Recycling / Organic waste in tonnes at Dalhousie University	5
--	---

Waste audit results

Figure 1.1: Initial Ratio before waste audit.....	14
Figure 1.2: Trash	14
Figure 1.3: Compost.....	15
Figure 1.4: Paper	15
Figure 1.5: Containers	15
Figure 1.6: Comparison Ratio	16

Sign survey results

Figure 2.1: Sign effectiveness	16
--------------------------------------	----

Results of recycling questionnaire

Figure 3.1: Question 1	17
Figure 3.2: Question 2.....	17
Figure 3.3: Question 3.....	18
Figure 3.4: Question 4.....	18
Figure 3.5: Question 5.....	19
Figure 3.6: Question 6.....	19
Figure 3.7: Question 7.....	20
Figure 3.8 i: Question 8.....	20
Figure 3.8 ii: Question 8.....	21
Figure 3.9: Question 9.....	22
Figure 3.10: Question 10.....	22

1. Abstract

This paper is the final report of the research project for the Greenfoot recycling team for the Environmental Problem Solving II class at Dalhousie University, supervised under Karen Harper. The overall goal of the project was to assess the state of our current 3/4 bin recycling and waste system in the Killam Library and SUB building, and to improve the efficiency of this system. Using a questionnaire, a sign survey and a waste audit, we gathered information on recycling and waste habits at Dalhousie and concluded there were a number of ways that Dalhousie's system could be improved. These include: Providing signs that are more detailed than the ones currently in place and educating students and staff about what materials are allowed in each bin. Our findings showed us that there was a large disconnect between how people claimed to know what waste/recyclables went in which bin in the survey but the waste audit showed that much of the sorting was incorrect and a large percentage of garbage could be diverted away from the landfill. Overall, we found that Dalhousie's waste and recycling system could be improved with better signs and a greater awareness among users.

2. Acknowledgments

We would like to thank our professor, Karen Harper, for all her help and dedication to all group projects. We would also like to thank Mike Murphy of Dalhousie's Facilities Management for providing us with useful information about the recycling program and allowing us to do our waste audit here at Dalhousie. We would also like to send a special thanks to Rochelle Owens, of Dalhousie's office of sustainability, she was a great help and provide us with some very helpful information and guided our project in the right direction. We would also like to extend our gratitude to all of the students, faculty, and staff who participated in our study.

3.Introduction

The global community is producing more waste today than ever before. Factors such as an expanding population and increasing urbanization have both contributed to the vast amount of waste produced in the world annually (David Suzuki, 2007). In Canada, as is the case in many other industrialized nations, our high rates of consumption and past decades of environmental ignorance, has resulted in an over-reliance on landfills to dispose of our waste(Environment Canada, 2008).

Landfills are not the solution to our waste problems for a number of reasons. First, toxic runoff from decomposing garbage in landfills may leach into surrounding areas, which may have detrimental effects on the vegetation, wetlands, groundwater, and wildlife populations in the area (Environment Canada, 2008). Decomposing waste also produces carbon dioxide and methane gases, landfill sites account for thirty-eight percent of the nation's total methane emissions which are three times stronger than CO₂ gases in the atmosphere (Freedman, 2006).

The second reason why landfills are not the solution is because of the ecological foot print that goes along with a landfill; the landfill alone takes up a large area plus the roads that are often cut into the land take up much surface area. As well often time landfills give off a not so tasteful aroma so they are often built outside of towns and cities, which increase CO₂ emissions because the waste trucks have to drive so far to reach the landfills.

In response to these problems, there has been a governmental and societal shift to reduce the amount of waste going to landfills in Canada and other parts of the world. One of the many comprehensive recognized ways of doing this, is the three "R's" reduce, reuse and the main focus of this project 'recycling'. Studies suggest that, recycling has become increasingly

important to society and industry to meet the goals of cost reduction, efficient management of limited resources, and reduced landfill utilization (Martchek, 2000).

At Dalhousie University, the Facilities Management department operates an on campus recycling program that has increased each year after its implementation in 1991(see Table 1).

Table 1. Recycling / Organic Waste in Tonnes At Dalhousie University

Year	Paper Products	Beverage Containers	Batteries	Organic Waste	Totals
1991	50.4	2.13			52.53
1992	111.0	2.38			113.38
1993	119.3	3.13			122.43
1994	131.5	3.18			134.68
1995	155.8	3.83			159.63
1996	208.6	7.15			215.75
1997	292.7	9.47			302.17
1998	323.52	10.11	0.19		333.82
1999	399.15	10.84	0.58	68.00	478.57
2000	395.74	10.36	0.59	102.10	508.79
2001	402.27	15.35	0.56	128.56	546.74
2002	411.09	16.56	0.87	149.29	577.81
2003	421.77	16.20	1.10	155.08	594.15
2004	441.98	15.73	1.00	166.25	624.96
2005	463.49	16.7	2.47	175.39	658.05
2006	479.25	16.62	1.39	181.88	679.14
Totals	4807.56	159.74	8.75	1126.55	6102.60

Initially, the program focused on recycling paper products and beverage containers, but expanded in 1998 to incorporate batteries and in 1999 to incorporate organic waste.

3.1.Problem

By decreasing the amount of waste/trash that is sent to the landfill every year, the current Dalhousie campus recycling program continues to be beneficial to our surrounding environment. Furthermore, the program is an important step towards achieving a more sustainable campus,

which is a common goal of institutions and governments alike. Universities need to be the vehicle of social change, they need to lead the way towards more sustainable practices, and this is because they are often times networked globally and can connect on a local level with society (M'Gonigle, 2006). Although Dalhousie has increased their annual recycle every year since the program started in 1991, there is still a considerable amount of recyclable waste that is being sent to landfills and much can be done to improve the program's efficiency and increase its success.

3.2.Purpose

The purpose of this research project is to increase the efficiency of the Dalhousie University campus recycling program, with the lowest possible budget. This project proposes simple recommendations to Mike Murphy of Facilities Management, Rochelle Owen the first director of the Office of Sustainability and other decision makers that. The long run goal of this research project will be to decrease the amount of waste going to landfills, which will reduce Dalhousie's impact on the environment and save the university money, while helping Dalhousie become a more sustainable campus.

