Green Machine:

An Investigation of Healthy Vending Machines on Dalhousie Campus

Final Report
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ENVS/SUST 3502: Campus as a Living Laboratory
Dalhousie University
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Executive Summary

Green Machine: An Investigation of Healthy Vending Machines on Dalhousie Campus was a research project that focused on the practicality of supplying healthier vending machine options onto Dalhousie's Studley campus. Preliminary research revealed that when students eat healthier they will perform and feel better. University is typically the first time for someone to act out independence and it is crucial that they do not develop bad eating habits that last a lifetime.

This project was a pilot study with a 15 question mixed method survey to determine how Dalhousie students feel about current vending machines and alternatives options to them. The survey was delivered to the public through an online service called Survey Monkey, and we received 166 respondents. Of these respondents 5 were non Dalhousie students meaning they could not participate and were disqualified, while 2 left the survey immediately, leaving 159 people who completed the survey. The majority of the demographic were females between the ages of 17 and 24 currently completing their undergraduate degree.

Main Results:

- 73% of respondents do not use vending machines, 18% use them once a week, leaving only 9% who use vending machines more than once a week
- The main reasons respondents do not use vending machines are the price, health concerns, and limited options
- The maximum amount of money most respondents are willing to spend on a vending machine is $3.00
- 33% of respondents are not satisfied with vending machines, 61% are somewhat satisfied, and 6% are very satisfied

The recommendations for Dalhousie are to perform further studies into the matter. From the results it is clear that students are not completely satisfied with the current status of vending machines. Dalhousie should investigate if the current amounts of vending machines in place are fully utilized with positive feedback, or if some of them are wasting energy and product due to lack of usage. We also recommend that Dalhousie perform a case study with healthy vending machines to determine if one would be successful on campus.

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1.0 INTRODUCTION

1.1 PROJECT DEFINITION

The human body is equivalent to a machine engine where an energy source or fuel is essential for its operation, and in the case of human beings, its survival. Although indispensable, global food production systems neglect the "environment upon which its survival is based" (Garnett, 2013, p. 29) consuming valuable resources while also playing a major role in contributing greenhouse gases (GHG). Estimates suggest that the effect of the current processes of the global food supply system contributes between 15 and 28% to overall GHG emissions in developed countries, measuring from the agricultural production stage through to the waste of the product (Garnett, 2013, p. 30). In addition to GHG emissions, current food systems are linked to negative nutritional wellbeing and health consequences of consumers, where Garnett (2013) states that "about 35% of adults are overweight, with half a billion of them obese." Addressing these issues of our current food system will need strong attention and resilient efforts to provide positive change for our future.

In Nova Scotia, the typical diet is heavily reliant on imported foods from outside of the province where food travels an average distance of just under 4,000 kilometers from its origin to Halifax (Scott, & Macleod, 2010). To effectively reduce the negative impact of GHG emissions, studies suggests reducing the consumption of junk food with empty calories (Scott, & Macleod, 2010). Furthermore, according to Nova Scotia Canada's population Health Profile report (2015, p. 19), 61% of the population of Nova Scotia is overweight or obese. Capital Health endocrinologist Dr. Tom Ransom says obesity will bring a burden on the provincial health system as a whole, carrying with it astronomical [financial] costs (Wong, 2014).

At current date, Dalhousie students have a variety of food options available for purchase ranging from large food chain restaurants to the familiar vending machine. With the goal to reduce GHG emissions and provide students with a healthy environment, commitments have been made by the school's food service providers to offer local, sustainable and quality food (Dalhousie College of Sustainability, 2014).

1.2 RESEARCH QUESTION

This research examines the question: Do students enrolled in Dalhousie University in the 2015/2016 school year desire availability to sustainable food alternatives within the vending machines on Studley Campus?

Sustainable food alternatives translate to having locally sourced products where the Canadian Food Inspection Agency (CFIA, 2014) defines 'local' as:

- Food produced in the province or territory in which it is sold, or
- Domestic goods that originated within 50 kilometers of the place where they are sold

Select Nova Scotia suggests that buying local can improve our sustainability goals offering a strengthening of local economy, an increase of local jobs, and a reduction of GHG emissions related to food transportation (Select Nova Scotia, 2013). Nova Scotia is presently seeing a downturn of agricultural farming business (Scott, & Macleod, 2010), which calls for alternatives and solutions to support the provinces' food security and economic system.

Analysis of this research will conclude whether it is important to the student population at Dalhousie University to have access to locally sourced, healthy, sustainable food options through the use of vending machines. Our team made the attempt to address this question by conducting qualitative questionnaires to gather information regarding the choices students make while purchasing food products on campus. Results are presented in efforts to assist Dalhousie University's Office of Sustainability to promote and improve sustainability practices on campus. This study also act as an informant for the Dalhousie Food Services team on how to further asses the needs and desires of the student population for food products offered.

2. Background and Rationale

2.1 Role of a Nutritious Diet

Nutrition and eating habits are fundamental factors that influence the cognitive and physiological functions of the human body throughout its lifecycle. Research has shown that poor eating behaviour is a major public health concern among young adults during their transition into university (Ganasegeran et al., 2012, p.1). At a young age individuals establish tastes and eating habits through external authoritative guidance - parents and preschools - however, the transition to university is critical period determining individuals lasting food behaviours (Deshpande, Basil, & Basil, 2009, p. 146). As university generally represents a time in which young adults fist gain independence; students' are highly susceptible to developing poor eating habits when first obtaining autonomy in daily food choices (Marquis, 2005; Rappoport, 2003; as cited in Deshpande et al., 2009, p.146). Studies report that university "students tend to eat fewer fruits and vegetables on a daily basis and report high intake of high-fat, high-calorie foods" (Deshpande et al., 2009, p.146). Initial self-dependence, stress, and time management are several factors that challenge students' ability to adopt healthy lifestyle and eating behaviours during their transition into university/college (Ganasegeran et al., 2012, p.1). Studies have shown that "although [eating] behaviours of students are considered temporary, as part of university life, unhealthy habits picked up at this age generally persists in older adult life" (Ganasegeran et al., 2012, p.1). Therefore, cognitive and physical diseases that accompany long term nutritionally deficient eating habits are preventable if healthy food behaviours are encouraged and maintained throughout early adulthood. Highlighting students' susceptibility to developing poor eating habits, Dalhousie should invest conscientious efforts to positively encourage students' eating behaviour on campus.

2.2 Background Research

Research on university/college students' eating behaviours highlights barriers to healthy eating. Reviewing reasons students struggle to maintain healthy eating habits in university will aid the process of creating an efficient and effective solution. Recent studies argue that taste, time sufficiency, convenience, and budget are main factors that influence students' eating choices on university/college campuses (Deshpande et al., 2009, p. 148). A study by House, Su, and Levy-Milne (2006) found that even though students understood the negative effects of poor eating habits, taste, time sufficiency, convenience, and budget were "more influential than benefits given the prevalence of eating habits among college students" (as cited in Deshpande et al., 2009, p. 148). The lack of regular meals and a decreased daily consumption of nutritious foods amongst students have been mainly attributed to students' perception of inconvenience; students regard fruits, vegetables, and fresh meats as time consuming and an inefficient cost (Marquis, 2005, p. 61). In addition to external barriers, studies suggest that internal motivations and psychological factors influence eating behaviour. Findings in the 2012 study by Ganasegeran demonstrated that psychological factors were more influential than the benefits of maintaining healthy eating habits among university/college students. A lack of self-control, boredom, nervousness, and joyfulness are feelings that students associate to the frequency at which they eat, and the type of food they eat (Ganasegeran et al., 2012, p.4). The research from this study highlights convenience - of junk food on campus - as an enabling factor for students to develop poor eating habits. University infrastructures such as the current vending machines on Dalhousie campus are facilitating negative eating behaviours amongst students. However, healthy vending machines address several of the main barriers to health diets among student populations; vending machines are convenient, highly accessible, and can contain cost efficient food that offers substance and nutrition. Implementing healthy vending machines on campus can address students' determinates of healthy eating while increasing and promoting sustainable diets on Dalhousie's campus.

2.3 Sustainable Diets

The term 'sustainable diet' "considers not just the kinds of foods we eat, but how the [foods] are produced" (Garnett, 2014, p. 4). The current global food system is causing devastating effects on the natural environment. Modern dietary practices are negatively impacting social and economic factors; on both an individual and collective scale (Garnett, 2014, p. 1). Although there are few studies available that specify environmental, economic, and social factors associated with snack food consumption, there is an explicit negative relationship between snack food production and sustainable development.

2.3.1 Environmental Impacts

Ingredients for the production of snack foods such as cane sugar, cocoa, maize and corn syrup, have a considerable negative impact on the environment (Garnett, 2014, p. 27). Environmental concerns such as stress on water resources, deforestation and habitat destruction are correlated to their production (Gockowski & Sonwa, 2011; as cited in Garnett, 2014, p. 27). A report conducted by the Nordic Council of Ministers in 2011 shows that "sweets and snacks have a significantly greater adverse impact on the environment than healthy food products" (Norden, 2011). As these foods provide no nutritional value, the environmental impacts during production and manufacturing can be deemed unnecessary (Garnett, 2014, p. 27). Reducing the availability of such foods on a university campus can decrease product demand as well as discourage school populations from future purchases of such products. Replacing large snack food brands (ex. Lays & Doritos chips) with healthy alternatives in Dalhousie campus vending machines would symbolize commitment to support sustainable food.

2.3.2 Physical and Mental Impacts

Large quantities of snack food consumption are associated with mental and physical issues amongst individuals in developed modern societies (Garnett, 2014, p. 27 & Deshpande et al., 2009, p. 145). The modern epidemic of obesity has been labeled as the second leading cause of preventable deaths (Goel, 2006, p. 317). The majority population of obese individuals is an avertable epidemic, preventable by discouraging consumption and discontinuing an availability of foods with a high sugar/fat profile. Dalhousie's effort to promote healthy eating behaviours and lifestyles can prevent susceptible members of the student population from developing negative habits.

The human brain is an ever growing organ that requires nutrients for development, and optimal functioning. Eating habits that do not supply the body's efficient intakes of nutrients hinder individuals' abilities to sustain prime cognitive utility (Parletta, Milte, & Meyerc, 2013, p. 725). Poor eating habits are associated to decreased cognitive functions and hindered brain development throughout individuals' lifecycles; micronutrient deficiencies developed in later years of life directly influence cerebral functioning (Parletta, et al., 2013, p. 725; Wärnberg, Gomez-Martinez, Romeo, Díaz, & Marcos, 2009, p. 166). As dietary habits developed during university persist into later years of adulthood, the negative influences of eating behaviours can compromise cognitive function throughout life (Wärnberg et al., 2009, p. 167). Inhibited cognitive function during educational and professional careers can negatively affect the level of performance and achievements of individuals. Dalhousie's promotion of healthy eating habits can have a direct positive impact on student life and academic achievements. Implementing healthy vending machines on campus can initiate a campus movement to support healthy eating habits among students.

2.3 Sustainable Diets at Dalhousie

Over the past 30 years, Dalhousie University has demonstrated a committed initiative to promote sustainable behaviour within internal operations and curricular activities (Dalhousie University, n.d.). The mission of the Dalhousie Office of Sustainability is to "create campus solutions that support positive ecological, social health and economic outcomes" (Dalhousie University, n.d.). Dalhousie has created a 'Sustainability Wheel' that highlights university specific issues and outcomes that are associated to achieving greater sustainability within institutional activities (Dalhousie University, n.d.). Amongst various subjects within the 'Wheel', student life and academic achievement are emphasized. Dalhousie continues to lead by example to engage and encourage its university population to practice sustainable behaviour. Therefore, promoting healthy eating lifestyles on campus is essential to supporting and encouraging positive social health and sustainable diets among the student population. Providing healthy foods in vending machines throughout campus has the potential to be an optimal solution to addressing the common researched determinates of healthy eating behaviours of students on university campuses. Universities provide an environment for academic learning and personal development, Dalhousie has an opportunity to engage and encourage students to adapt sustainable diets as an initiative to achieve social health and increase the quality of student life and academic achievement.

3.0 Research Methods

The purpose of the research is to question if students enrolled in the 2015/2016 year at Dalhousie University desire sustainable snacking options within the vending machines located on campus. The sustainability aspects that we intended to target are a combination of dietary health and supporting locally based economy. Our team wanted to determine if the current student population had an interest in vending machines with local, organic, fresh or any other forms of healthy/sustainable consumable products.

3.1 Overview

Our study used non-probabilistic convenience sampling to answer the question: Do students enrolled in Dalhousie University in the 2015/2016 school year desire availability to sustainable food alternatives within the vending machines on Studley Campus? Non-probabilistic sampling comprises of "a set of sampling techniques in which the probability of selecting each sampling unit is unknown or unknowable" (Palys, & Atchison, 2014, pg. 424). This sampling technique was appropriate for our study as we had a target population that included all students at Dalhousie, but do not have access to the entire Dalhousie student sample frame. A fully representative study of

the population is not practical given time restrictions we had. However a wide range of data was collected to determine if any trends appear. Research methods for this study included electronic online questionnaires only.

3.2 Procedures

Our research was conducted to determine if there was a sufficient interest in the topic by the student body. Questionnaires were selected so as to collect large quantities of preliminary data; by using an online questionnaire, we collected and organized the data more efficiently. We chose to proceed with an online survey instead of in person surveys for a number of reasons. The primary reason was that with limited time and resources, an online survey was able to reach out to a wider audience in a short amount of time. Unfortunately we had to introduce a delimitation that only people with access to internet could respond, however on a modern day campus this does not drastically reduce our sample frame. Secondly, using an online survey allowed us to eliminate the possibilities of any forms of human error when analyzing data and provided us with an efficient analysis of the data.

3.3 Questionnaire Construction

Questionnaire distribution was intended to provide our research project with direct feedback of the Dalhousie student bodies' opinion in current snack food options on Studley campus. Our team advertised virtual copies on University specific social media. We decided to use online surveys to increase our reach of the Dalhousie student population. Research has shown that online surveys increase participant accessibility and usability (Palys & Atchison, 2014 p.147).

The questionnaire consisted of a series of structured, categorical, and open-ended questions (identified in Appendix 02). SurveyMonkey was used as a software application to record and analyze information from virtual surveys during the research data collection. This strategy was used to eliminate the flaws of online surveys such as low response rates and an inability to clarify question ambiguities/misinterpretations. This also increased the ease and efficiency of collecting and analyzing the data (Palys & Atchison, 2014 p.147). In the survey we used logic paths to target vending machine users with different questions than non-vending machine users. This allowed us to determine why people who used vending machines used them, and why people who do not use vending machines deter from them.

3.4 Strategy

In order to reduce respondent bias we devised a few successful strategies. We did not indicate in any way that this was for an environmental course. In the introduction we stated it was for a third year course and the individual questions in our survey did not overly emphasize the environmental factor. Secondly we had a question at the beginning that eliminated any non dal student.

