Vending Machines and Sustainable Development on Grenfell Campus, Memorial University

Adelle Pike
Grenfell Campus
Memorial University of Newfoundland

This paper discusses the food and beverage vending machines that are located at Memorial University's Grenfell Campus and endeavors to assess how much those vending machines are being used and how they affect sustainability initiatives on campus. A survey was conducted to gauge the use of vending machines, their contents and what is purchased, and if participants did not purchase from these machines they were also asked why they did not. This survey produced many other questions that are directly linked to vending machines. Water quality on campus was heavily discussed, along with the use of bottled water and the implications that are associated with drinking only from bottles that are thrown away. The study concludes with a discussion of the alternative choices that can be implemented to replace vending machines.

Introduction

Grenfell Campus is a campus of Memorial University, Newfoundland. The west coast Grenfell Campus has a student population of approximately 1200 with an on-campus population of 420, as of winter 2010 (N. Newell, personal communication, February 4, 2011).

The Campus is largely an undergraduate studies campus with a on its way to adding graduate studies programs soon to be added as well. There are sixteen undergraduate degrees offered at this campus, four of which are strongly environmentally-based. These four programs are Environmental Science, Environmental Studies, Tourism, and Sustainable Resource Management. Recently, Grenfell Campus added a new unit to its list of programs, the Environmental Policy Institute. The Environmental Policy Institute "is a new initiative at Sir Wilfred Grenfell College, Memorial University, dedicated to research and facilitating debate on critical environmental policy issues within the province of Newfoundland and Labrador..." (Grenfell Campus[1], 2007).

Throughout the year, there are many events that promote sustainability within Grenfell Campus. The Environmental Policy Institute holds a Green Books event every year where guest speakers who have written a book on sustainability are invited to present a public lecture on their work and to engage and educate the Grenfell community and broader provincial population. The Environmental Policy Institute also has a speaker series, where they invite authors to come to Corner Brook to speak on important topics which support sustainability. There is also a large research initiative, called the Humber River Basin Project, where many different partners collaborate, including the Vice Principal research chair and the Environmental Policy Institute. The Humber River Basin project "[responds] to critical issues decision-makers face concerning the sustainability of the Humber River Basin and its environs" (Humber River Basin, 2007). It

[1] Grenfell Campus was formally known as Sir Wilfred Grenfell College.

examines the issues that surround provincial and federal programs, as well as the issues that directly impact the Grenfell Campus.

This paper examines the choices that students are given in campus vending machines and discusses the findings related to students' preferences, with an accompanying survey. Survey results were used to deduce what students would like to see in the vending machines in their own school, Memorial University, and the issues that need to be addressed surrounding sustainability and vending machines.

The central questions of this research were: are the food and vending machines located throughout Grenfell Campus sustainable, and what steps are needed to make this campus more sustainable? This paper is then organized as follows: The Context, Methodology, Results, and the Discussion, including: Water, Water Fountains, Clean Drinking Water, Bottled Water Free, Recycling, Vending Machines and, finally, Recommendations.

Sustainability can be defined as: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Bruntland Commission, 1987). This idea of sustainability is crucial in this discussion of vending machines. Food and beverage vending machines located throughout campus are not sustainable. These machines produce considerable waste and need a lot of energy to use. These machines meet the needs of individuals today but use up space in a landfill, do not degrade and are filled with unhealthy food choices.

There has been some literature written on sustainable campuses, giving insight on sustainability in universities. One author suggests that university sustainability can be credited to a "bottom-up approach" (Beringer, 2006). This bottom-up approach is from "concerned and dedicated students requesting changes in organizational policies and practices, in particular with regard to minimizing the ecological footprint of their respective university of college" (Beringer, 2006).

The Context

There is a high population of students who almost exclusively spend their day on the Grenfell Campus – they live in a residence or chalet, they work part-time on campus, they attend classes, and they spend study time on the Grenfell Campus. Many Grenfell students are not just members of our college community; they are exclusively members of that community and no other community population. Many of these students do all of their daily routines on campus. For example, if water is not clean to drink from the tap or if drinking fountains are not equipped with bottle filling stations, the student community must spend $2.25 per 500ml bottle of water that, for many students, and most people, is far too expensive. Frequent boil orders are another issue at Grenfell Campus. During a boil order students and staff are required to spend money to drink clean water, without any sources of free drinking water. This paper hopes to bring forth all the information on the drinking water available at Grenfell Campus, Memorial University and the available options it has to make this institution a more sustainable campus.