3.3.Objectives

The first objective of this study was to gain a deeper understanding of Dalhousie's recycling program. In particular, we investigated students', faculty members', and Staff recycling habits on campus to understand the reasons why they do or do not use the appropriate recycling bin provided by Dalhousie University. We also wanted to see if what people answered on the questionnaire was true, we would perform a waste audit to test the validity of the answers. The primary objective of this research project was to make simple and reasonable recommendations to improve the efficiency of Dalhousie's campus recycling program, the main idea for improving the system is better signs on each on the bins.

3.4. Research Question

How efficient is the campus recycling program at Dalhousie University? And, what changes could be implemented to improve the system's efficiency?

3.5. Hypothesis

We hypothesized as a group and with Rochelle Owen that a large amount of recyclable material on campus is being discarded as trash in garbage receptacles instead of being put in the proper recycling bins, and non-recyclable material is being put into recycling bins, and that some recyclable items are discarded into incorrect recycling bins.

We hypothesized that one of the main reasons for the improper placement of material in the bins is because individuals are often confused; we believe it is due to improper labeling and improvements on the labeling of each bin by using colour picture, words and products that are on campus (i.e. Tim Horton's coffee cup, Pepsi can, etc.) can significantly improve the current systems efficiency.

There were several other explanations that we hypothesized as to why some individuals do not use the receptacles on campus properly, including: a lack of knowledge about what waste is recyclable on campus and what waste is not, individuals are too lazy to use the correct receptacles and lack of recycling bins.

3.6. Significance

The information and data presented in this research project is significant because it can be used beyond the limits of the Dalhousie campus and can be useful for a number of groups and individuals. The information and data provided by this study can be of use to the entire Dalhousie University population. Mike Murphy and Rochelle Owen can use this research to

better understand the problems associated with the current recycling system on campus and they will be provided with ideas on how to improve the system. Individual students who have a personal interest in Dalhousie's environmental initiatives may also be interested in this study for the use of their own research projects, as well societies such as the Environmental Programmes Student Society might be interested in the results of this research project. Also other universities can use this study to compare their campus's recycling habits with Dalhousie's, to help understand how to establish a more efficient campus recycling program.

4.Literature Review

For the Greenfoot literature review, a number of projects were examined. Many of the studies had similar characteristics in research methods and the questions and answers they were looking for. As expected, much of the same information was found to be similar, as was the conduct of the research.

One study done at McMaster University (coupled with the University of North Carolina) examined a "hypothetical municipality" in which the attempt was to identify whether or not this research deemed feasible in the real world. The major difference between this analysis and Team Greenfoot was that this approach focused mainly on the cost of disposal into landfills and how to lower those costs. This approach was not favored in our research because the focus was not relevant to our study. The center of our attention was rather on what was being done wrong *before* the waste reached the landfill.

Another study done was at the University of Toronto and focused on the St. George Campus. The study was specifically on composting at that campus and implementation probability according to costs and payback time. The largest difference of this study, compared to Team Greenfoot, was not only that the focus was on composting, but also that it was a

financial analysis, as in it looked at a possible profit margin for the university as oppose to helping with sustainability. This study was deemed not feasible because the pay-back period of initial costs of implementation was too long.

Lastly, a past project done at Dalhousie in the 2006 Environmental Problem Solving II class was very similar to our research and conduct. It was interesting to compare the two studies because they were both so similar, but yet very different at the same time. Similar aspects of research found were things like the survey questions, observations on disposal by the public at Dalhousie and the possible actions that perhaps should be taken to improve the situation. The most prevalent difference, however, was the fact that Team Greenfoot proposed that Dalhousie was confused because of improper signage methods and placement, as well as actual pictures. Our team looked at 2 buildings – the Killam and the SUB, while this project analyzed 5 buildings in total. Our team was able to complete a waste audit, and their team was not able to get in contact with facilities management. Team Greenfoot had questionnaires and short surveys, while their team just had surveys. Nevertheless, the similarities in analyzing the data collected were almost the same, and obvious improvement ideas were nearly unchanged.

5.Methods

5.1.Proposed research methods

In this project we made use of a mixed methods approach to collect and analyze both qualitative and quantitative data, in order to present a true representation of the Dalhousie current recycling program. We used a concurrent transformative method in our data collection strategy, meaning data will be taken simultaneously while not favouring either quantitative or qualitative data and allowed us to use both types of data interchangeably (Creswell 2003).

We feel it is necessary to improve this project's validity by collected relevant background information through research and literature reviews (example, looking at similar studies done at other universities). We continuously consulted with not only each other but our professor, teacher assistant, Rochelle Owen, Mike Murphy and reference the textbook, to help with this projects reliability.

Our group had chosen to use an action oriented questionnaire as our preferred method of choice. It includes a variety of closed ended questions and a couple open ended ones, to ensure we collect both qualitative and quantitative data (Creswell 2003). The questionnaire was self administered by group members at random; in order to ensure there are no complications or confusion with questions; group members were present while the questionnaire was being completed by sample subjects. Using Haphazard, a Non-probabilistic sampling technique, data was collected at random by whoever is available and willing to participate. No criteria or specifications were required when recruiting participants, any and all Dalhousie students, faculty, and employees were used. For the survey, observations, and audit we use a stratified random

sample. The sample size for the surveys and the number of observations and the total weight for trash audit were all predetermined.