As incentive to participate in our research project, participants where entered into a draw for a prize winning a $25 gift certificate redeemable at the Dalhousie book store. Personal contact information from participants was only recorded for the purposes of the gift certificate raffle. After participation in our research study, respondents received a letter of appreciation for participation in our research. The feedback letter (found in Appendix 03) contains a brief summary of our project, the anticipated goals of our research and our contact information.

3.4 Data Analysis

The qualitative data was coded a posteriori ally so as to open to other concepts that might be applicable. We graphed relevant trends or differences in groups from the quantitative data while verbally describing what qualitative trends arose.

The quantitative data was analyzed for trends in what changes Dalhousie students would like to see occur to vending machines on campus. The main data analysis tool we used was the mode, the information that occurs most frequently in specific question(s) (Palys, & Atchison, 2014, pg. 342). We used this for questions that ask students about their preferences such as question ‘8’ from the survey where we ask what snacks they prefer. For some questions mean was more appropriate than the mode. The mean is more simply known as the arithmetic average and is calculated by adding all the numbers up and then dividing the sum by the number of responses (Palys, & Atchison, 2014, pg. 342). This was used for questions with ratio data such as number ‘7’ where we ask participants to state how often they use a vending machine. Using mean here allowed us to find the average amount of times students are using vending machines as opposed to the response that occurred the most.

3.5 Limitations and Delimitations

All research projects have limitations and delimitations. A limitation is a limit that is out of the researcher's control, and delimitation is a limit that has been imposed by the researchers (Wright, March 1st, 2016). The limitations and delimitations of this project are outlined below.

Limitations:

- There was a limited timeframe to complete research (3 weeks)
- As a group we have a limited amount of resources and experience to complete research
- The amount and diversity of participants who are willing to volunteer is out of our control
- The fact that this is a research project for an environmental class could create bias in answers

Delimitations:

- We advertised the surveys online solely through Facebook specific groups
- We conducted the questionnaires over a one week span (March 6-12 2016)
- We aimed to have 100 survey responses
- Our sample population was restricted to Dalhousie students

4.0 Results

The following represents the results analyzed from the 161 responses from current Dalhousie students. (See Appendix 04 for raw data)

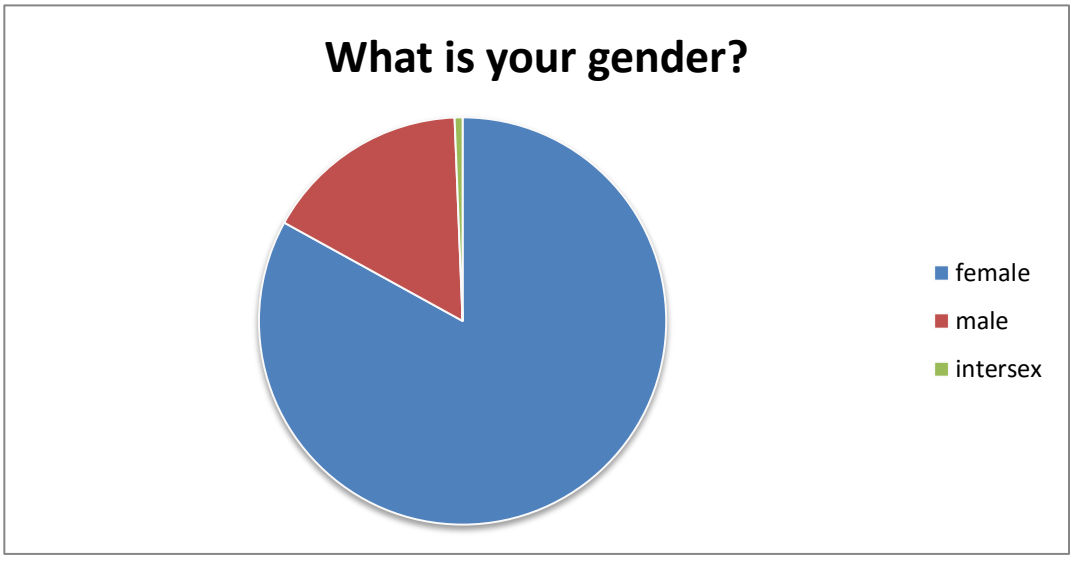


Figure 01: Gender distribution of the 161 total participants, with over 80% female respondents. 83.0% were female, 16.4% male and 0.6 % (1 respondent) intersex.

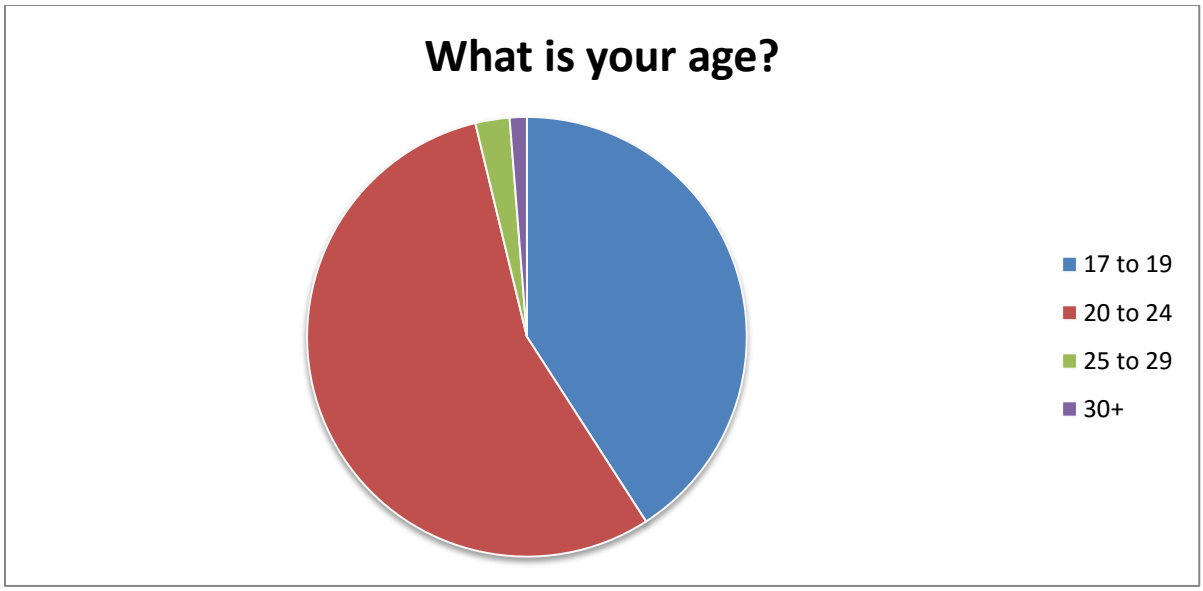


Figure 02: Representation of age group from respondents

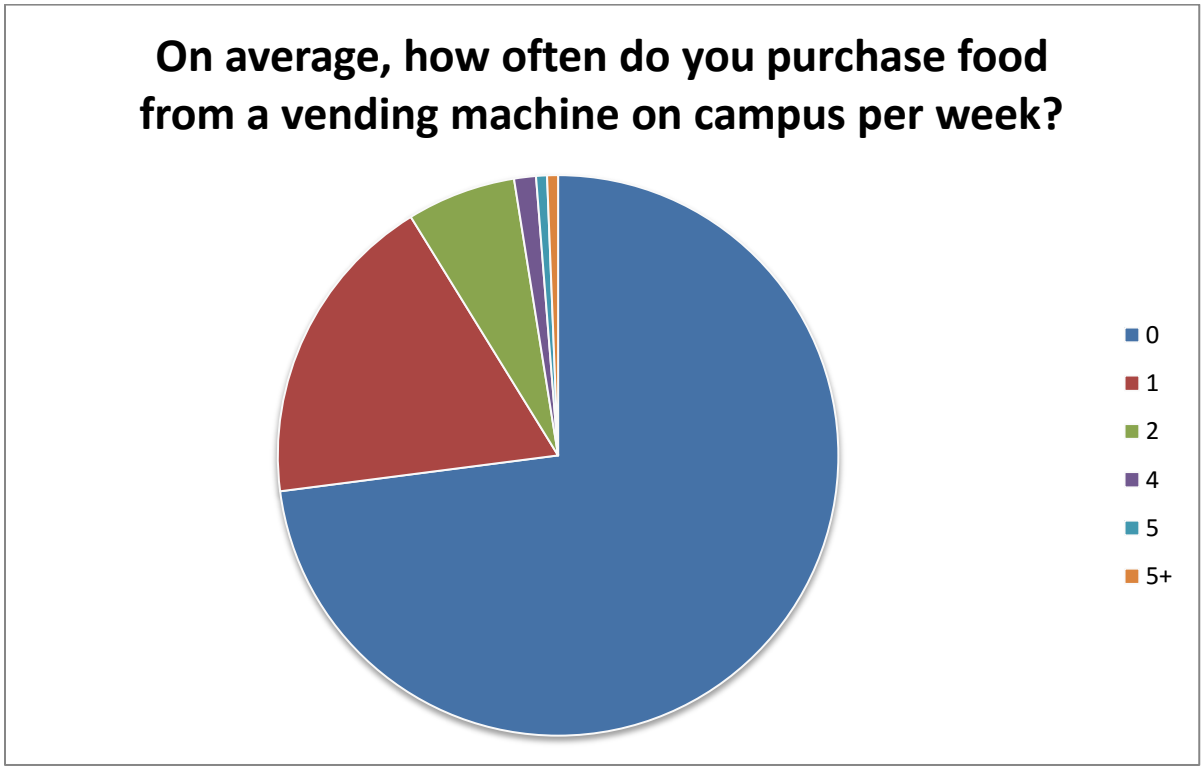


Figure 03: How often on average respondents purchase vending machine food on campus per week. A large majority of the student participants purchased very few items from vending machines (Figure 2): 73% did not regularly buy any food from vending machines (i.e. buy 0 items from vending machines on average each week) and 18% only purchasing 1 item, on average, per week.

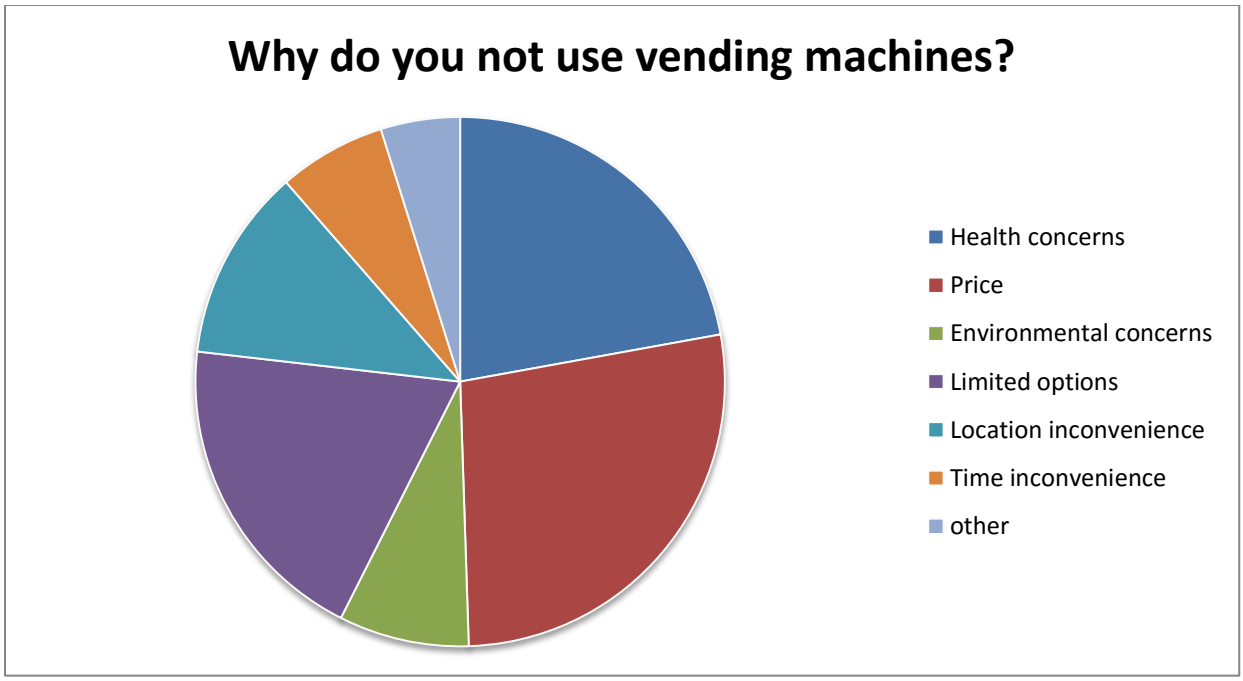


Figure 04: Identity of the rationale for not purchasing items from the vending machines and included: price (68.1%), health concerns (55.2%) and limited options (48.3 %), location inconvenience (29.3%), environmental concerns (19.8%), and time inconvenience (16.4%).

Respondents had the option to manually fill in the response for "other" which resulted in a 12.1% of the respondents including at least one written response which included:

- 3 students who were not interested in any of the food items in the machines
- 2 disapproving of the quality of the food
- 3 noting that they don't carrying change
- 1 person complaining about broken machines
- 1 person noting that they normally bring food from home so other options would have to be more substantial than what was offered.

(Note: Original responses can be found with the raw data in Appendix 04.)

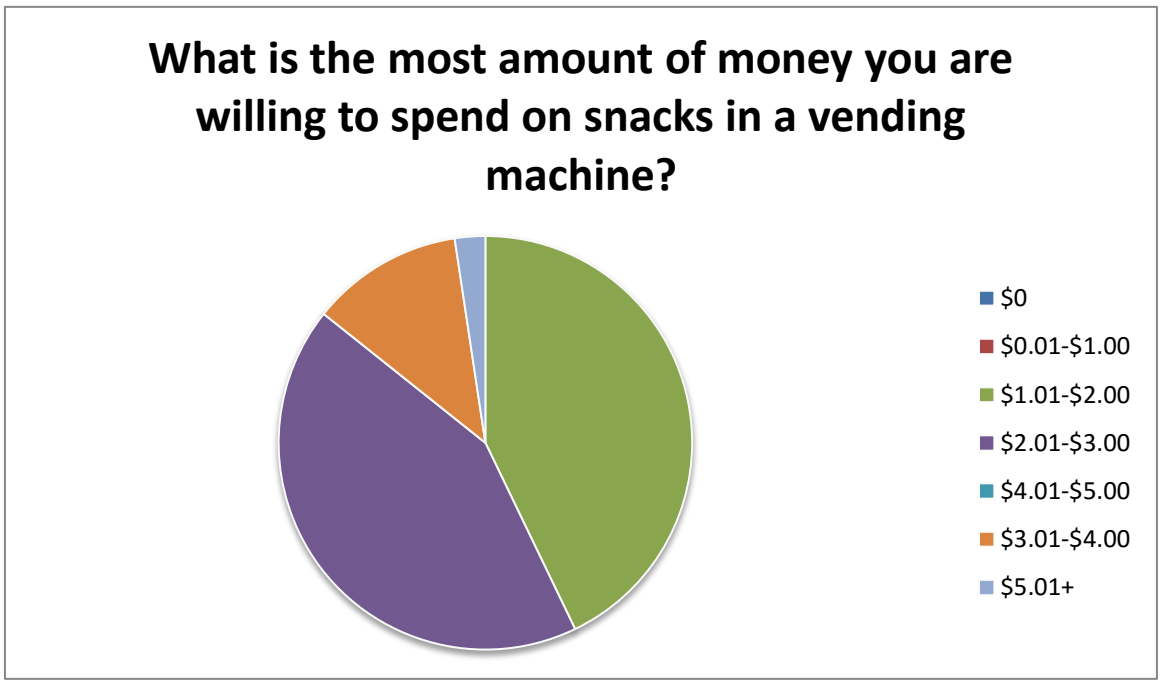


Figure 05: Students expressed that they were willing to spend a maximum of $1.01-3.00 on vending machine items.