Throughout Grenfell Campus there are food and beverage vending machines. The food vending machines carry products that are high in fat and highly processed. Many of the students that attend Grenfell Campus are very conscious of what they eat, ensuring the product is healthy

and not highly processed. This paper examines the alternative products that can be implemented into the vending machines.

In addition, water bottle disposal options are investigated once they are put into the recycling bins. Several times throughout the year, Visual and Theatre Arts students take the recycling that is located throughout the school as a part of their ongoing Harlow Fundraising effort. It is unclear who is responsible for the recycling program for the rest of the semester? In this paper, available options for clean drinking water at Grenfell Campus are examined including options that do not pollute.

Methodology

A survey (found in Appendix A) was conducted to look at the attitudes towards the vending machines and their contents, which are found throughout Grenfell Campus, Memorial University of Newfoundland. There are twenty (20) vending machines on campus. They are owned, operated, supplied and maintained by various distributors. Coca Cola products – including such as Sprite, Coke and the energy drinks -- come straight from a distributor working with Coca Cola. A distributor who fills the food vending machines brings in other products, including chips, chocolate bars, and gum. The vending machines use electricity from an outlet at the wall, powered by Memorial University. The school receives rental revenue from the vending machines that are located on campus property. For the purposes of the study, the contents of the vending machines were broken into two categories: food and beverage. The survey was given out randomly during the month of January to various classes throughout the Grenfell Campus. Sample surveys were passed out to various classes throughout the University; a student went into classrooms and asked the full class to participate. There were 100 participants surveyed and 83 surveys were valid. Participants were asked questions pertaining to the frequency of use and types of food or beverage; the complete survey can be found in Appendix A. If the participant does not purchase anything from the vending machines they were asked to indicate their rationale. The survey asked whether they would use the vending machines if there were healthier alternatives included in the selections. It also probed other options people would prefer to have available in the vending machines and dispensers. Also, participants were asked if they would prefer to receive purified water through dispensers throughout campus, or through a campus-wide or city-wide filtration system.

Survey responses data was input into SPSS statistical software and analyzed for results. These results were tabulated by frequencies in the selected categories. Percentages were then determined and compared to the student population as a whole. Assumptions were then extrapolated about campus-wide purchasing patterns and student ideals about food and beverage vending machines.

An extensive review of literature based on healthy eating at schools was conducted. There is little information available regarding healthy eating using vending machines for post-secondary institutions. Much of the literature on this topic refers to secondary schools (Callaghan, Mandich & He 2010). Research on bottled water and the elimination of bottled water is from a very broad base, including peer-reviewed articles, news articles and websites. Significant information about the elimination of bottled water in universities was available in the research (Beringer, 2006; Girard, 2009; Water Watch Acadia, 2010).

Besides a review of literature, there were discussions with professionals throughout Grenfell Campus. These discussions were not audio recorded as many occurred through email. Also, there were discussions with professionals outside Grenfell Campus, especially to investigate data specific to Corner Brook or the secondary schools in the city. These discussions included individuals who work with water and sewer in both Corner Brook and Pasadena.

There could and will be several errors in this research. Several surveys had to be discarded because respondents did not comply with directions. Survey questions were necessarily focused, but consequently may have left out vital pieces of information, such as the last page, demographics. Also, questions in the paper survey could be misread and misinterpreted, and filled out under the influence of misunderstandings. Participants may have also filled out the survey with a social desirably basis, in which participants indicate a certain answer only because they think the surveyor wants to see that specific response.

It was expected that results would indicate that students prefer to eat healthier choices out of the vending machines and, if given the choice, would drink from refillable bottle fountain stations rather than purchasing the bottled water from vending machines. These results were expected because of several other similar issues happening simultaneously in other universities and college campuses. In 2010, students of the University of Ottawa banned the sale of bottled water on their campus. Hundreds of students in Ottawa signed a petition "asking school administrators to put a stop to the years-long practice" of selling bottled water (The Canadian Press, 2010). All bottled water was removed from the Ottawa campus and "students [were] encouraged to use on-campus water fountains and reusable containers" (The Canadian Press, 2010). As well as improving the existing water fountains, gooseneck faucets to fill reusable containers were also installed on the Ottawa campus (The Canadian Press, 2010).