5.2.Procedures

Our procedures leading up to and including the administration and completion of the surveys and observations include:

Step 1) Created research the question: How efficient is the campus recycling program at Dalhousie University? And, what changes could be implemented to improve the system's efficiency? from which we built our study; decided to triangulate our data by conducting interviews, surveys, and a waste audit

Step 2) Determined the two buildings we would use for the groups surveys and waste audit; (killam and SUB) each buildings had a large multiunit recycling bin and was used by a large number of individuals on campus

Step 3) Conducted a 'Pilot Study' of our survey; received feedback from participants regarding what they thought should be changed

Step 4) Edited the original draft of the survey based on participant's recommendations as well as our own ideas and created the final draft of the survey

Step 5) create and edited observation sheet; only three questions which sign do you like better had three choices

Step 6) Contacted Rochelle Owens had a group meeting with her, she gave very valuable information

Step 7) Set goal of completing 80 surveys, set quota for the number of surveys to be done in each building according to what we thought would be an accurate depiction of the Dalhousie campus, keeping in mind our time constraints. 20 surveys by each group member

Step 8) Met with Mike Murphy of Facilities Management to set a date and time when we would be allowed to do a waste audit. He then contacted the staff working that day and advised them not to empty bins as a group of students were going to empty them.

Step 9) Set goal of auditing at least 50 lbs of trash in total

Step 10) Administered surveys from March 10 - 17th, in both Killam and SUB buildings; approached random individuals and asked them to complete survey; participation was voluntary and participants read and answered questions themselves; in total completed 80 surveys

Step 11) March 18th did waste audit in the afternoon at both the killam and SUB.

Step 12) Assessed, analyzed, and compared data from the surveys, observations and waste audit; put results into graphs and charts for clear explanations of our findings

5.3.Limitations/Delimitations

Limitations in your research or study are factors that you have no control over, while delimitations are measures that you intentionally impose on your project or study (MacAskill 2006).

Limitations

The major *limitations* we faced when conducting our study. The first limitation was time, we only had one semester (three and half months) to plan, design, implement, and analyze our research. Thus, time was a major consideration when planning how many interviews to complete, how many buildings to observe, and what data to compare and analyze.

Delimitations

There were also several *delimitations* that we intentionally placed on our research. First, we chose to survey a set number of people and observe a specific amount of bins in certain buildings on campus. In addition, the Studley campus was the campus of choice for reasons, such as easy access for the group and these buildings have a high traffic rate. The SUB and the Killam Library were the building of choice; these buildings are accessed by a wide variety of students, giving the sample population more randomness and even distribution of individuals from each faculty.

6.Results

6.1 Waste audit results

The following section includes the results of the waste audit. Exact procedures and correlations are included in the methods and discussion sections, respectively. The figure numbers of the waste audit results correspond to those designated in the table of contents Fig. 1.1- 1.6.

Fig 1.1 Initial Ratio Before Audit

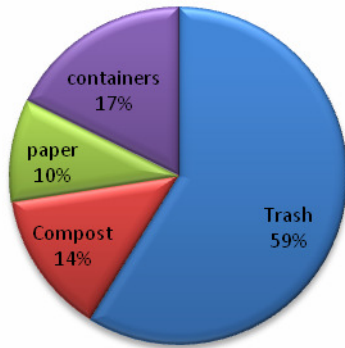


Fig 1.1 The percentage of total weight in pounds of each bin type before sorting in the SUB and Killam Library.

Fig 1.2 The Initial Trash weight measured in pounds compared to the after sorting Trash weight in pounds.

Fig 1.2 Trash

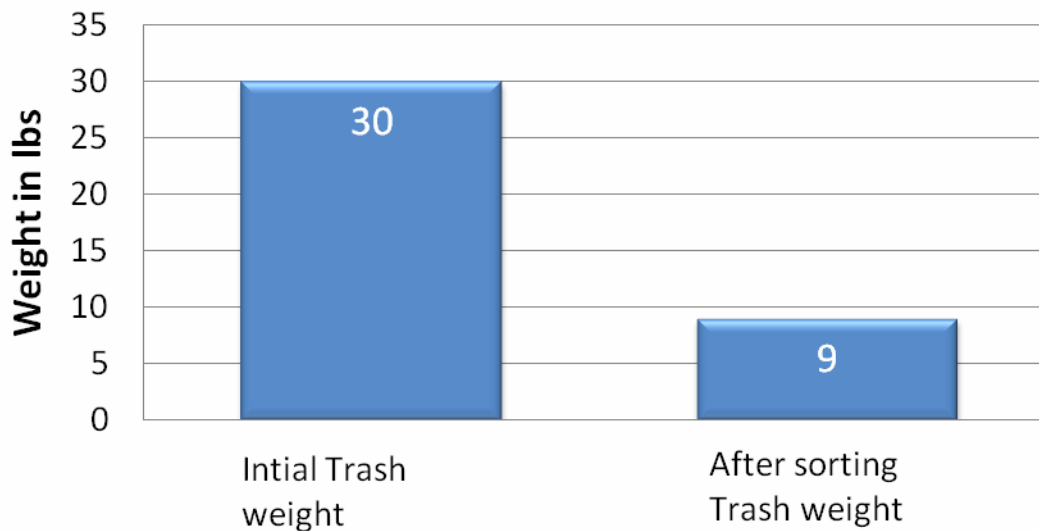


Fig 1.3 Compost

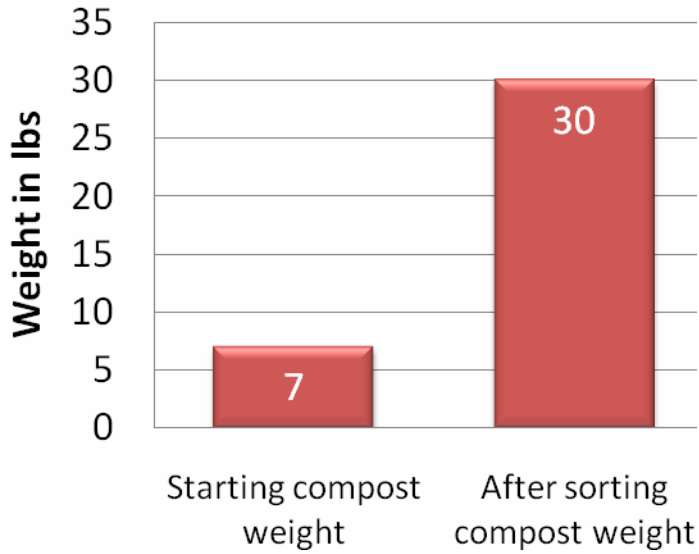


Fig 1.3 The initial compost weight in pounds compared to the after sorting compost weight in lbs.