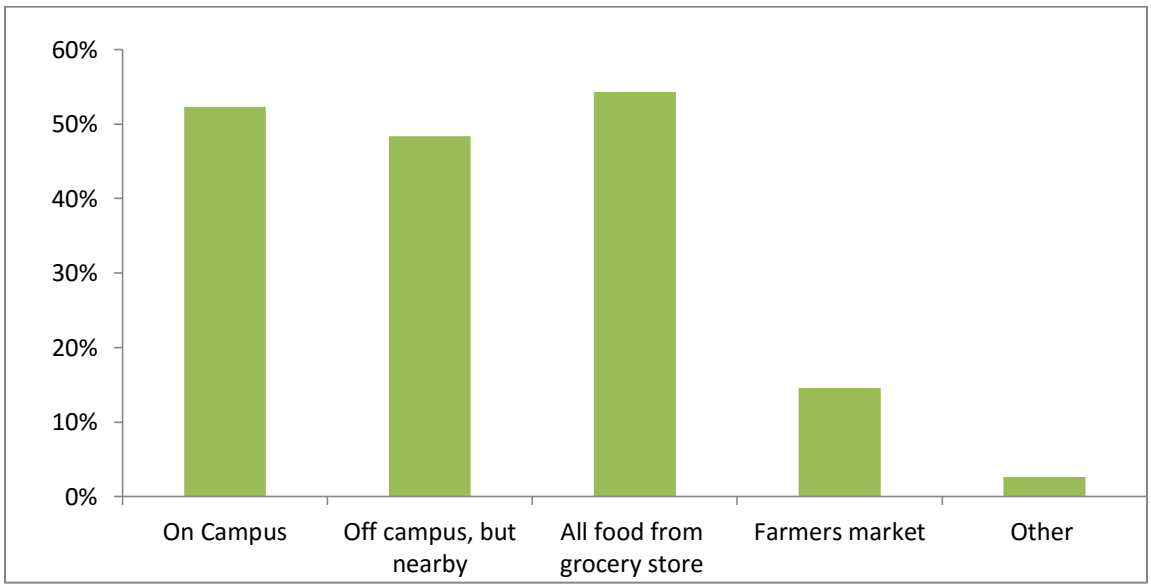


Figure 06: Preferred sites of student food purchasing show a slight majority of the 151 students prefer to buy at least some of their food on campus and/or from local grocery stores. Others choose to buy from stores which included: Shopper's Drugmart, Wal-Mart, the King's Gallery, and delivery.

Snack Option	1	2	3	4	5	Total	Weighted average
Chocolate bars	36.6%	14.6%	19.5%	22.0%	7.3%	41	3.51
Dried fruit	5.0%	15.0%	20.0%	30.0%	30.0%	40	2.35
Salad	7.3%	4.9%	17.1%	22.0%	48.8%	41	2.00
Baked chips	33.3%	19.1%	31.0%	9.5%	7.1%	42	3.62
Fried chips	16.7%	47.6%	14.3%	16.7%	4.8%	42	3.55

Table 1: Distribution of ranking of preference of snack bars with 1 being least favourite and 5 being the most favourite

When given the choice of a variety food items with varying levels of healthfulness, students preferred the snack options in the following order:

1. baked chips
2. fried chips
3. chocolate bars
4. dried fruit
5. salads

Reason for Purchase	Not at all	Mildly	Moderately	Extremely	Total	Weighted Average
Stress	16.7%	26.2%	42.9%	14.3%	42	2.55
Boredom	21.4%	26.2%	23.81%	28.6%	42	2.6
Loneliness	50.0%	21.4%	19.1%	9.5%	42	2.6
Anxiety	45.2%	33.3%	11.9%	9.5%	42	1.9
School work load	23.8%	11.9%	40.5%	23.8%	42	1.88
Time of day	7.1%	19.1%	33.3%	40.5%	42	3.1
Weather	50.0%	23.8%	21.4%	4.8%	42	1.86

Table 2: Distribution of rating scores of common literature based factors of vending machine use

For those who use vending machines on campus, the most significant factor related to use (Table 2) proceeds in the following order:

1. Time of day used
2. Boredom and loneliness
3. Stress
4. School work load
5. Weather

Decision Reasoning	Not at all influenced	Mild influence	Moderate influence	Significant influence	Total	Weighted Average
Time sufficiency	7.3%	25.3%	37.3%	30.0%	150	2.9
Taste	4.6%	9.2%	36.8%	49.3%	152	3.31
Convenience	3.3%	10.67%	48.67%	37.33%	150	3.2
Budget	4.0%	12.6%	30.5%	53.0%	151	3.32
Nutritional value	6.76%	35.1%	37.8%	20.3%	148	2.72
Local ingredients	46.3%	34.2%	16.1%	3.4%	149	1.77
Organic ingredients	54.3%	31.1%	11.9%	2.7%	151	1.63

Table 3: Distribution of various literature based factors on student's decision in buying food on campus

For all respondents, the factors most influencing their choice of vending machine purchases proceeds in the following order:

1. Budget,
2. Taste
3. Convenience
4. Time sufficiency
5. Nutritional value
6. Local ingredients
7. Organic ingredients.

Overall, a majority of respondents measuring 60.7% were only somewhat satisfied with the food selection in vending machines located on the Dalhousie campus. 33.3% feel their needs are not being satisfied, while only 6% of respondents are very satisfied.

5.0 Discussion

5.1 Summary of Research Question and Purpose

This report examined the question: Do students enrolled in Dalhousie University in the 2015/2016 school year desire availability to sustainable food alternatives within the vending machines on Studley Campus? The purpose of this research question was to determine whether or not students on the Dalhousie Studley campus use vending machines, what type of food they usually select, and if they want to see an improvement with healthier options to choose from. Specifically to find out if these options were more sustainable and locally sourced. The focus of the research was questioning whether students would prefer healthy, local, and fresh alternatives in the machines, as these snacks would be more sustainable than the current options.

This research was conducted because although vending machines are fast, convenient, and located in every building on campus, they do not seem to be used frequently. As well, the options within the machines are typically unhealthy, unsustainable processed snacks, with little to no 'green' options. We were concerned about the effect that unhealthy, processed food has on a student, as their consumption of unhealthy food has a direct effect on the cognitive and physiological functions of their brain, potentially leading to poor performance in school.

Replacing the current content of vending machines on Studley campus would provide students with healthy, local, and sustainable options that will not hinder their health or performance as well as being affordable.

5.2 Significant Findings

There were no other research studies done on the effects of vending machine options on university campuses, so we were interested in exploring this subject.

We found that the majority of students (73%) do not use the vending machines on campus, and those who do were more concerned about health, limited options, and the price of the food rather than how environmentally friendly the contents were. Though budget and taste seems to bare more importance than healthier choices of food, chocolate bars, baked and fried chips were chosen over the healthier alternatives of dried fruit and salads. This discrepancy will need to be considered for all future related work.

Thus, the answer to our research question was that no, the majority of students enrolled in Dalhousie University in the 2015/2016 school year do not desire availability to sustainable food alternatives within the vending machines on Studley Campus.

6.0 CONCLUSION

6.1 RECOMMENDATIONS FOR ACTION

With the results of our findings that students do not demonstrate concern for locally sourced, sustainable snack options to be available from vending machines, we recommend that Dalhousie take further action into investigating this topic. Dalhousie should conduct a more detailed research investigation amongst the Dalhousie student population on Studley campus concerning snack preferences within campus vending machines. Suggestions include:

- A pilot test of implementing healthy vending machines. The pilot test would include goals of creating awareness of healthy options in vending machines and discontinue the stigma of only junk food options in vending machines.
- Either representatives from Dalhousie food services, Sustainability office, and or DSUSO, contact the local Lean Machine business located in Halifax. Their goal is to provide tasty, healthy snacks in a convenient matter to Canadians. They have already implemented these vending machines into many high schools in Atlantic Canada and could provide more information regarding a university setting.
- Create a case study on investing in healthy vending machines. This could increase vending machines sales and students' satisfaction of the snacks available on campus. Both of which would influence student's eating habits, positively impacting their mental and physical health transmitted through from their career at Dalhousie into later years of life.
- Track the purchases of vending machines with healthier options.

6.2 RECOMMENDATIONS FOR FURTHER RESEARCH

Upon the chance for further research, we would recommend the University investigate into further depth on the subject based on our study. It is highly recommended to figure out specifically what type of healthy snack or meal option that students would prefer to have available in the campus vending machines. Furthermore, asking why students would choose the specific option in an effort to link eating habits to the product. This qualitative research data could be used to collect the opinions and beliefs of students concerning on-site eating options. We would also suggest introducing a more comprehensive list of product options to fully exhaust the capabilities of the vending machines. Further research into innovative vending machine technology could expand these capabilities, which could bring new light into the perception of the vendor.

We also recommend that future research on this subject focuses on students in residence. We believe that this population of the student body are the most frequent users of the vending machines; therefore, members within its population will provide better insights on the issue. This also investigates our assumption of students living on residence being the title users of vending machines, based on all hours' accessibility.

Finally, another possibility for further research is to analyze the specific locations of current machines in relation to individual machine use. Quantitative data collection could determine the times, input and output of products, and the popularity of location and/or products.

6.3 Major Contribution of the Study

The results of our study show that students do not demonstrate concern for locally sourced, sustainable snack options to be available from vending machines on campus. However, students did show preference for implementing healthy snack options. Students also do not highly value the food options within the vending machines, particularly due to price, health, and limited options.

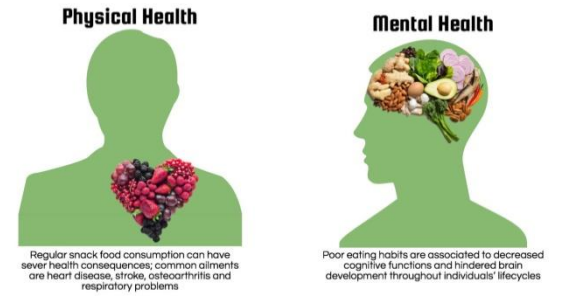
7.0 Acknowledgements

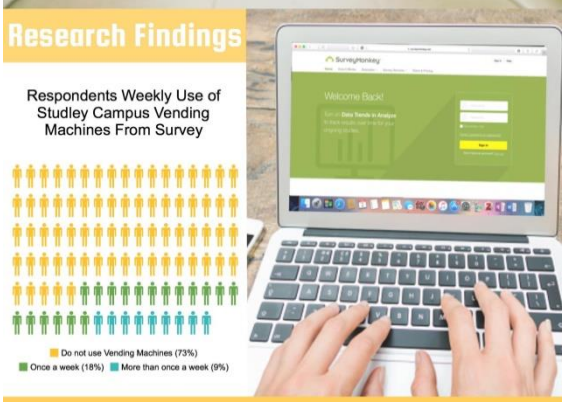
This research was supported by Tarah Wright and Erik Fraser who provided insight and expertise that greatly assisted the research. We thank the College of Sustainability for offering students the opportunity to work closely with the university and use Dalhousie campus as a living laboratory, so that we may develop our skills and knowledge outside of the classroom. We would also like to show our gratitude to DUSUSO for donating monetary funds to assist our research methods. Our team is greatly thankful to all who supported our research project. We hope our findings will positively contribute to our Dalhousie family in the future.

8.0 Appendix

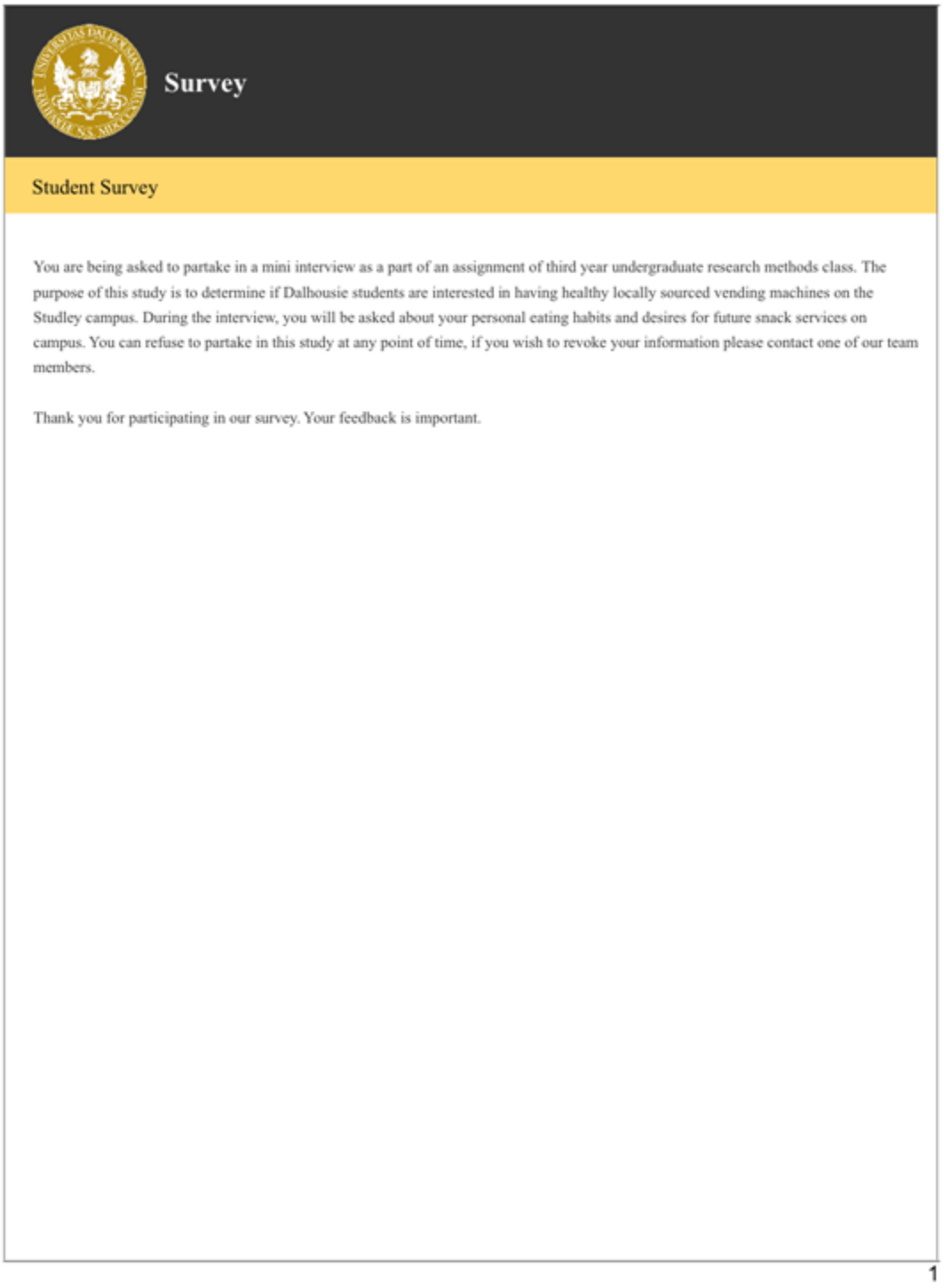
Appendix 01:

Infographic for DSUSO and Dalhousie Food Services





Appendix 02: Student Survey



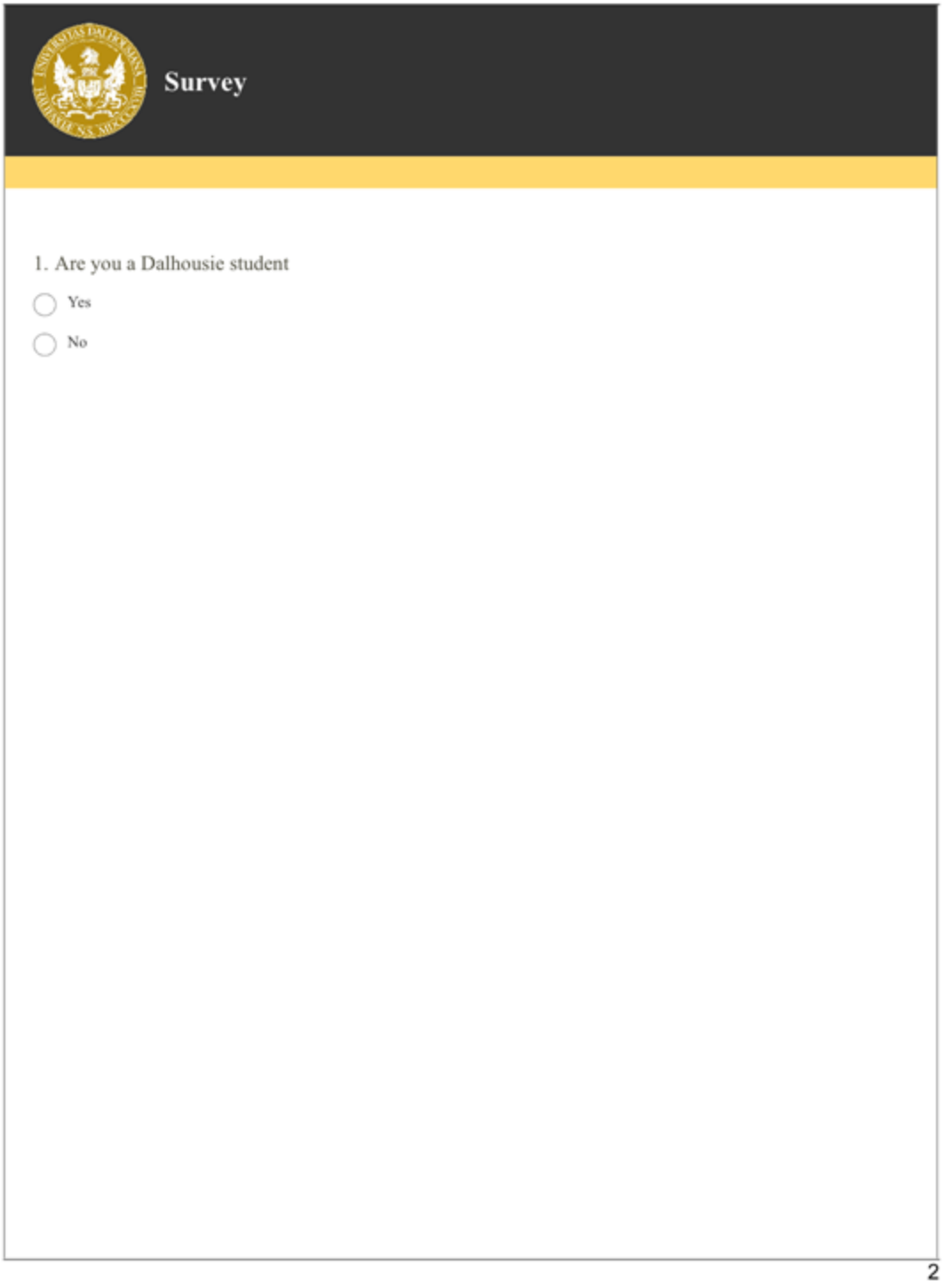
Survey

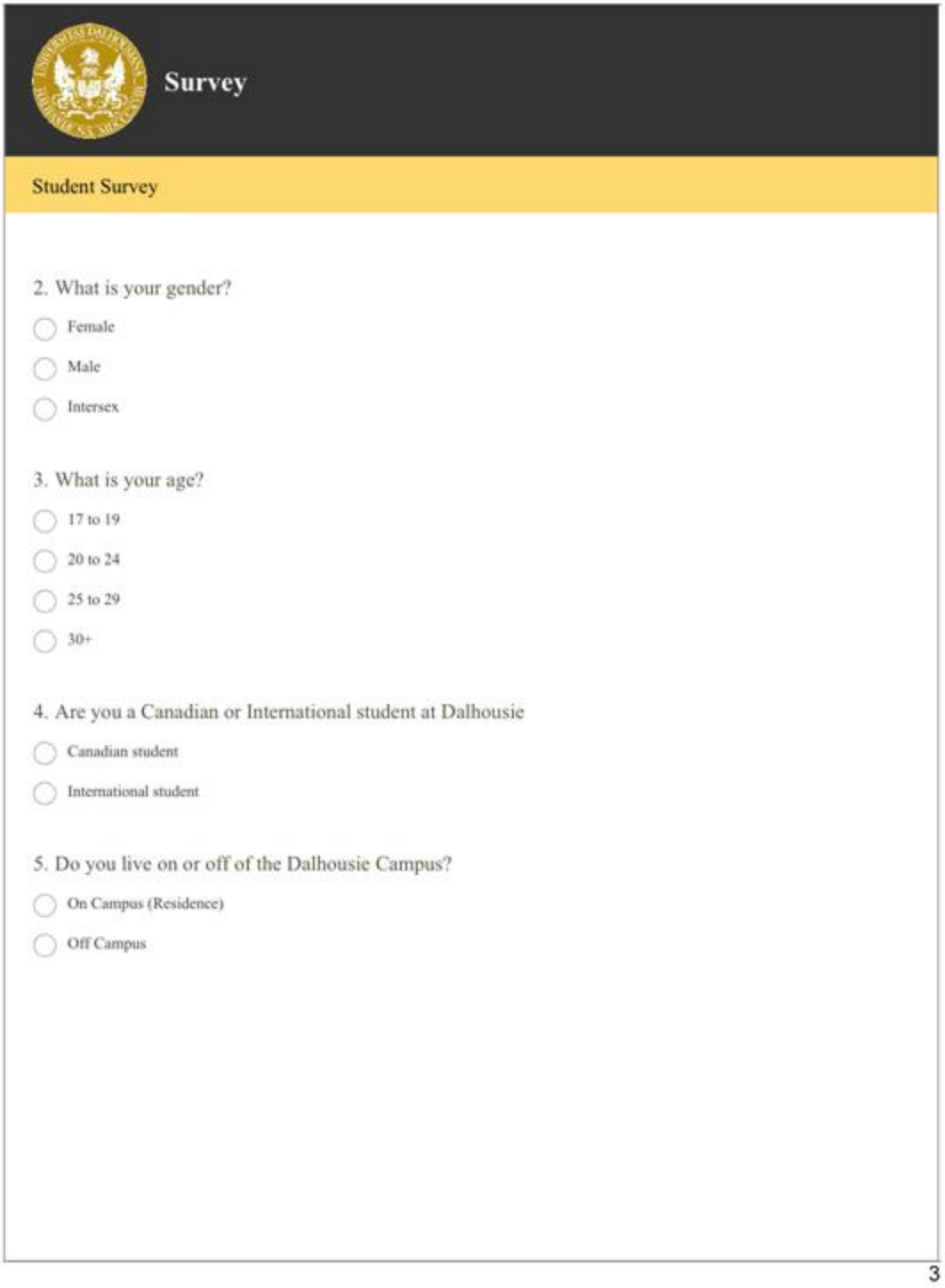
Student Survey

You are being asked to partake in a mini interview as a part of an assignment of third year undergraduate research methods class. The purpose of this study is to determine if Dalhousie students are interested in having healthy locally sourced vending machines on the Studley campus. During the interview, you will be asked about your personal eating habits and desires for future snack services on campus. You can refuse to partake in this study at any point of time, if you wish to revoke your information please contact one of our team members.

Thank you for participating in our survey. Your feedback is important.

1


Survey
1. Are you a Dalhousie student
Yes
No
2


Survey
Student Survey
2. What is your gender?
Female
Male
Intersex
3. What is your age?
17 to 19
20 to 24
25 to 29
30+
4. Are you a Canadian or International student at Dalhousie
Canadian student
International student
5. Do you live on or off of the Dalhousie Campus?
On Campus (Residence)
Off Campus
3

6. What is your faculty ?

- ◯ Agriculture
- ◯ Architecture and Planning
- ◯ Arts and Social Sciences
- ◯ Computer Science
- ◯ Dentistry
- ◯ Engineering
- ◯ Graduate Studies
- ◯ Health Professions
- ◯ Law
- ◯ Management
- ◯ Medicine
- ◯ Science

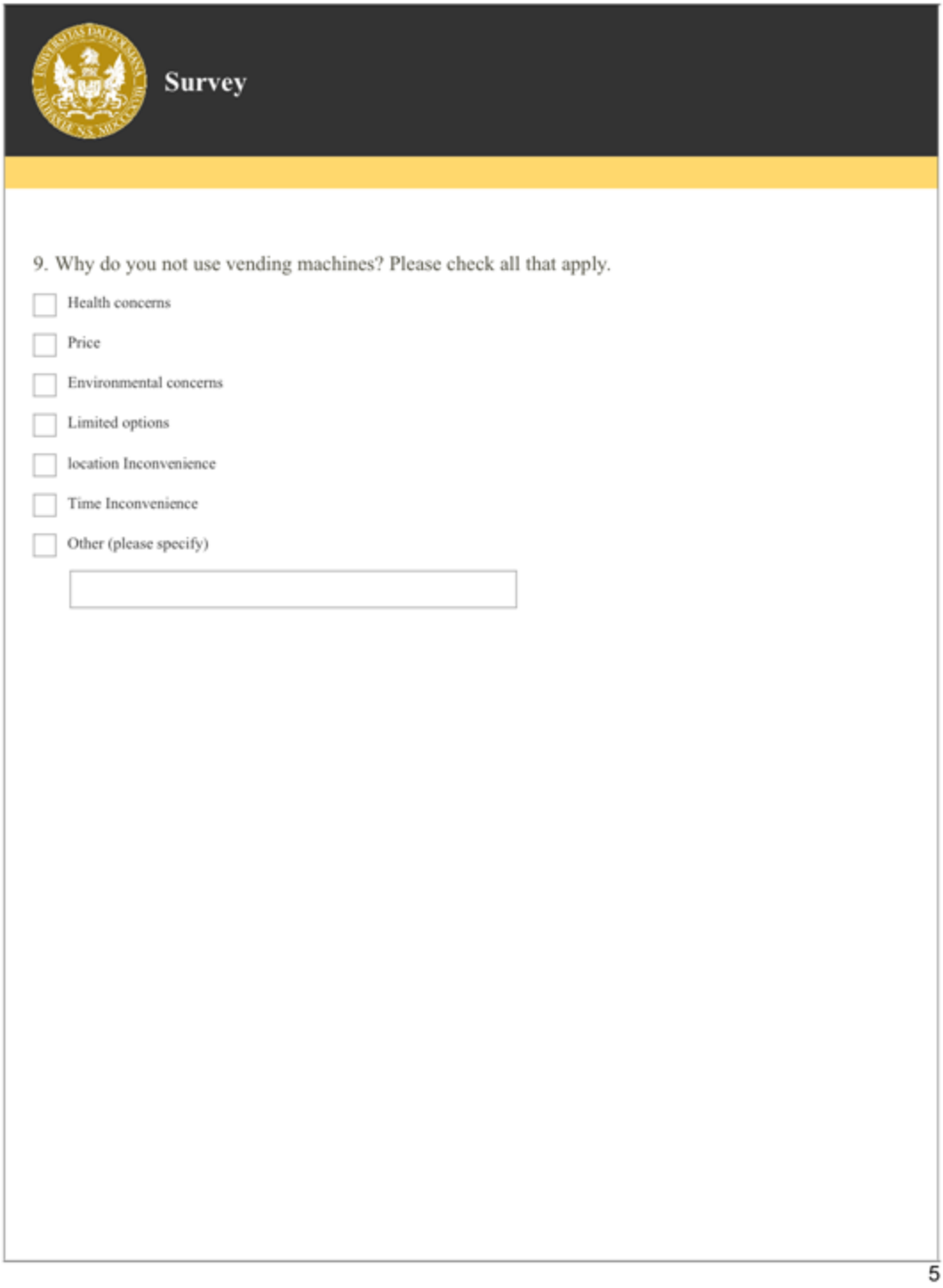
7. At what level of study are you at within the university?