Results

Of the 100 students that were surveyed, 83 of the surveys were valid representing a response rate of 83%. As mentioned previously, students were asked various questions on spending habits at the vending machines. With a sample size of 100, of the 1200 students attending, the margin of error is 9.39%, with a confidence interval of 95%. All of the participants were students with 49.4% being first year University students, 21.7% second year, 12% third year and 14.5% were fourth year students.

Students were asked if they purchased food from the vending machines on campus and if they did purchase from the vending machines, how often. In Figure 1, 56.6% of participants stated that they purchased from the food vending machines, whereas 43.4% did not purchase. In further questions, Figure 2 onward, N/A represents the students that said no. Most participants who purchased from the food vending machines purchased only 'sometimes' equally one time a month, 48.2%.

Figure 1

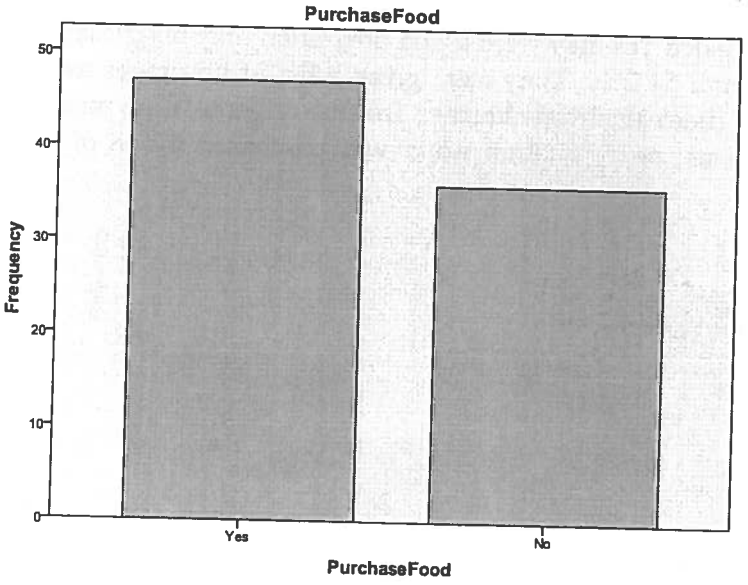
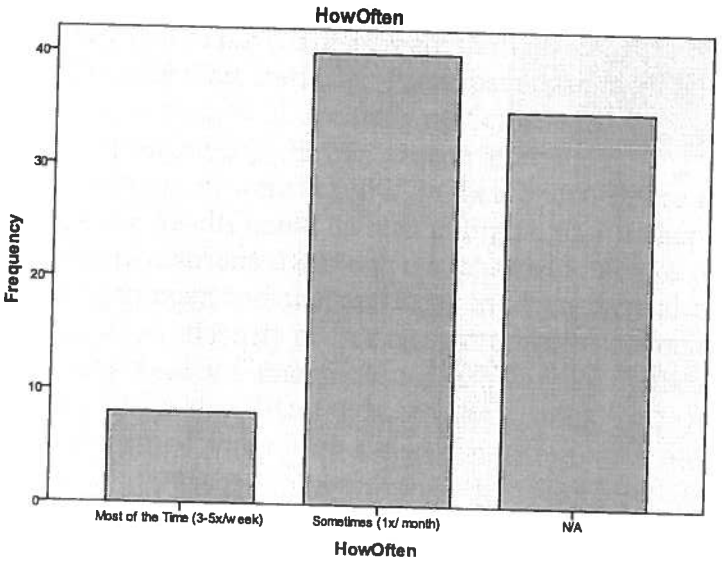


Figure 2



Participants were given a list of the available options in the vending machines to gauge what they ate. Of the 47 participants who purchase from the vending machines, 24 ate the Sun Chips product, the healthiest option in the machines. The second most purchased was Doritos at 20 participants. Participants were asked if there were alternatives in the vending machines would they purchase them, with the results shown in Figure 3. 75.9% of students stated that would purchase from the vending machines if there were healthier alternatives and 24.1% stated it would not change their spending. Approximately half of the students that were surveyed did purchase from the vending machines at least once a month, though many of the participants were very willing to purchase alternative items out of the vending machine if they were offered.

Students were then asked if they purchased beverages from the vending machines, as seen in Figure 4. 65.1% of participants purchased from the beverage vending machines whereas 33.7% did not purchase. If they responded yes they were asked how often they purchased them, again most purchased only once a month 54.2%. They were given a list of beverages available in the vending machines and asked to check their top choices. Bottled water was the most often purchased with 23 of the 55 participants; next, Vitamin water was purchased by 18 of the 55 participants.