Fig 1.4 The initial paper weight in pounds compared to the after sorting paper weight in pounds.

Fig 1.4 Paper

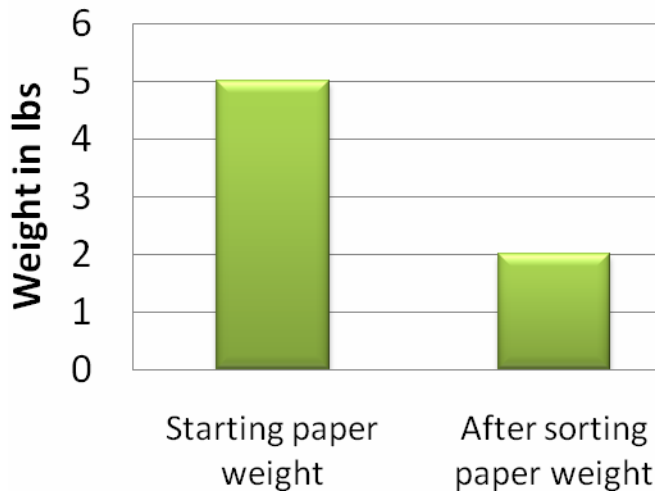


Fig. 1.5 Containers

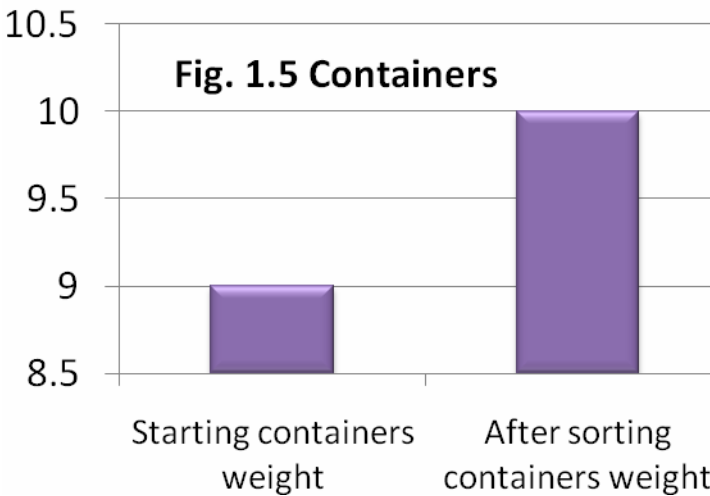


Fig 1.5 The initial container weight in pounds compared to the after sorting container weight in pounds.

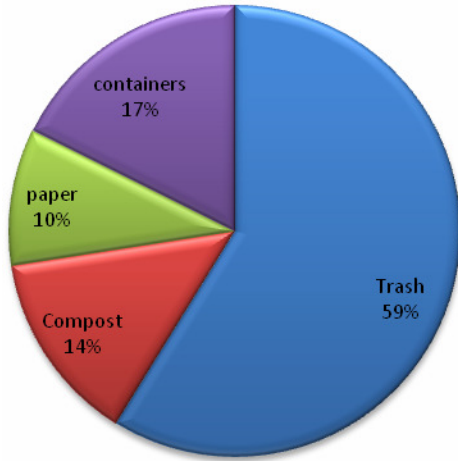
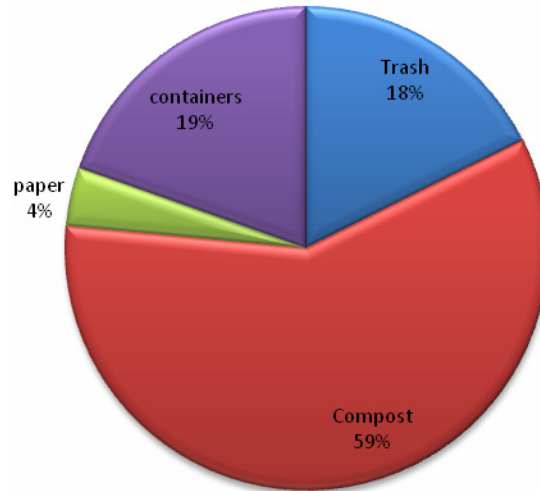
Initial Ratio Before Audit**Final Ratio After Audit**

Fig 1.6 The comparison of the initial weight in pounds percentage before the waste audit was completed with the percentage of weight in pounds after. Major findings of the waste audit show a reduction of trash from 59% of total weight to 18% of total weight after correct sorting completed. Also noted is the increase of compost from 14% of initial weight percentage to 59% after sorting was completed.

6.2. Sign survey results

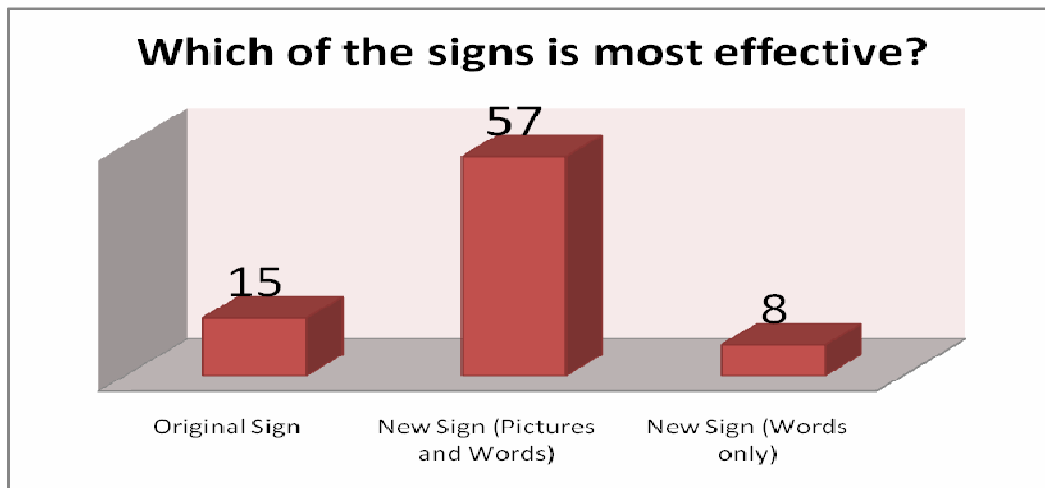


Fig 2.1 In a haphazard survey of 80 participants, 57 participants stated that they found the new sign with words and pictures the most effective for recycling with the 3 / 4 bin system. The original signs were next with 15 participants responding that they were the most effective. The

new signs with words only proved non-effective with only 8 participants choosing them as the most effective.