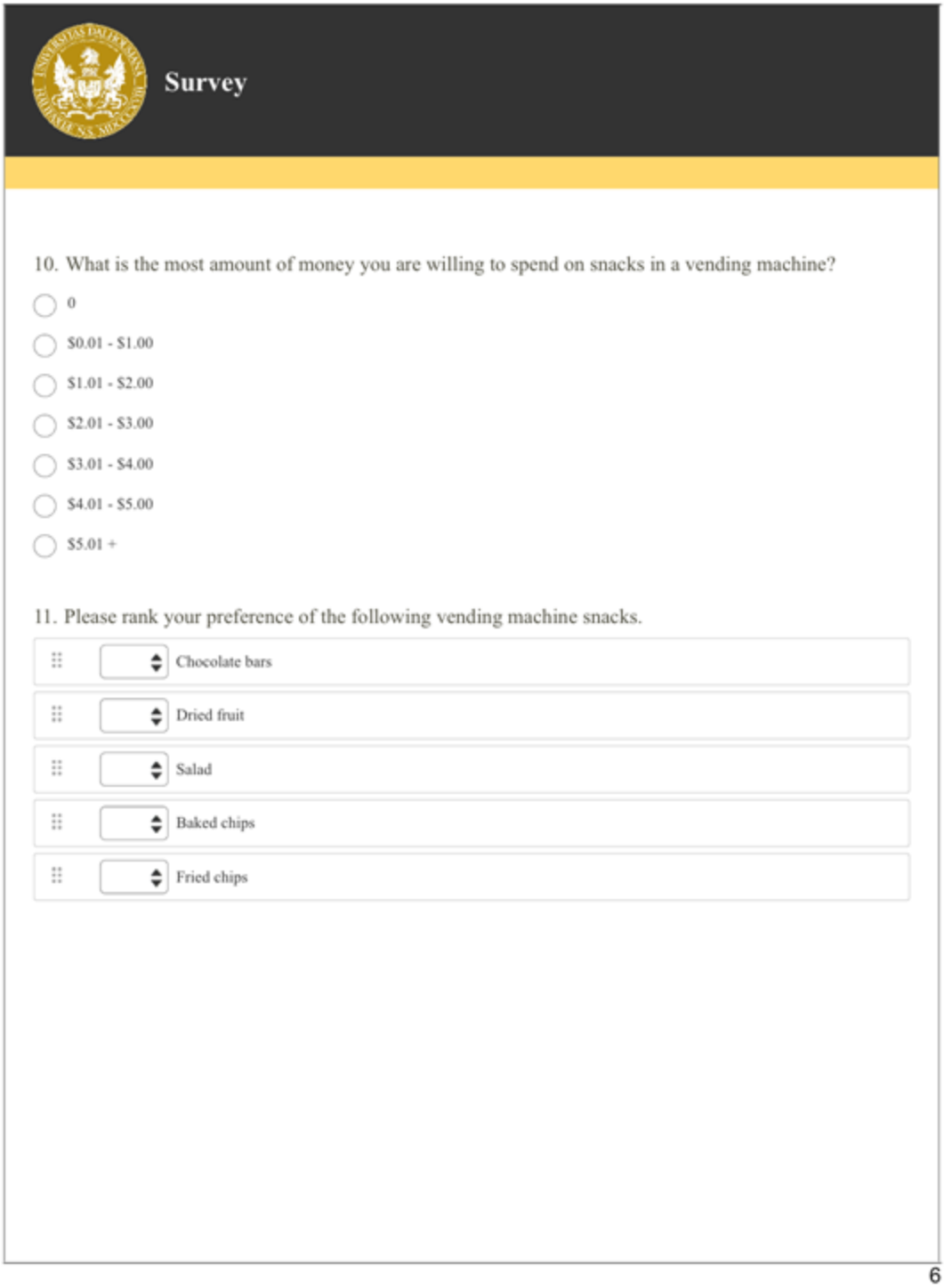
- ◯ Undergraduate
- ◯ Masters
- ◯ Ph.D

8. On average, how often do you purchase food from a vending machine on campus per week?

- ◯ 0
- ◯ One time a week
- ◯ Two times a week
- ◯ Four times a week
- ◯ Five times a week
- ◯ More than five times a week

4


Survey
9. Why do you not use vending machines? Please check all that apply.
Health concerns
Price
Environmental concerns
Limited options
location Inconvenience
Time Inconvenience
Other (please specify)
5



Survey

10. What is the most amount of money you are willing to spend on snacks in a vending machine?

- 0
- $0.01 - $1.00
- $1.01 - $2.00
- $2.01 - $3.00
- $3.01 - $4.00
- $4.01 - $5.00
- $5.01 +

11. Please rank your preference of the following vending machine snacks.

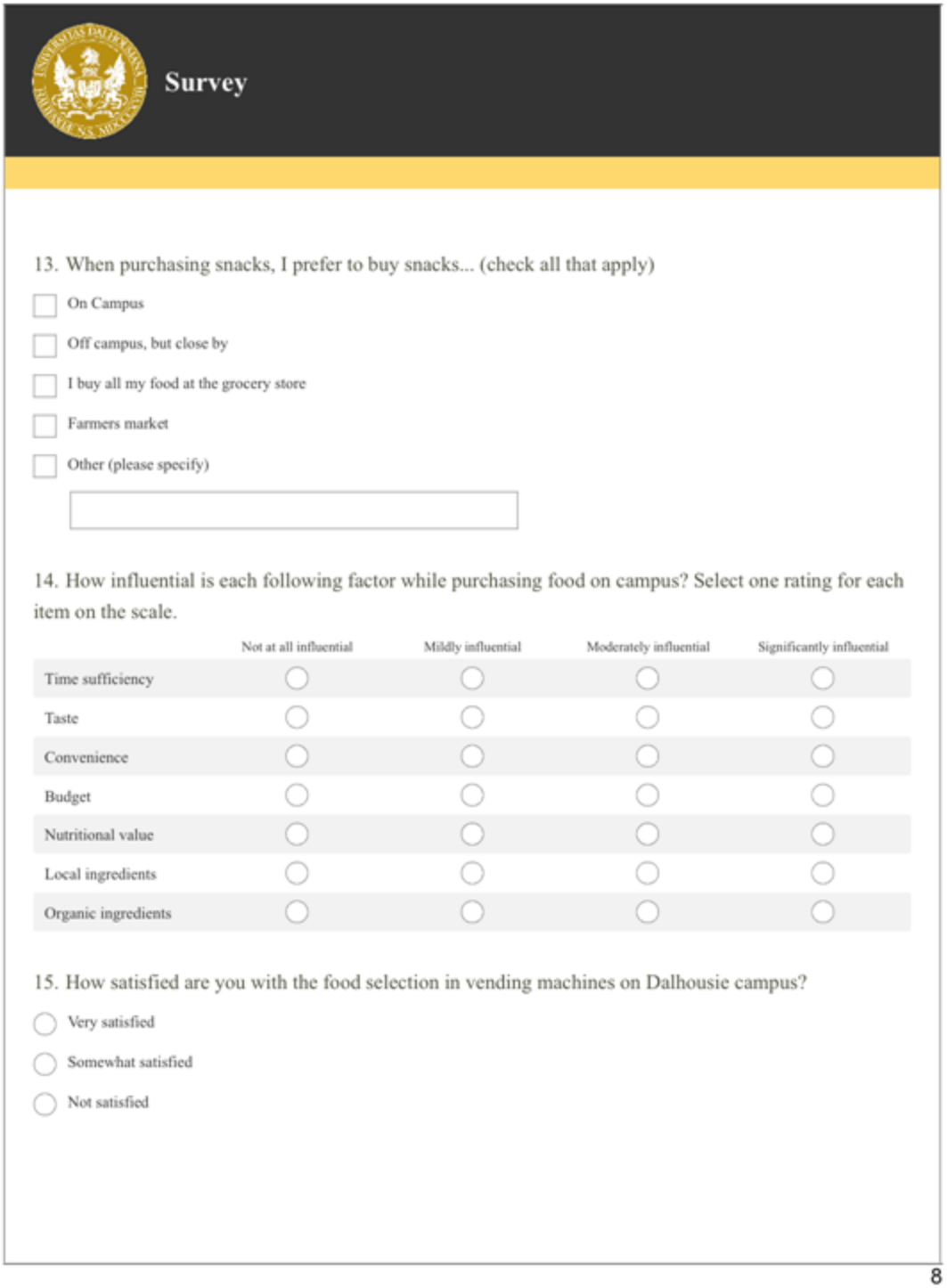
- Chocolate bars
- Dried fruit
- Salad
- Baked chips
- Fried chips

6

12. To what extent do each of the following factors influence your use of vending machines? Select one degree for each item on the scale

	Not at all	Mild	Moderate	Extremely
Stress	○	○	○	○
Boredom	○	○	○	○
Loneliness	○	○	○	○
Anxiety	○	○	○	○
School work load	○	○	○	○
Time of day	○	○	○	○
Weather	○	○	○	○

7



Survey

13. When purchasing snacks, I prefer to buy snacks... (check all that apply)

- [ ] On Campus
- [ ] Off campus, but close by
- [ ] I buy all my food at the grocery store
- [ ] Farmers market
- [ ] Other (please specify)

14. How influential is each following factor while purchasing food on campus? Select one rating for each item on the scale.

	Not at all influential	Mildly influential	Moderately influential	Significantly influential
Time sufficiency	○	○	○	○
Taste	○	○	○	○
Convenience	○	○	○	○
Budget	○	○	○	○
Nutritional value	○	○	○	○
Local ingredients	○	○	○	○
Organic ingredients	○	○	○	○

15. How satisfied are you with the food selection in vending machines on Dalhousie campus?

- ○ Very satisfied
- ○ Somewhat satisfied
- ○ Not satisfied

8

16. Please provide your Dalhousie email if you would like to be entered into a draw for a $25 gift certificate to the Dalhousie Bookstore. All answers and information will remain confidential.

9

Appendix 03: Participant Feedback Form

Dear Participant,

We would like to express our gratitude for partaking in our survey on vending machines. The information you have provided us is extremely valuable for the project. To show our appreciation you have been entered in a draw to win a $25 gift certificate to the Dalhousie Bookstore. We will do the draw March 20th 2016 and will let the winner know through an email.

The purpose of this study is to determine whether or not Dalhousie students are interested in having locally sourced healthy food in vending machines on the Studley campus. We predict that students will be interested in this as it provides more options for them to purchase food on campus.

All the information provided will be kept confidential and individual responses will only be available to the research supervisor, our mentor, and us. If at any point you wish for your results to be withdrawn from our data, please do not hesitate to send us an email requesting so.

Contact Information

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Josh Kester josh.kester@gmail.com

Research Supervisor

Tarah Wright tarah.wright@dal.ca

Appendix 04: Raw Questionnaire Data

Q1: Are you a Dalhousie student?	
Yes	161
No	5
Q2: What is your gender?	
female	132
male	26
intersex	1
Q3: What is your age?	
17 to 19	65
20 to 24	88
25 to 29	4
30+	2
Q4: Are you a Canadian or International student at Dalhousie ?	
Canadian student	146
International student	13
Q5: Do you live on or off Dalhousie Campus?	
On Campus(Residence)	62
Off campus	97
Q6: What is your faculty?	
Agriculture and Law	0
Architecture and Planning	1
Arts and Social Sciences	42
Computer Science	5
Dentistry	1
Engineering	7
Graduate Studies	2
Health Professions	22
Management	12
Medicine	1
Science	66
Q7: At what level of study are you at within the university?	
Undergraduate	156
Masters	2
Ph.D.	1

Q8: On average, how often do you purchase food from a vending machine on campus per week?	
0	116
1	29
2	10
4	2
5	1
5+	1
Q9: Why do you not use vending machines? Please check all that apply.	
Health concerns	64
Price	79
Environmental concerns	23
limited options	56
location inconvenience	34
time inconvenience	19
other	14
Responses from the "other" category were:	
not interested	
No need for the food/drink	
Not tasty	
Not interested in the food, especially at those costs	
Broken machines	
Usually don't have any change on me- said 3 times	
My pockets empty of dinero	
Vending machines only have chocolate bars and chips	
Usually more intriguing options or I bring snacks like that from home (ex. granola bar) so if I purchase food it will be something more substantial	
Don't carry cash	
Bud, no candy corn	
Q10: What is the most amount of money you are willing to spend on snacks in a vending machine?	
$0	0
$0.01-$1.00	0
$1.01-$2.00	18
$2.01-$3.00	18
$4.01-$5.00	0
$3.01-$4.00	5
$5.01+	1

Q11: Please rank your preference of the following vending machine snacks.							
	1	2	3	4	5	total	Average
Chocolate bars	15	6	8	9	3	41.0	3.5
Dried fruit	2	6	8	12	12	40.0	2.4
Salad	3	2	7	9	20	41.0	2.0
Baked chips	14	8	13	4	3	42.0	3.6
Fried chips	20	6	7	2	2	42.0	3.6

Q12: To what extent does each of the following factors influence your use of vending machines? Select one degree for each item on the scale.						
	Not at all	Mild	Moderate	Extremely	Total	Weighted Average
Stress	7	11	18	6	42	2.6
Boredom	9	11	10	12	42	2.6
Loneliness	21	9	8	4	42	1.9
Anxiety	19	14	5	4	42	1.9
School work load	10	5	17	10	42	2.6
Time of day	3	8	14	17	42	3.1
Weather	21	10	9	2	42	1.8

Q13: When purchasing snacks, I prefer to buy snacks... (check all that apply)	
On Campus	79
Off campus, but close by	73
I buy all my food at the grocery store	82
Farmers market	22
Other	4

Comments from the "other included:
Walmart, sometimes Shoppers
I'll buy wherever is convenient, when I'm hungry
From the King's galley
Ordering delivery

Q14: How influential is each following factor while purchasing food on campus? Select one rating for each item on the scale.						
	Not at all influential	Mildly influential	Moderately influential	Significantly influential	Total	Weighted Average
Time sufficiency	11	38	56	45	150	2.9
Taste	7	14	56	75	152	3.31
Convenience	5	16	73	56	150	3.2
Budget	6	19	46	80	151	3.32
Nutritional	10	52	56	30	148	2.72

value						
Local ingredients	69	51	24	5	149	1.77
Organic ingredients	82	47	18	4	151	1.63

Q15: How satisfied are you with the food selection in vending machines on Dalhousie campus?	
Very satisfied	9
Somewhat satisfied	91
Not satisfied	50

Appendix 05: Preliminary Proposal

Sustainable Vending Machine Choices:

An Analysis of Vending Machine products on Dalhousie University's Studley Campus

March 03 2016
Preliminary Research Proposal
ENVS/SUST 3502: Campus as a Living Laboratory
Dalhousie University
Instructed by: Dr. Tarah Wright
Mentor: Erik Fraser

Presented by:
Meredith Crawley
Joshua Kester
Jennifer Lorandos
Ian Smith
Michael Trewartha

Table of Contents

1.0 Introduction

1.1 Project Definition

The human body is comparable to a machine engine where an energy source or fuel is essential for its operation, and in the case of human beings, its survival. Although indispensable, global food production systems neglect the "environment upon which its survival is based" (Garnett, 2013, p. 29) consuming valuable resources while also playing a major role in contributing greenhouse gases (GHG). Estimates suggest that the effect of the current processes of the global food supply system contributes between 15 and 28% to overall GHG emissions in developed countries, measuring from the agricultural production stage through to the waste of the product (Garnett, 2013, p. 30). In addition to GHG emissions, current food systems are linked to negative nutritional wellbeing and health consequences of consumers, where Garnett (2013) states that "about 35% of adults are overweight, with half a billion of them obese." Addressing these issues of our current food system will need strong attention and resilient efforts to provide positive change for our future.

In Nova Scotia, the typical diet is heavily reliant on imported foods from outside of the province where food travels an average distance of just under 4,000 kilometers from its origin to Halifax (Scott, & Macleod, 2010). To effectively reduce the negative impact of GHG emissions, studies suggests reducing the consumption of junk food with empty calories (Scott, & Macleod, 2010). Furthermore, according to Nova Scotia Canada's population Health Profile report (2015, p. 19), 61% of the population of Nova Scotia is overweight or obese. Capital Health endocrinologist Dr. Tom Ransom says obesity will bring a burden on the provincial health system as a whole, carrying with it astronomical [financial] costs (Wong, 2014).

At current date, Dalhousie students have a variety of food options available for purchase ranging from large food chain restaurants to the familiar vending machine. With the goal to reduce GHG emissions and provide students with a healthy environment, commitments have been made by the school's food service providers to offer local, sustainable and quality food (Dalhousie College of Sustainability, 2014).