Figure 3

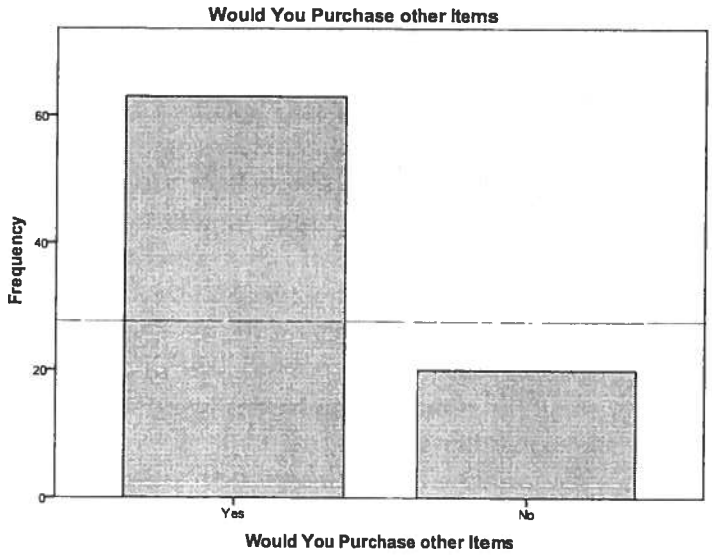


Figure 4

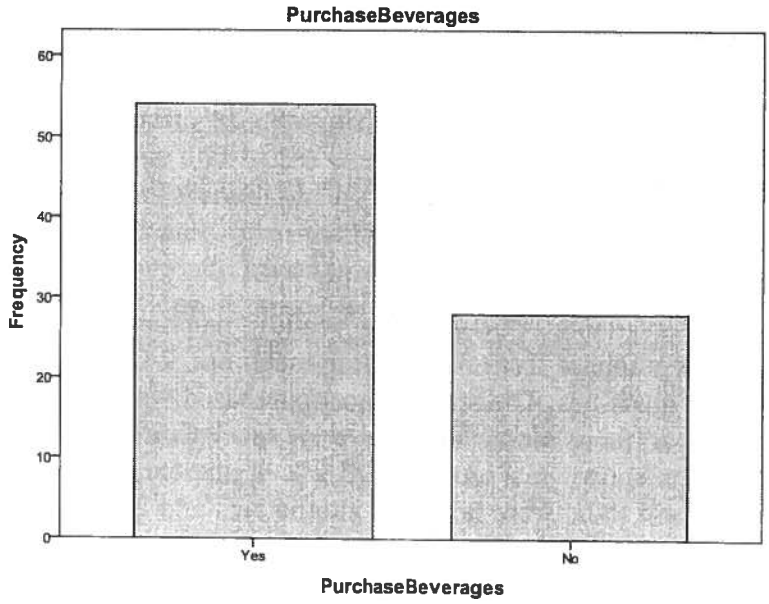
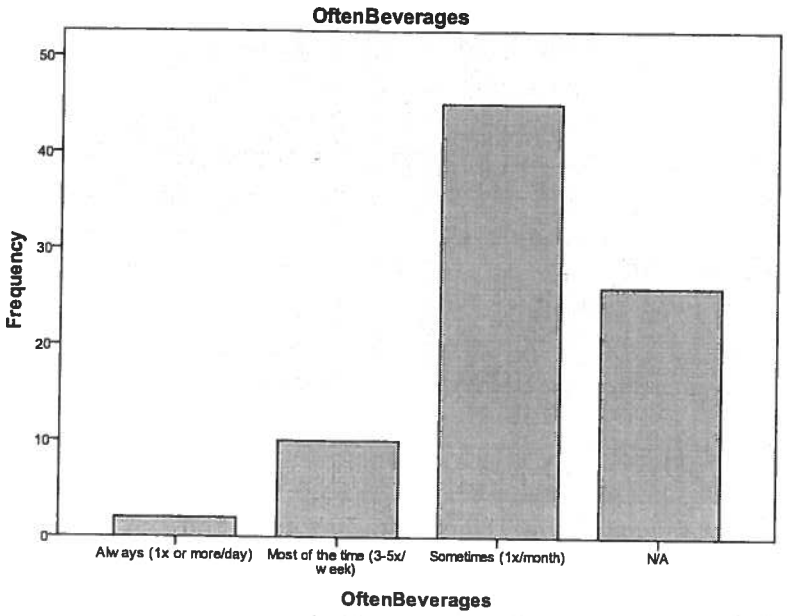


Figure 5



Lastly, participants were asked if given the option of clean free drinking water, how would they like to have it dispensed: through a dispenser using disposable cups, or from a dispenser using their own cup. Participants would prefer to have water from a dispenser using a reusable container, 41%, secondly participants would prefer to have clean water from a dispenser using a disposable cup, 33.7%, as seen in Figure 5.