6.3. Results of Recycling Questionnaire

Q1: What is your current role at Dalhousie University?

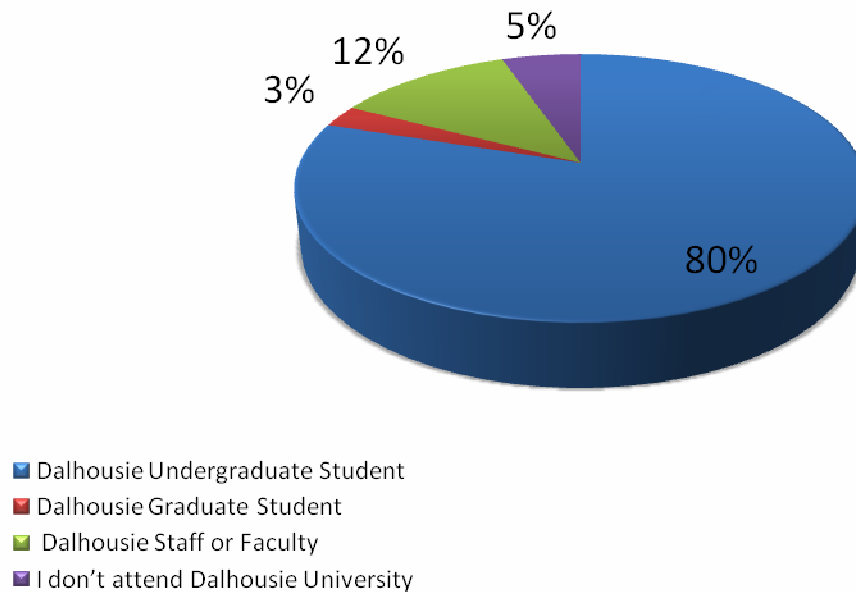


Fig 3.1 The results of question 1, the percentage of the respondents relation to Dalhousie University.

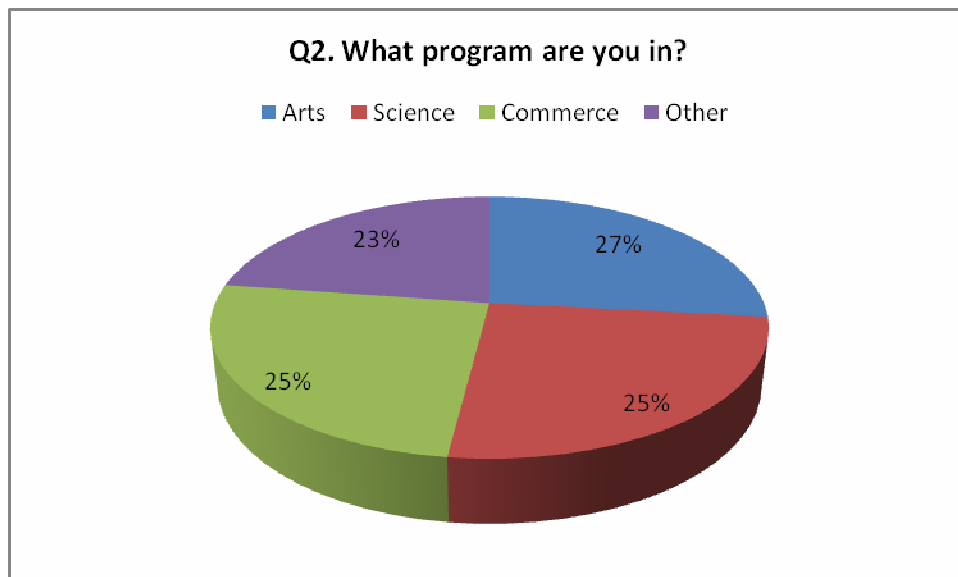


Fig 3.2 The results of question 2, an accurate description of what program they belong to. It is noted that the Other category contains Staff, Engineering, Graduate students, and any other program that does not belong to the other three categories.

Q3: How would you rank your personal knowledge of environmental issues?

- Know nothing
- Know major issues
- Keep up to date on all issues
- Know little
- Keep up to date on some issues

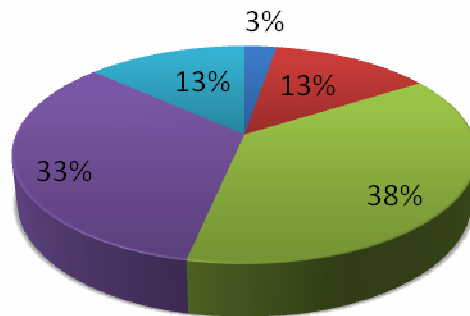


Fig 3.3 The results of question 3, the percentage of personal knowledge of environmental issues at Dalhousie University.

Q4: How many times a week do you eat at the Killam Library or the SUB?

- 0--1
- 2--4
- 5--7

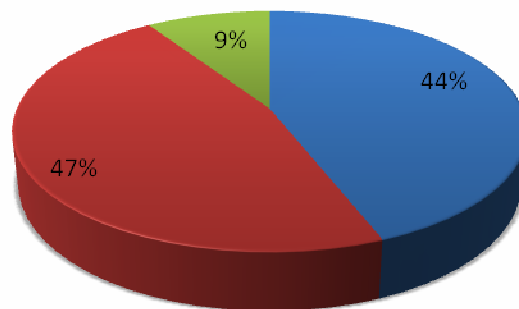


Fig 3.4 The results of question 4, a description of respondents eating habits in or around the Killam Library and SUB building.