1.2 Research Question

This research examines the question: Do students enrolled in Dalhousie University in the 2015/2016 school year desire availability to sustainable food alternatives within the vending machines on Studley Campus?

Sustainable food alternatives translate to having locally sourced products where the Canadian Food Inspection Agency (CFIA, 2014) defines 'local' as:

- Food produced in the province or territory in which it is sold, or
- Domestic goods that originated within 50 kilometers of the place where they are sold

Select Nova Scotia suggests that buying local can improve our sustainability goals offering a strengthening of local economy, an increase of local jobs, and a reduction of GHG emissions related to food transportation (Select Nova Scotia, 2013). Nova Scotia is presently seeing a downturn of agricultural farming business (Scott, & Macleod, 2010), which calls for alternatives and solutions to support the provinces' food security and economic system.

Analysis of this research will conclude whether it is important to the student population at Dalhousie University to have access to locally sourced, healthy, sustainable food options through the use of vending machines. Our team will attempt to address this question by conducting qualitative questionnaires and quantitative interviews to gather information regarding the choices students make while purchasing food products on campus. Results will be presented in efforts to assist Dalhousie University's Office of Sustainability to promote and improve sustainability practices on campus. This study will also inform the Dalhousie Food Services team on how to further asses the needs and desires of the student population for food products offered.

2. Background and Rationale

2.1 Role of a Nutritious Diet

Nutrition and eating habits are fundamental factors that influence the cognitive and physiological functions of the human body throughout its lifecycle. Research has shown that poor eating behaviour is a major public health concern among young adults during their transition into university (Ganasegeran et al., 2012, p.1). At a young age individuals establish tastes and eating habits through external authoritative guidance - parents and preschools - however, the transition to university is critical period determining individuals lasting food behaviours (Deshpande, Basil, & Basil, 2009, p. 146). As university generally represents a time in which young adults fist gain independence; students' are highly susceptible to developing poor eating habits when first obtaining autonomy in daily food choices (Marquis, 2005; Rappoport, 2003; as cited in Deshpande et al., 2009, p.146). Studies report that university "students tend to eat fewer fruits and vegetables on a daily basis and report high intake of high-fat, high-calorie foods" (Deshpande et al., 2009, p.146). Initial self-dependence, stress, and time management are several factors that challenge students' ability to adopt healthy lifestyle and eating behaviours during their transition into university/college (Ganasegeran et al., 2012, p.1). Studies have shown that "although [eating] behaviours of students are considered temporary, as part of university life, unhealthy habits picked up at this age generally persist in older adult life" (Ganasegeran et al., 2012, p.1). Therefore, cognitive and physical diseases that accompany long term nutritionally deficient eating habits are preventable if healthy food behaviours are encouraged and maintained throughout early adulthood. Highlighting students' susceptibility to developing poor eating habits, Dalhousie should invest conscientious efforts to positively encourage students' eating behaviour on campus.

2.2 Background Research

Research on university/college students' eating behaviours highlights barriers to healthy eating. Reviewing reasons students struggle to maintain healthy eating habits in university will aid the process of creating an efficient and effective solution. Recent studies argue that taste, time sufficiency, convenience, and budget are main factors that influence students' eating choices on university/college campuses (Deshpande et al., 2009, p. 148). A study by House, Su, and Levy-Milne (2006) found that even though students understood the negative effects of poor eating habits, taste, time sufficiency, convenience, and budget were "more influential than benefits given the prevalence of eating habits among college students" (as cited in Deshpande et al., 2009, p. 148). The lack of regular meals and a decreased daily consumption of nutritious foods amongst students has been mainly attributed to students' perception of inconvenience; students regard fruits, vegetables, and fresh meats as time consuming and an inefficient cost (Marquis, 2005, p. 61). In addition to external barriers, studies suggest that internal motivations and psychological factors influence eating behaviour. Findings in the 2012 study by Ganasegeran demonstrated that psychological factors were more influential than the benefits of maintaining healthy eating habits among university/college students. A lack of self-control, boredom, nervousness, and joyfulness are feelings that students associate to the frequency at which they eat, and the type of food they eat (Ganasegeran et al., 2012, p.4). The research from this study highlights convenience - of junk food on campus - as an enabling factor for students to develop poor eating habits. University infrastructures such as the current vending machines on Dalhousie campus are facilitating negative eating behaviours amongst students. However, healthy vending machines assess several of the main barriers to health diets among student populations; vending machines are convenient, highly accessible, and can contain cost efficient food that offers substance and nutrition. Implementing healthy vending machines on campus can address students' determinates of healthy eating while increasing and promoting sustainable diets on Dalhousie's campus.

2.3 Sustainable Diets

The term 'sustainable diet' "considers not just the kinds of foods we eat, but how they are produced" (Garnett, 2014, p. 4). The current global food system is having devastating affects on the natural environment, and modern dietary practices are negatively impacting social and economic factors; on both an individual and collective scale (Garnett, 2014, p. 1). Although there are few studies available that specify environmental, economic, and social factors associated with snack food consumption, there is an explicit negative relation between snack food production and sustainable development.

2.3.1 Environmental Impacts

Ingredients for the production of snack foods such as cane sugar, coca, maize and corn syrup, have a considerable negative impact on the environment (Garnett, 2014, p. 27). Environmental concerns such as water stress, deforestation and habitat destruction

are correlated to their production (Gockowski & Sonwa, 2011; as cited in Garnett, 2014, p. 27). A report conducted by the Nordic Council of Ministers in 2011 shows that "sweets and snacks have a significantly greater adverse impact on the environment than healthy food products" (Norden, 2011). As these foods provide no nutritional value, the environmental impacts during production and manufacturing can be deemed unnecessary (Garnett, 2014, p. 27). Reducing the availability of such foods on a university campus can decrease product demand as well as discourage school populations from future purchases of such products. Replacing large snack food brands (eg. Lays & Doritos chips) with healthy alternatives in Dalhousie campus vending machines would symbolize commitment to support sustainable food.

2.3.2 Physical and Mental Impacts

Large quantities of snack food consumption are associated to mental and physical issues amongst individuals in developed modern societies (Garnett, 2014, p. 27 & Deshpande et al., 2009, p. 145). The modern epidemic of obesity has been labeled as the second leading cause of preventable deaths (Goel, 2006, p. 317). The majority population of obese individuals is an avertable epidemic, preventable by discouraging consumption and discontinuing an availability of foods with a high sugar/fat profile. Dalhousie's effort to promote healthy eating behaviours and lifestyles can prevent susceptible members of the student population from developing negative habits.

The human brain is an ever growing organ that requires nutrients for development, and optimal functioning. Eating habits that do not supply body's efficient intakes of nutrients hinder individuals' abilities to sustain prime cognitive utility (Parletta, Milte, & Meyerc, 2013, p. 725). Poor eating habits are associated to decreased cognitive functions and hindered brain development throughout individuals' lifecycles; micronutrient deficiencies developed in later years of life directly influence cerebral functioning (Parletta, et al., 2013, p. 725; Wärnberg, Gomez-Martinez, Romeo, Díaz, & Marcos, 2009, p. 166). As dietary habits developed during university persist into later years of adulthood, the negative influences of eating behaviours can compromise cognitive function throughout life (Wärnberg et al., 2009, p. 167). Inhibited cognitive function during educational and professional careers can negatively affect the level of performance and achievements of individuals. Dalhousie's promotion of healthy eating habits can have a direct positive impact on student life and academic achievements. Implementing healthy vending machines on campus can initiate a campus movement to support healthy eating habits among students.

2.3 Sustainable Diets at Dalhousie

Over the past 30 years, Dalhousie University has demonstrated committed initiative to promote sustainable behaviour within internal operations and curricular activities (Dalhousie University, n.d.). The mission of the Dalhousie Office of Sustainability is to "create campus solutions that support positive ecological, social health and economic outcomes" (Dalhousie University, n.d.) Dalhousie has created a 'Sustainability Wheel' that highlights university specific issues and outcomes that are associated to achieving greater sustainability within institutional activities (Dalhousie

University, n.d.). Amongst various subjects within the 'Wheel', student life and academic achievement are emphasized. Dalhousie has lead by example to engage and encourage its university population to practice sustainable behaviour. Therefore, promoting healthy eating lifestyles on campus is essential to supporting and encouraging positive social health and sustainable diets among the student population. Providing healthy foods in vending machines throughout campus has the potential to be an optimal solution to addressing the common researched determinates of healthy eating behaviours of students on university campuses. Universities provide an environment for academic learning and personal development, Dalhousie has an opportunity to engage and encourage students to adapt sustainable diets as an initiative to achieve social health and increase the quality of student life and academic achievement.

3.0 Research Methods

The purpose of the proposed research is to question if students enrolled in the 2015/2016 year at Dalhousie University desire sustainable snacking options within the vending machines located on campus. Our team will determine if the current student population has an interest in vending machines with local, organic, fresh or any other forms of healthy/sustainable consumable products. To do so, we will evaluate current student purchasing behaviour from existing campus vending machines.

3.1 Overview

Our study will use non-probabilistic convenience sampling to answer the question: Do students enrolled in Dalhousie University in the 2015/2016 school year desire availability to sustainable food alternatives within the vending machines on Studley Campus? Non-probabilistic sampling comprises of "a set of sampling techniques in which the probability of selecting each sampling unit is unknown or unknowable" (Palys, & Atchison, 2014, pg. 424). This sampling technique is appropriate for our study as we do not have access to the entire Dalhousie student sample frame; a fully representative study of the population is not practical given time restrictions, however a wide range of data will be collected to determine if any trends appear. Research methods for this study will include in person and virtual online questionnaires. Brief face to face interviews will also be conducted with Dalhousie students. All questions asked will be regarding vending machine purchases in several highly concentrated student locations including: the Student Union Building (SUB), McCain Building, Life Science Centre (LSC), Howe Hall Residence Building and the Rowe Building.

3.2 Study Design

Our research methods will be conducted to determine if there is a sufficient interest in the topic by the student body. Questionnaires were selected so as to collect large quantities of preliminary data; by using an online questionnaire, we can collect and organize the data more efficiently. In person surveys will allow study coordinators to interact with potential participants to encourage their participation and will be readably accessible to reduce potential ambiguity of research questions.

3.3 Proposed Methods

3.3.1 Questionnaires

Questionnaire distribution is intended to provide our research project with direct feedback of the Dalhousie student bodies' opinion of current snack food options on Studley campus. Various locations that are normally heavily populated by a diverse mixture of students (LSC, SUB, etc.) will be sought out for survey participants. Data collection will be performed on one day for each building within the same week. In addition to in-person surveys our team will advertise virtual copies on University specific social media. We have decided to use online surveys to increase our reach of the Dalhousie student population. Research has shown that online surveys increase participant accessibility and usability (Palys & Atchison, 2014 p.147). The questionnaire will consist of a series of structured and open-ended questions (identified in Appendix 01). A minimum of ten participants will be randomly chosen from each identified location. Participants will be able to complete in-person questionnaires on Mac device leased from Dalhousie IT facilities. SurveyMonkey has been chosen as a software application to record and analyze information from both in-person and virtual surveys during research data collection. This strategy is aimed to eliminate the flaws of online surveys [low response rates and an inability to clarify question ambiguities/misinterpretations] while increasing the ease and efficiency of collecting and analyzing the data of in-person/paper surveys (Palys & Atchison, 2014 p.147). As incentive to participate in our research project, participants will be eligible to enter a prize winning draw for a $25 gift certificate redeemable at the Dalhousie book store. The laptops will be presented on tables accompanied by two group members during a two hour time period in each identified building; timing and location can be identified via chart 01 on page 11. Each group member, when not answering questions, will try to encourage people in the area to participate in our study. Study coordinators will provide participants with a brief introduction of the goals and objectives of the study while also providing consent forms. Participants will be issued a copy of the consent form (found in Appendix 03) that assures confidentiality of their identity. Personal contact information from participants will only be recorded for the purposes of the gift certificate raffle. After participation in our research study, respondents will receive a

letter of appreciation for participation in our research. The feedback letter (found in Appendix 04) contains a brief summary of our project, the anticipated goals of our research and our contact information.

3.3.2 Interviews

The intention of interviews will be used to obtain more in-depth information than could not otherwise be obtained from the questionnaires. These interview questions will be semi-structured to allow participants the freedom to exhaust and elaborate on specific topics of interest that would assist in interpretation of study findings. Interview candidates will be randomly selected in the identified location while in-person surveys are being conducted. Those who participate in interview will be eligible to win an additional $25 gift certificate redeemable at the Dalhousie University bookstore. The number of interview participants will remain limited compared to questionnaire participants, aiming for a minimum of six participants. The short interview will consist of questions found in Appendix 02. We intend to use neutral language during the in-person surveys In order to reduce potential reactive bias amongst potential participants (Palys & Atchison, 2014 p.151). With the assistance of Palys & Atchison (2104, p.150) our team has decided to implement interviews as a research method in light of the following advantages:

- Reduced quantity of volunteer bias;
- Enhanced quality of data gathered;
- High respondent rate.

Data will be recorded using SurveyMonkey software which will aid in the collection and organization of research data gathered during the interviews.

3.4 Data Analysis

The qualitative data will be coded both a priori content specifically and grounded a posteriori ally so as to have pre-set concepts that we are looking for based on the research while staying open to other concepts that might be applicable. We will graph relevant trends or differences in groups from the quantitative data while verbally describing what qualitative trends arise with potential of mind mapping concepts that appear most with coding if it remains an appropriate way of displaying the data.

The quantitative data will be analyzed for trends in what changes Dalhousie students would like to see occur to vending machines on campus. The main data analysis tool we will use is the mode, the information that occurs most frequently in specific question(s) (Palys, & Atchison, 2014, pg. 342). We will use this for questions that ask students about their preferences such as question ‘8’ from the survey where we ask what snacks they prefer. For some questions mean will be more useful than the

mode. The mean is more simply known as the arithmetic average and is calculated by adding all the numbers up and then dividing the sum by the number of responses (Palys, & Atchison, 2014, pg. 342). This will be used for questions with ratio data such as number '7' where we ask participants to state how often they use a vending machine. Using mean here will allow us to find the average amount of times students are using vending machines as opposed to the response that occurred the most.

3.5 Limitations and Delimitations

All research projects have limitations and delimitations. A limitation is a limit that is out of the researcher's control, and delimitation is a limit that has been imposed by the researchers (Wright, March 1st, 2016). The limitations and delimitations of this project are outlined below.