Participants were asked if, in their opinion there should be clean drinking water free of change, these results could be seen in Figure 6. Another option was a campus-wide centralized water system distributed through the taps and fountains or through a city-wide filtration system distributed through fountain and taps. Students were also asked whether they thought that there should be an availability of free clean drinking water on campus, as seen in Figure 7. Participants were not unanimous in their decision on the way in which they would like to get free clean drinking water. Most did not want to drink their water from the tap or water fountain but preferred purified water from a dispenser using either a disposable mug or refillable mug.

Figure 6

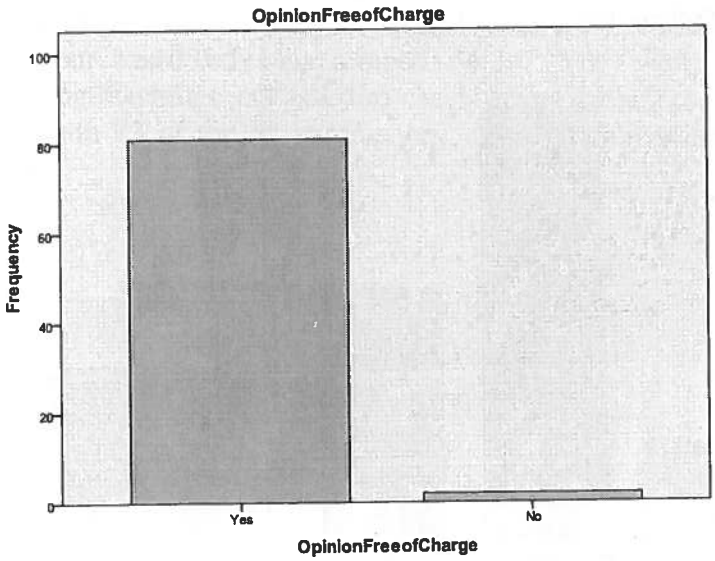
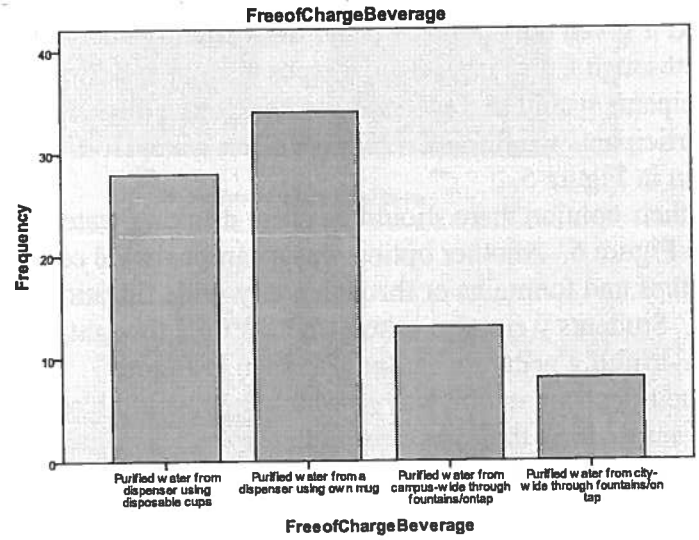


Figure 7



Discussion

Water

Over the past decade, there has been a growing concern over the water resources on this planet, "more than one out of six people lack access to safe drinking water, namely 1.1 billion people" (World Water Council, 2010). Canada has a significant portion of the fresh water resources, "Canadian rivers discharge close to 9% of the world's renewable water supply" (Natural Resources Canada, 2009). Though compared to other countries that do not have significant fresh water resources, most Canadians frequently do not trust their tap water and

purchase bottled water, instead. The people of Corner Brook are not any different than other Canadians and many residents purchase bottled water regularly.