Q5: Are you aware of the recycling systems in the lobbies of the Killam and SUB buildings?

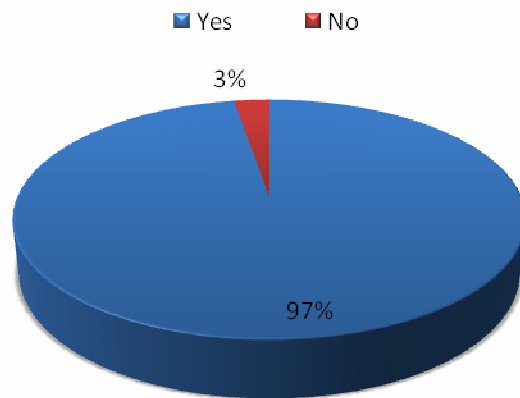


Fig 3.5 The results of question 5, the awareness of the 3/ 4 bin systems in the lobbies of the Killam Library and SUB buildings.

Q6: Do you ever get confused about which bin your waste or recyclables belong to?

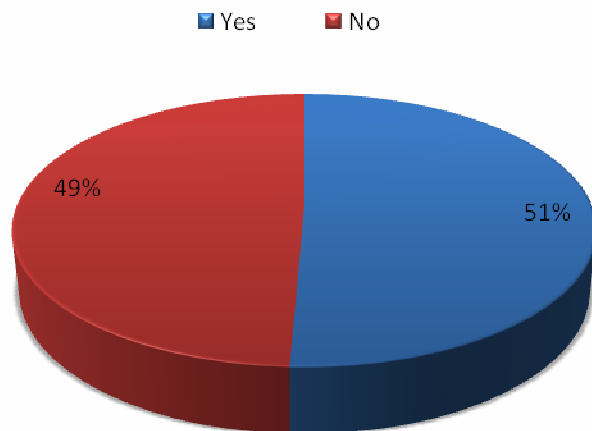


Fig 3.6 The results of question 6, the percentage of respondents who felt they were confused about what bins their waste or recyclables belonged

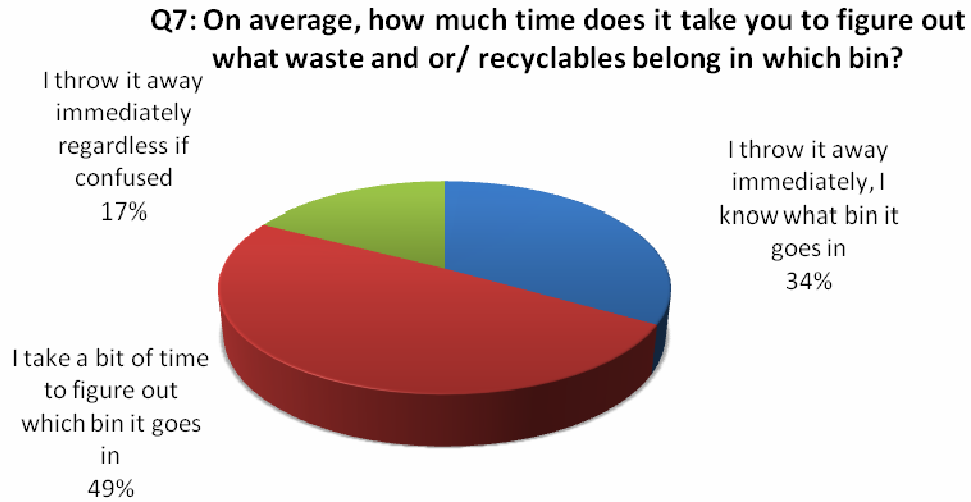


Fig 3.7 The results of question 7, the computation of how respondents deal with their waste and recyclables and the time it takes for them to dispose of them. It is noted that a large percentage (17%) dispose of waste without concern for where it actually belongs.

Q8: Are the signs clear and easy to understand?



Fig 3.8i The results for question 8, the percentage of respondents that felt the existing signs were easy to understand, not easy to understand and sometimes clearly understandable.

Fig 3.8ii The sometimes clear category included an open ended question where respondents could explain their reason for why the signs were only sometimes easy to understand. Included are 14 responses to why the signs are only sometimes easy to understand.

Opinion 1	The signs are not large enough, they could be more strategically placed than they are.
Opinion 2	The signs are unclear.
Opinion 3	Coffee cups are a huge mystery to me.
Opinion 4	Sometimes the signs are not enough to help you pick the correct bin.
Opinion 5	I can figure out the majority of materials but I still don't know where coffee cups go.
Opinion 6	Sometimes it seems that a material can go in more than just one bin.
Opinion 7	I know where to put my waste when it is in the picture but not otherwise.
Opinion 8	If the item is not clearly shown in picture, I throw it in the garbage
Opinion 9	The province of Nova Scotia's standard are different from Dalhousie's.
Opinion 10	I don't know if some things are recyclable, compostable, etc.
Opinion 11	Some of the bins are not standard at Dalhousie University.
Opinion 12	Signs are often helpful but random items make things very difficult.
Opinion 13	The signs need much more detail.
Opinion 14	Different types of plastic containers are hard to figure out.