Limitations:

- There is a limited timeframe to complete research (3 weeks)
- As a group we have a limited amount of resources and experience to complete research
- The amount and diversity of participants who are willing to volunteer is out of our control
- The fact that this is a research project for an environmental class could create bias in answers
- Our presence during interviews could create a bias in answers

Delimitations:

- We will be advertising for the surveys online solely through Facebook
- We will be conducting interviews and surveys in the Student Union building, McCain building, Life Science Center, Howe Hall, and the Rowe Building
- We will conduct the interviews and survey questions over a one week span (March 6-12 2016)
- We will try to get 100 surveys and 20 interviews completed
- Our sample population will be restricted to Dalhousie students

4.0 Schedule

Chart 01. Time frame for completion of major steps

Major Steps/Weeks	Week 7 – Feb 14-20	Week 8 – Feb 21-27	Week 9 – Feb 28-March 5	Week 10 – March 6-12	Week 11 – March 13-19	Week 12 – March 20-26	Week 13 – March 27-April 2	Week 14 – April 3-9	Exam Period – April 10-16
Develop rough draft of preliminary proposal	X								
Complete final draft of preliminary proposal		X							
Apply for DSUSO funding			X						
Complete ethics form and consent information			X						
Submit final proposal			X						
Conduct surveys online and on campus				X					
Conduct interviews				X					
Develop final report					X	X	X		
Pecha Kucha Project Presentation								X	
Submission of final report									X

Our group has divided up the work evenly while each major step will be completed by the group as a whole. Each member of the group is responsible for contributing their individual part to the preliminary proposal construction and submission; Michael is responsible for the project definition, Jennifer is responsible for the background and rationale, Ian is responsible for the proposed research methods, Meredith is responsible for the schedule and budget, and Josh is responsible for the ethics forms, consent information, deliverables and communication plan. Michael is submitting the report and all group members are responsible for providing references and appendices where appropriate. Similarly, we are all equally responsible for the final report and completing the section that we have assigned to ourselves and presenting at the Pecha Kucha. Meredith is responsible for completing the DSUSO funding application and making sure it is submitted on time. We will be developing our rough draft of the preliminary proposal over the week of February 14-20 and will aim to have it completed by February 23.

There are costs associated with our project, specifically the use of two Dalhousie bookstore gift cards as incentives for participants to fill out our surveys. We will be applying for funding from the Dalhousie Student Union Sustainability Office (DSUSO) by the end of the application deadline of February 29. The ethics form and consent information will be completed by March 1. We will work on the final draft of the preliminary proposal during February 28-March 3 and will have the completed final draft submitted on March 3 by midnight.

We will post an online version of the survey on Dalhousie Facebook groups on March 6. In-person surveys will be conducted during March 6-11 and will be done in six locations on Studley campus: Life Sciences Centre (LSC), Student Union Building (SUB), Rowe, McCain, Howe Hall, and LeMarchant Place (LMU). We will conduct the surveys in pairs and survey each location on a different day. We will survey at two different time blocks during the day for a variety of results and participants: 11am-1pm and 3-5pm. On March 6, Jennifer and Ian will survey in the LSC during the first block and Josh and Meredith will survey during the second block. On March 7, Josh and Meredith will survey in the SUB during the first block and Michael and Ian will survey during the second block. On March 8, Michael and Ian will survey in the Rowe during the first block and Jennifer and Meredith will survey during the second block. On March 9, Jennifer and Meredith will survey in McCain during the first block and Michael and Josh will survey during the second block. On March 10, Michael and Josh will survey in How during the first block and Jennifer and Ian will survey during the second block. On March 11, Jennifer and Ian will survey in LMU during the first block and Josh and Meredith will survey during the second block. We will be conducting interviews during these days as well, and the times will depend on which participants are willing to be interviewed. The Pecha Kucha presentation will take place on April 5 during class time in the Grawood, located in the SUB. The final report will be developed during week 11-13 and will be submitted on April 11 by midnight.

5.0 Budget

Table 1. Costs associated with implementation process

Required Resource	Product Description	Costs
Dalhousie bookstore gift cards	Two gift cards to use as incentives for participants to fill out the surveys and participate in interviews	$25.00 $25.00
	Total	$50.00

6.0 Deliverables and Communication Plan

This project is looking to determine if it is feasible to move forward in providing Dalhousie students with a healthy alternative to vending machine products on campus. The deliverables in the final report will include:

- A summarization of the surveys we have conducted
- A summarization of the mini interviews conducted
- An analysis of the surveys and interviews
- Pecha Kucha presentation

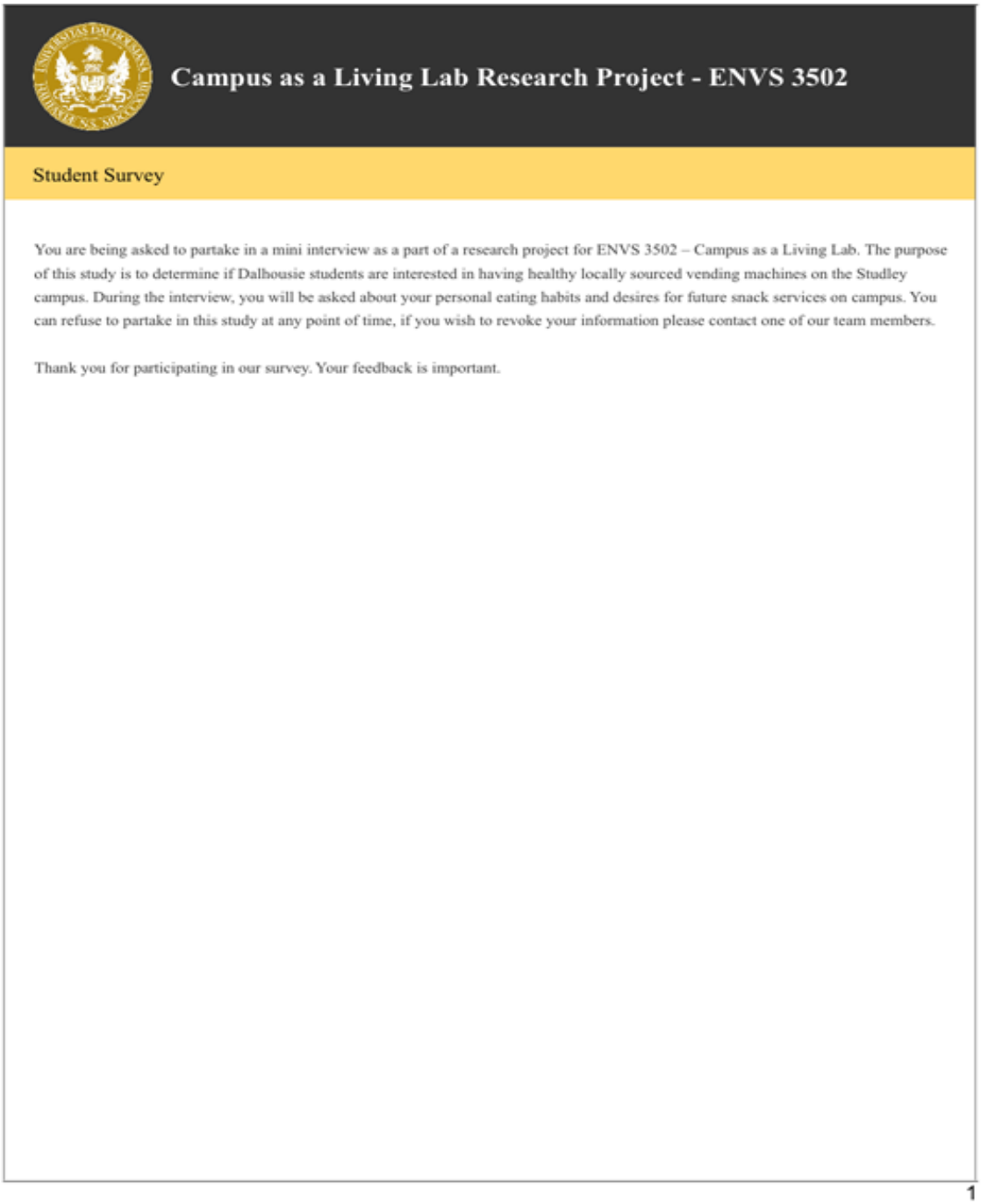
At the end of this project we hope to show whether or not the Dalhousie student body is interested in local vending machine alternatives and if it is environmentally better for the campus to support these machines over the current ones.

Tool	**Objective**	**Audience**
Final Report	Summarizing our entire findings into one report	Class supervisor
One page report/ Infographic	An eye catching way to display our data	• DSUSO • Food services
Pecha Kucha	Share the information we have learnt	ENVS 3502 class

Our Communication objectives are to inform our mentor, course instructor, and DUSUO about our finding at the end of the project with a full report. During the research the target audience will be all students regardless of their degree. The reasoning behind this is that students are the ones most likely to be using the new vending machine services so their inputs are the most important. We will be communicating with them through mini interviews and by conducting surveys in the Killam.

7.0 Appendices

Appendix 01



Campus as a Living Lab Research Project - ENVS 3502

Student Survey

You are being asked to partake in a mini interview as a part of a research project for ENVS 3502 – Campus as a Living Lab. The purpose of this study is to determine if Dalhousie students are interested in having healthy locally sourced vending machines on the Studley campus. During the interview, you will be asked about your personal eating habits and desires for future snack services on campus. You can refuse to partake in this study at any point of time, if you wish to revoke your information please contact one of our team members.

Thank you for participating in our survey. Your feedback is important.

1

Campus as a Living Lab Research Project - ENVS 3502

Student Survey

1. Email for your chance to win !

Email Address

2. What is your gender?

- ◯ Female
- ◯ Male
- ◯ Intersex

3. What is your age?

- ◯ 17 to 19
- ◯ 20 to 24
- ◯ 25 to 29
- ◯ 30+

4. Are you a Canadian or Internation student at Dalhousie?

- ◯ Canadian Student
- ◯ International Student

5. Do you live on or off of the Dalhousie Campus?

- ◯ On Campus (Residence)
- ◯ Off Campus

2

6. At what level of study are you at within the university?

- ◯ Undergraduate
- ◯ Masters
- ◯ Ph.D

7. How often do you purchase food from a vending machine on campus per week?

- ◯ 0
- ◯ 1
- ◯ 1 to 2
- ◯ 2 to 3
- ◯ 3-4
- ◯ 4+

8. When purchasing snacks, I prefer to buy snacks...

- ◯ On Campus
- ◯ Off campus, but close by
- ◯ I buy all my food at the grocery store
- ◯ Farmers market
- ◯ Other (please specify)

9. What is the most amount of money you are willing to spend on healthy snacks in a vending machine?

- ◯ 0
- ◯ $0.01 - $1.00
- ◯ $1.01 - $2.00
- ◯ $2.01 - $3.00
- ◯ $3.01 - $4.00
- ◯ $4.01 - $5.00
- ◯ $5.01 +

3

10. To what extent does each of the following influence your use of vending machines? Select one number for each item on the scale.

	Not at all	Mild	Moderate	Extremely
Stress	◯	◯	◯	◯
Boredom	◯	◯	◯	◯
Loneliness	◯	◯	◯	◯
Anxiety	◯	◯	◯	◯
School work load	◯	◯	◯	◯
Time of day	◯	◯	◯	◯
Weather	◯	◯	◯	◯

If applicable, please indicate the general location of vending machines that you most frequently use on the Dalhousie campus.

11. To what extent does each of the following influence your choice while purchasing food on campus. Select one number for each item on the scale.

	Not at all relevant	Mild relevance	Moderate relevance	Severe relevance
Time sufficiency	◯	◯	◯	◯
Taste	◯	◯	◯	◯
Convince	◯	◯	◯	◯
Budget	◯	◯	◯	◯
Nutritional value	◯	◯	◯	◯
Local ingredients	◯	◯	◯	◯
Organic ingredients	◯	◯	◯	◯

12. Dalhousie had made considerable effort to provide a range of food avalible on campus. If Dalhousie were to replace the current food in campus vending machines with healthy options, what types of snacks would you prefer?

13. How satisfied are you with the food selection on Dalhousie campus?

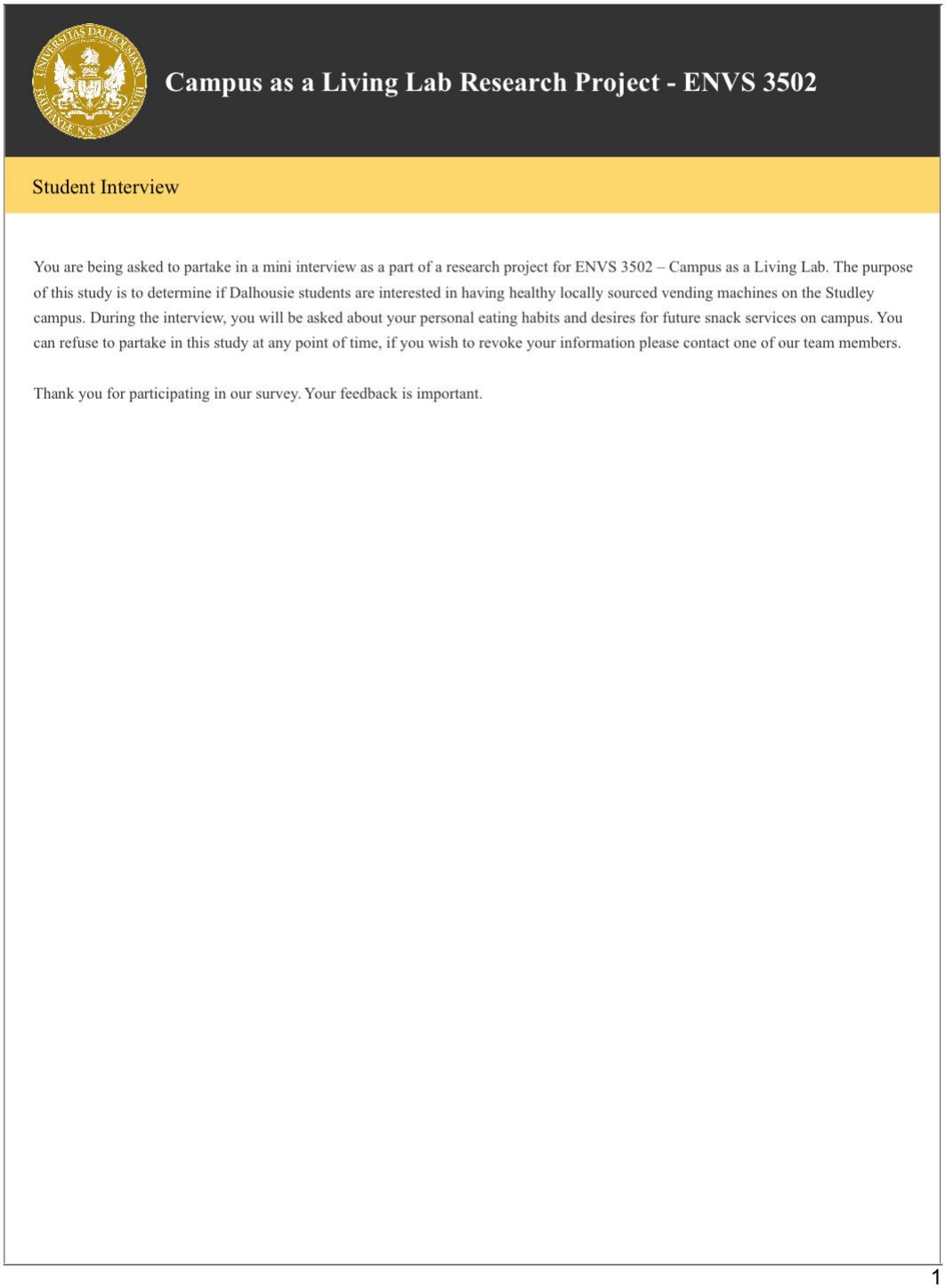
◯ Very satisfied

◯ Somewhat satisfied

◯ Not satisfied

4

Appendix 02



Campus as a Living Lab Research Project - ENVS 3502

Student Interview

You are being asked to partake in a mini interview as a part of a research project for ENVS 3502 – Campus as a Living Lab. The purpose of this study is to determine if Dalhousie students are interested in having healthy locally sourced vending machines on the Studley campus. During the interview, you will be asked about your personal eating habits and desires for future snack services on campus. You can refuse to partake in this study at any point of time, if you wish to revoke your information please contact one of our team members.