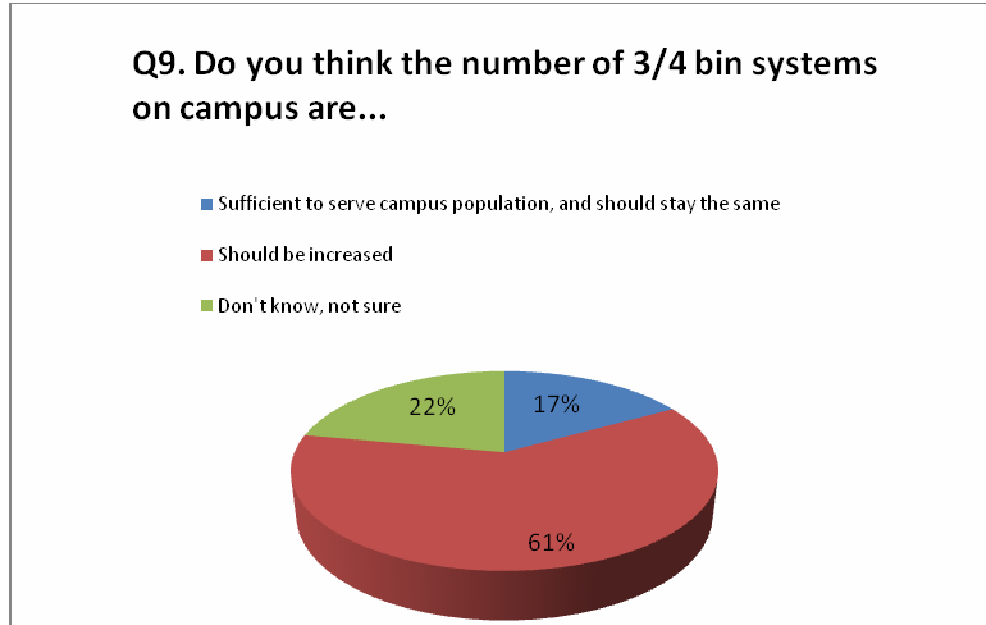


Fig 3.9 The results of question 9, the percentage of respondents that felt that the number of bins were adequate for the Dalhousie population, should be increased or weren't sure.

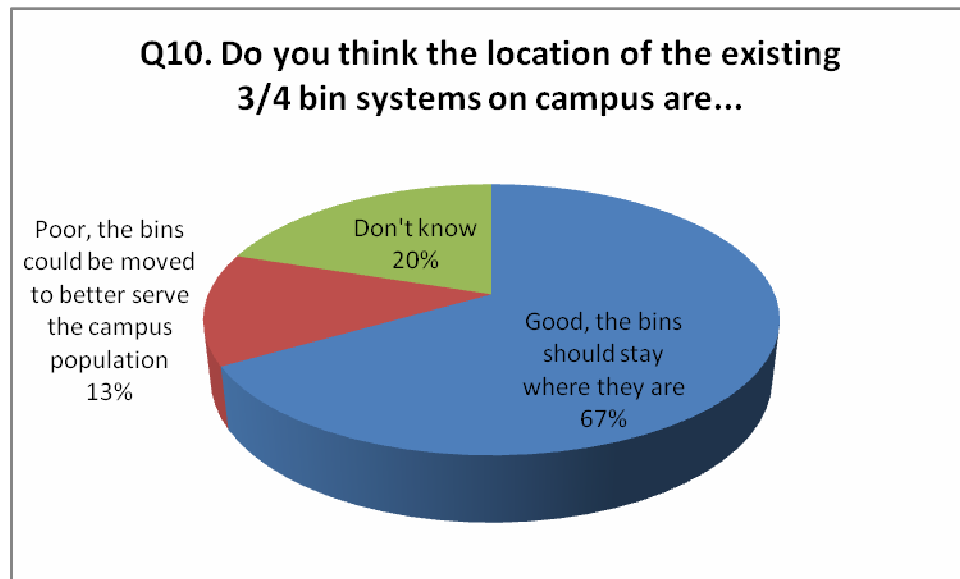


Fig 3.10 The results to question 10, the number of respondents who felt the locations of 3/4 systems were good, poor or didn't know.

Question 11. Due to complications that were beyond the control of the group, the results of question 11 were not included in this report. About half of the respondents confused ranking their opinions from 1-4 with giving them a number grade of 1-4, which lead to a total loss of use for our questionnaire. Upon using this question for another report, we suggest rewriting the question to be easier for the participants to understand it.

7. Discussion

This study sought to reveal the answer behind that question of: “do the $\frac{3}{4}$ bin recycling disposal container units on Dalhousie campus work efficiently, and if not what changes can be made to improve them?” Our assumption when starting this research was that the Dalhousie campus $\frac{3}{4}$ bin recycling program was operating inefficiently due to several factors, including: a general lack of knowledge of how the system works; an insufficient number of bins for the campus population to use; and the unclear labeling signs, depicting what belongs in each bin. As previously discussed, in our ‘Methods’ sections, we employed the use of various methods of data collection in order to discover an answer to our research question and to prove or disprove our hypothesis. We decided upon three different means of data collection to encompass all areas of our research, including: a survey to determine the preference of signs/labeling on bins; a questionnaire to reveal knowledge and recycling habits of Dalhousie’s population; and lastly a garbage audit, to uncover whether the bins are actually being used properly and whether the answers on the questionnaire correlate harmoniously with what is discovered during the audit.

The purpose and goals of our research were to increase the efficiency of the $\frac{3}{4}$ bin recycling system units on the Dalhousie University campus by determining reasons for, and proposing solutions to, the improper disposal of recyclable materials. In this discussion section we will review and evaluate the main results from our data collected and indicate the correlations found within them, as well as an overview of our general observations. First we will discuss our results and observations of the signs/labeling survey, we will then review and discuss the sample population’s general knowledge and general recycling habits on campus, lastly we compare the questionnaires’ results to those of the garbage audit.

7.1. Sign Survey

For our sign survey we decided to create new labels based on what we felt would be more understandable for the general Dalhousie community. We designed 2 new versions of the labeling signs; one with more detailed pictures and the other with just descriptive writing. Once we had completed the new labels we put them to the test. After placing them on the bin units we asked anyone passing by to select which set of signs they personally felt were most understandable. We involved 80 participants and what we discovered was what we initially expected; 71% of the sample size selected the new picture labels, while only 19% preferred the original labels. Our observations were equally as important in this survey, we discovered that almost 100% of our participants preferred the labeling to be on the top of the bin unit at eye level, as opposed to in front of the unit on the lower section. Also, because of the placement, when people were passing by and disposing their garbage they actually took a minute to review the new signs and place their garbage/recycling in the appropriate bin, unaware of our observing presence. We feel that this was one of our ___ observations or discoveries, and will prove to be of great importance to discovering and offering solutions to improper recycling habits on campus.

7.2. Questionnaire and Garbage Audit

We have decided to combine both of these data results in the discussion section in order to focus our evaluation on the correlations discovered between them. We anticipated that the results between the two would differ greatly, this is because one is based on personal opinion and point of view and the other is actual fact.

From the garbage Audit, we uncovered the results we expected; that, in fact, the 3/4 bin systems was not working efficiently. Referring to figure 1.1 in the 'results' section, you are able

to see how inefficient the utilization of these disposal units actually are. The reduction of the trash from 59% to a mere 18% after the sorting process provides the most apparent for this inefficiency.

When reviewing the questionnaires, however, we were faced with much different results. Once again referring to the 'results' section, more specifically figures 3.5 and 3.7, we can see how personal views of the bins systems provides different results in terms of efficiency. Figure 3.5 shows that 51% of participants claimed that they do not get confused about which bin their waste or recycling goes in. Figure 3.7 shows that 34% of participants are confident in their knowledge of the bin system and are able to throw their trash away immediately, while 49% dispose of their garbage properly after taking a little time to decipher which bin it belongs in.

Although the results from both these data collection methods differ greatly in relation to efficiency we did not see this as a ditherer, but rather a means of discovering reasoning behind the improper use of the bin system. We were able to theorize and come to a sort of conclusion that has aided us in validating our research and also brainstorming alternative solutions. We concluded that it's not that the Dalhousie population has a disregard for the recycling system and that they make no effort of caring which bin their waste belongs too, but rather that they have been misinformed or ill educated about the 3/4 bin systems. And this means that our offered solutions to the inefficiency problem will relate to creating more of an understanding of the bin system on the Dalhousie campus. Utilizing means of awareness, for example, clearer labeling, advertisement of proper recycling methods, enforcement etc. This in end also ended up confirming our research and reasoning for changing the current sign/labeling on the bins.

This also proves that our research, if utilized properly with solutions based on our conclusion and recommendations, will have a high chance of actually creating greater efficiency in relation to Dalhousie's recycling and waste disposal programs.

As the GREENFOOT research team we greatly enjoyed our time working together and conducting research that will assist our university in a more sustainable future. While we did encounter time limitations we were satisfied with the data we were able to collect and discoveries and conclusions we came to discover. Other than the issues relating to time, we were able to avoid all other predicted problems, with the help of Rochelle Owens and Michael Murphy, as well as the will participants of the Dalhousie community.

8. Conclusion

The results of this research showed that the Dalhousie University recycling program is operating inefficiently for a number of reasons. Some major reasons include: a lack of public awareness about the details of the program- such as what can and cannot be recycled on campus; an inadequate number of recycling facilities on campus; inadequate labeling on the recycling bins explaining what belongs in each bin; as well as personal indifference towards the system.

The results found in the study suggest that taking simple measures to improve the system, such as: increasing the number of recycling bins, we feel it increasing the number of bins will only continue to be inefficient without better labels. Improving the locations of bins, is another really good idea, but for the most part the bins are already in high traffic areas, but there is still room for improvement, and again without improvements on the labels people are going to be confused and still place items in the wrong bins. As a group and as the research showed us that

placing better quality signs on the bins has the most potential, with regards to increasing recycling at Dalhousie.

In closing, this research is important to Dalhousie and facilities like this because they can be generalized beyond the bounds of the work presented. Not only can the results be used to understand why members of the Dalhousie campus population do not recycle, but the results can also help to decrease the amount of waste Dalhousie produces on campus. Moving further beyond the intended scope of the project, the findings addressed a larger issue in society today. The idea of recycling and reusing our waste to minimize our ecological impact on the environment relates directly to the fundamental ideas of sustainability; a key issue for the environment of Dalhousie and rest of the nation.

9. References

Baetz, B.W., Neebe, A.W., (Dec., 1994), A Planning Model for the Development of Waste

Material Recycling Programms. *The Journal of the Operational Research Society*, Vol.

45, No. 12pp. 1374-1384

Brooks, K., Brown, L., Estridge, M., Fahey, K., Fraser, S., Harding, C., Pardoe, A., Parsons, A.,

Pothier, H. (April 2006) An Evaluation of Dalhousie University's Campus Recycling

Program. Group Project- ENVS 3502, Dalhousie University, Canada.

Creswell, John. (2003). *Research Design: Qualitative, Quantitative, and Mixed Methods*

Approaches. Sage Publications, Inc: Thousands Oaks, CA.

- Dalhousie University. (2008). Facilities Management website. Retrieved March 24, 2008, from <http://fm.dal.ca/>
- David Suzuki Foundation. (2005). "Landfills." *David Suzuki Foundation website*. Retrieved March 25, 2006, from http://www.davidsuzuki.org/climate_change/solutions/landfills.asp
- Environment Canada, Nova Scotia (2008). "Brochures, Booklets & Signage." Environment Canada's Website, Nova Scotia recycling. Retrieved March 19, 2008, from <http://www.rafb.com/pages/downloads.html>
- Freedman, B. 2007. *Environmental Science. A Canadian Perspective, 4th ed.* Pearson Prentice Hall Canada, Toronto, ON
- Martchek, K.J. (2000). "The Importance of Recycling to the Environmental Profile of Metal Products." Fourth International Symposium on Recycling of Materials and Engineered Materials. Retrieved March 21, 2008 from http://www.alcoa.com/global/en/environment/pdf/importance_of_recycling.pdf
- M'Gonigle, R Michael (2006) Planet U : sustaining the world, reinventing the university. Gabriola Island, BC , New Society Publishers, c2006..
- Tsun, T. and Chow, S. (2005). "Organic waste diversion at Ron Eydt Village (V2): A waste audit." Green Student Library. Retrieved 02/11/08, from <http://www.adm.uwaterloo.ca/infowast/watgreen/projects/library/w05revfoodwasteaudit>. Pdf

Rasanu, S. (March, 2008)On- site in-vessel Composting at the University of Toronto's St.

George Campus: A Financial Analysis. Sustainability Office, University of Toronto,

Canada

10. Appendices

See Binder for all the following information, including:

Preliminary proposal,

Pilot test exercises,

Final surveys,

Ethics review approval,

Completed surveys,

New signs,

Results of garbage audit