Thank you for participating in our survey. Your feedback is important.

1

Campus as a Living Lab Research Project - ENVS 3502

Student Interview

1. Email for your chance to win !

Email Address

2. What is your gender?

- ◯ Female
- ◯ Male
- ◯ Intersex

3. What is your age?

- ◯ 17 to 19
- ◯ 20 to 24
- ◯ 25 to 29
- ◯ 30+

4. Are you a Canadian or Internation student at Dalhousie?

- ◯ Canadian Student
- ◯ International Student

5. Do you live on or off of the Dalhousie Campus?

- ◯ On Campus (Residence)
- ◯ Off Campus

2

6. At what level of study are you at within the university?

- ◯ Undergraduate
- ◯ Masters
- ◯ Ph.D

7. How often do you purchase food from a vending machine on campus per week?

- ◯ 0
- ◯ 1
- ◯ 1 to 2
- ◯ 2 to 3
- ◯ 3-4
- ◯ 4+

8. How has you eating habits changed since you began university?

9. What are the ideal products you would like to purchase in a healthy vending machine ?

10. What are the main factors that influence you to purchase snacks from vending machines ?

3

Appendix 03

DALHOUSIE UNIVERSITY
Inspiring Minds

Research Consent Form
ENVS 3502 – Campus as a Living Lab Research Project

Dear Participant,

You are being asked to partake in a mini interview as a part of a research project for ENVS 3502 – Campus as a Living Lab. This document is a consent form and will inform you of the risks and your rights. Please read through it and do not hesitate to ask questions if they arise.

Purpose of the study
The purpose of this study is to determine if Dalhousie students are interested in having healthy locally sourced vending machines on the Studley campus.

Study Procedure
In the interview you will be asked a few questions about eating habits and your desires for on campus food services. In the survey you will be asked multiple questions about food services on campus.

Compensation
You will be entered in a draw for $25 to the Dalhousie Bookstore. There will be two prizes handed out, one for the surveys, and one for the interviews

Risks
There are no apparent risks involved with this study.

Confidentiality
The only piece of identification asked for is an email and that will solely be used in the purpose of contacting the winner of the draws. If you wish to partake in the survey but not provide your email that is fine, however you will not be entered in the draw.

Rights
You can refuse to partake in this study at any point of time, and if later you wish to revoke your information send an email to one of the researchers stating that you would like your survey or interview revoked.

Contact Information

Researchers
Michael Trewartha Michael.Trewartha@dal.ca
Jennifer Lorandos JN233212@dal.ca

DALHOUSIE UNIVERSITY
Inspiring Minds

Research Consent Form
ENVS 3502 – Campus as a Living Lab Research Project

Ian Smith in620994@dal.ca
Meredith Crawley mr288446@dal.ca
Josh Kester josh.kester@gmail.com

Research Supervisor

Tarah Wright tarah.wright@dal.ca

By signing below you are stating that you wish to partake in this study

_____ _____
Name of Participant Date

_____
Signature of Participant

Appendix 04

DALHOUSIE UNIVERSITY
Inspiring Minds

Participant Feedback Form
ENVS 3502 – Campus as a Living Lab Research Project

Dear Participant,

We would like to express our gratitude for partaking in our survey on vending machines. The information you have provided us is extremely valuable for the project. To show our appreciation you have been entered in a draw to win a $25 gift certificate to the Dalhousie Bookstore. We will do the draw March 20th 2016 and will let the winner know through an email.

The purpose of this study is to determine whether or not Dalhousie students are interested in having locally sourced healthy food in vending machines on the Studley campus. We predict that students will be interested in this as it provides more options for them to purchase food on campus.

All the information provided will be kept confidential and individual responses will only be available to the research supervisor, our mentor, and us. If at any point you wish for your results to be withdrawn from our data, please do not hesitate to send us an email requesting so.

Contact Information

Researchers
Michael Trewartha Michael.Trewartha@dal.ca
Jennifer Lorandos JN233212@dal.ca
Ian Smith in620944@dal.ca
Meredith Crawley mr288446@dal.ca
Josh Kester josh.kester@gmail.com

Research Supervisor

Tarah Wright tarah.wright@dal.ca

Appendix 05

ENVIRONMENTAL PROGRAMMES
FACULTY OF SCIENCE
DALHOUSIE UNIVERSITY

APPLICATION FOR ETHICS REVIEW OF RESEARCH INVOLVING HUMAN PARTICIPANTS
UNDERGRADUATE THESES AND IN NON-THESIS COURSE PROJECTS

GENERAL INFORMATION

1. **Title of Project: Sustainable Vending Machines On Dalhousie Campus**

2.

Faculty Supervisor(s)	**Department**	**Ext:**	**e-mail:**
Tarah Wright	Environmental Science		tarah.wright@dal.ca

3.

Student Investigator(s)	**Department**	**e-mail:**	**Local Telephone Number:**
Michael Trewartha	Arts & social Science	Michael.Trewartha@dal.ca	(416)986-0906
Jennifer Lorandos	Management	JN233212@dal.ca	(902)580-8920
Ian Smith	Biology & Sustainability	in620994@dal.ca	(902)880-1481
Meredith Crawley	IDS & Sustainability	mr288446@dal.ca	
Josh Kester	Environmental Science	josh.kester@gmail.com	(902)402-3793

4. **Level of Project:**
Non-thesis Course Project
[X] Undergraduate [ ] Graduate Specify course and number: ENVS 3502

5. a. **Indicate the anticipated commencement date for this project:** March 9th 2016

b. **Indicate the anticipated completion date for this project:** April 11th 2016

-

SUMMARY OF PROPOSED RESEARCH

1. Purpose and Rationale for Proposed Research
Briefly describe the purpose (objectives) and rationale of the proposed project and include any hypothesis(es)/research questions to be investigated.

The purpose of this project is to determine whether or not it is feasible to introduce a locally sourced vending machine on the Studley campus at Dalhousie University. The research question we are investigating is "Do Students enrolled in Dalhousie University in the 2015/16 school year desire Sustainable food alternatives in Vending machines on Studley Campus?"

2. Methodology/Procedures

a. ***Which of the following procedures will be used? Provide a copy of all materials to be used in this study.***.

[ ] Survey(s) or questionnaire(s) (mail-back)
[X] Survey(s) or questionnaire(s) (in person)
[X] Computer-administered task(s) or survey(s)]
[X] Interview(s) (in person)
[ ] Interview(s) (by telephone)
[ ] Focus group(s)
[ ] Audio taping
[ ] Videotaping
[ ] Analysis of secondary data (no involvement with human participants)
[ ] Unobtrusive observations

[ ] Other, specify _____

b. ***Provide a brief, sequential description of the procedures to be used in this study. For studies involving multiple procedures or sessions, the use of a flow chart is recommended.***

The research methods in this study will be based on student questionnaires and interviews. Questioners will be distributed using two methods; online surveys, and in-person surveys. The questioners will contain questions about students' eating habits on the Dalhousie Campus. The questioners will be brief; willing participants will be asked to participate in a following 5-10 minute in-person interview. This project will be incorporating a non-probabilistic haphazard sampling technique; participants will be sourced in highly populated campus buildings such as the Student Union Building (SUB), McCain Building, Life Science Centre (LSC), Howe Hall Residence Building and the Rowe Building.

3. Participants Involved in the Study

a. ***Indicate who will be recruited as potential participants in this study.***

Dalhousie Participants: [X] Undergraduate students
[X] Graduate students
[ ] Faculty and/or staff
Non-Dal Participants: [ ] Children
[ ] Adolescents
[ ] Adults
[ ] Seniors
[ ] Persons in Institutional Settings (e.g. Nursing Homes, Correctional Facilities)

[ ] Other (specify) _____

b. ***Describe the potential participants in this study including group affiliation, gender, age range and any other special characteristics. If only one gender is to be recruited, provide a justification for this.***

The potential participants in this study are current Dalhousie students on the Studly Campus. Participants will be random selection of Dalhousie students, there will be no required criteria.

b. ***How many participants are expected to be involved in this study?***

100-120 students

- ≤ 10 Students from each location:
  - Student Union Building (SUB)
  - McCain Building
  - Life Science Centre (LSC
  - Howe Hall Residence Building
  - Rowe Building

4. Recruitment Process and Study Location

a. ***From what source(s) will the potential participants be recruited?***

[X] Dalhousie University undergraduate and/or graduate classes
[X] Other Dalhousie sources (specify) Public Spaces
[ ] Local School Boards
[ ] Halifax Community
[ ] Agencies
[ ] Businesses, Industries, Professions
[ ] Health care settings, nursing homes, correctional facilities, etc.
[ ] Other, specify (e.g. mailing lists)

c. ***Identify who will recruit potential participants and describe the recruitment process.***

Participant recruitment for this research project will be conducted by all members of the group. We will proceed by advertising on Facebook, and recruiting a random population at various locations on Dalhousie Studley campus (SUB, LSC, ect.).

5. Compensation of Participants

Will participants receive compensation (financial or otherwise) for participation?
Yes [X] No [ ]
If **Yes**, provide details:

As incentive to participate we will be eligible for entry into a raffle for a chance to win a $25.00 gift certificate to the Dalhousie Book Store. There will be two raffles, [one for participants of the survey, the other for participants of the interview] both offering one $25.00 gift certificate. The prizes will be delivered after completion of the research project, and the winners, selected at random, will be contacted by email.

6. Feedback to Participants

Briefly describe the plans for provision of feedback and attach a copy of the feedback letter to be used. Wherever possible, written feedback should be provided to study participants including a statement of appreciation, details about the purpose and predictions of the study, contact information for the researchers, and the ethics review and clearance statement.

Note: When available, a copy of an executive summary of the study outcomes also should be provided to participants.

Participants involved in this project will receive a letter of appreciation for their participation in our research. The feedback letter will contain a brief summary of our project and the anticipated goals of our project, and any addition information that participants may latter require.

POTENTIAL BENEFITS FROM THE STUDY

1. **Identify and describe any known or anticipated direct benefits to the participants from their involvement in the project**.

The only known benefit to the participant is that they will be entered in a draw to win a prize.

2. **Identify and describe any known or anticipated benefits to society from this study.**

Potential benefits to the society may include improved environmental and health standards concerning food available on campus.

POTENTIAL RISKS TO PARTICIPANTS FROM THE STUDY

1. **For each procedure used in this study, provide a description of any known or anticipated risks/stressors to the participants. Consider physiological, psychological, emotional, social, economic, legal, etc. risks/stressors**

[X] No known or anticipated risks
Explain why no risks are anticipated:

There will be no risks associated with this project. Participants are only involved in surveys and interviews, from which their identity will remain confidential. Personal contact information from the participants will only be recorded for purposes of the raffle. A feedback sheet containing group members' contact information will be provided to all group participants. There are no anticipated risks/stressors to the participants of this project.

The questions being asked are not intrusive or personal at all.

[ ] Minimal risk
Description of risks:

[ ] Greater than minimal risk
Description of risks:

2. **Describe the procedures or safeguards in place to protect the physical and psychological health of the participants in light of the risks/stresses identified in Question 1.**

A feedback sheet containing group members' contact information will be provided to all group participants. If participants wish to withdraw records of their participation/contact information from the project, they are able to contact various members of the group to do so.

INFORMED CONSENT PROCESS

Refer to: http://pre.ethics.gc.ca/english/policystatement/section2.cfm

1. **What process will be used to inform the potential participants about the study details and to obtain their consent for participation?**

   [X] Information letter with written consent form; provide a copy
   [ ] Information letter with verbal consent; provide a copy
   [ ] Information/cover letter; provide a copy

   [ ] Other (specify) _____

2. **If written consent cannot be obtained from the potential participants, provide a justification.**

If written consent cannot be obtained from the potential participants, they will be ineligible to participate in our research project, and their contact information will not be collected.

ANONYMITY OF PARTICIPANTS AND CONFIDENTIALITY OF DATA

1. **Explain the procedures to be used to ensure anonymity of participants and confidentiality of data both during the research and in the release of the findings.**

   In order to ensure confidentiality of the participants of our project only emails will be collected, and random numbers/identification will be assigned. Participants email addresses will only be collected if they wish to participate in the raffle.

2. **Describe the procedures for securing written records, questionnaires, video/audio tapes and electronic data, etc.**

Written consent forms will be collected and safely stored in a folder. The folder will remain confidential to members of our group.

3. **Indicate how long the data will be securely stored, the storage location, and the method to be used for final disposition of the data.**

   [X] Paper Records
   [ ] Confidential shredding after _____ years
   [ ] Data will be retained indefinitely in a secure location
   [X] Data will be retained until completion of specific course.

   [ ] Audio/Video Recordings
   [ ] Erasing of audio/video tapes after _____ years
   [ ] Data will be retained indefinitely in a secure location
   [ ] Data will be retained until completion of specific course.

   [ ] Electronic Data

[ ] Erasing of electronic data after _____ years
[ ] Data will be retained indefinitely in a secure location
[ ] Data will be retained until completion of specific course.

[ ] Other _____
(Provide details on type, retention period and final disposition, if applicable)

Specify storage location: 1246 LeMarchant Street, in room 5340B.

ATTACHMENTS

Please **check** below all appendices that are attached as part of your application package:

[ ] **Recruitment Materials**: A copy of any poster(s), flyer(s), advertisement(s), letter(s), telephone or other verbal script(s) used to recruit/gain access to participants.
[X] **Information Letter and Consent Form(s)**. Used in studies involving interaction with participants (e.g. interviews, testing, etc.)
[X] **Information/Cover Letter(s)**. Used in studies involving surveys or questionnaires.
[ ] Parent Information Letter and Permission Form for studies involving minors.
[X] **Materials**: A copy of all survey(s), questionnaire(s), interview questions, interview themes/sample questions for open-ended interviews, focus group questions, or any standardized tests used to collect data.

SIGNATURES OF RESEARCHERS

_____ Signature of Student Investigator(s)	_____ Date
_____ Signature of Student Investigator(s)	_____ Date
_____ Signature of Student Investigator(s)	_____ Date
_____ Signature of Student Investigator(s)	_____ Date
_____ Signature of Student Investigator(s)	_____ Date
_____ Signature of Student Investigator(s)	_____ Date
_____ Signature of Student Investigator(s)	_____ Date

-

FOR ENVIRONMENTAL PROGRAMMES USE ONLY:

Ethics proposal been checked for eligibility according to the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans

_____

Signature Date

8.0 References

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