Grenfell Campus' track record for boil orders is high, these records are very difficult to find. Grenfell campus does not keep a record of when the campus gets a boil order and how long it is one a boil order for. These boil orders are either put in place by the City of Corner Brook or by the University. Health Canada states that boil orders have to be put in place when there is "local maintenance or emergency repairs in the distribution system..." (Health Canada, 2010). The City of Corner Brook may also post a boil order advisory if there are changes in water quality or turbidity in the water. The campus itself may also decide to impose a boil order on the campus alone. This may be due to changes in the water quality, which is checked on a routine schedule, or if there is maintenance performed on the system. During a boil order, there is no clean free drinking water available to students and staff.

Water Fountains

Water fountains are one way in which students, faculty and staff can receive clean free drinking water on campus. Currently there are eleven water fountains on the Grenfell's Campus. They are located throughout each building. Alarmingly, many of the water fountains have signage posted stating that they are broken, and none of the fountains have the proper gooseneck nozzle to fill up water bottles cleanly.

Other university campuses throughout Canada are having similar issue with water fountains, too. Memorial University's St. John's campus built a 9000 m2, "$17.3 million INCO Innovation Centre... which opened in 2005, with no drinking water fountains" (Girard, 2009). After the building had been open for four years, Memorial University "announced that it would be adding new water fountains in 12 buildings [including] the INCO Innovation Centre" (Girard, 2009).

Many buildings that are constructed, including at McMaster University, Dalhousie University and Simon Fraser University, lack a design that even includes a water fountain (Girard, 2009). If the buildings do include a water fountain they are very hard to access. For example, Dalhousie University built a $25 million building, which has four schools within it and the "building was constructed with only one water fountain situated on the main floor outside of high traffic areas" (Girard, 2009).

Currently at Grenfell Campus, there are eleven water fountains found throughout the four buildings. Many of the water fountains are located in the Arts and Science building; three of the eleven fountains do not work. The only fountain found in the Library building does not work and the closest one to it is in the Arts and Science Building, which also does not work. In the Fine Arts building, there are three fountains, one of which is out of order. Finally, in the Forestry Center there are two fountains found on the classroom floors. Of the eleven fountains found on campus three do not work; that is, 27% of the existing fountains do not work properly. In addition, none of the current fountains have goose neck faucets to fill water bottles, and all have low spouts for simply drinking straight from the spout. These short spouts make it difficult for individuals who bring refillable bottles to fill up their bottle fully. A goose neck spout will allow a one litre bottle to be filled without spilling.

The Student Union of Grenfell Campus is working towards installing a new water fountain in the cafeteria. This water fountain sounds very promising for the school given it has a small

fountain, as well as goose neck fountain to refill water bottles. The maintenance personnel have had significant difficulty with installing this new fountain. This new fountain would simply take the tap water and cool it for drinking. When the first one was delivered during summer of 2010 it was damaged so it had to be returned. When the second one arrived it did not have the bottle-filling nozzle, which was the main requirement from the campus when ordering this fountain (H. Pike, personal communication, February 4, 2011). Administration is still awaiting the fountain to come back so they can install it.

Clean Drinking Water

The idea of water fountains is excellent, but before people can start bringing reusable bottles to school there is a larger issue that needs to be addressed. Currently, Corner Brook has a small filtration system that cleans drinking water for all its residents, but that system simply involves taking the water from the various watershed areas and adding chlorine to it. The City of Corner Brook traditionally took its water from four different lakes, chlorinated it and sent it throughout the city. The system is being upgraded at the present moment to evolve into a lake/stream system that reduces the number of lakes used (Personal Communication, Keith Costello, March 3, 2011). Some residents of Corner Brook are already added to this water source and as they continue to work more are added.

Of significance are Trihalomethanes, which are present in most of the treated water systems in Newfoundland. Trihalomethanes, or THM's, are a concern when dealing with clean potable water. THM's are naturally occurring when a reaction occurs between chlorine and dissolved organic materials, but they can be hazardous if the water treatment system does not correctly remove them. THM's are "known to be carcinogenic in laboratory animals and is probably carcinogenic to humans" (Nazir & Khan, 2005). These naturally occurring particles in drinking water have been linked to an "increased risk of cancer [and] linked to heart, lung, kidney, liver, and central nervous system damage" (Aquatell, 2011).

The Department of Environment and Conservation of Newfoundland and Labrador conducts regular checks on the THM levels on supply lakes across the province. The national acceptable level of THMs is 100 µg/l. There are four ponds listed as serving Corner Brook: Trout Pond, Third Pond, Second Pond and Burnt Pond. According to the latest available results (Spring 2010), Trout Pond and Third Pond have 180.5 µg/l, Second Pond has 93.50 µg/l and, lastly, Burnt Pond has 150.50 µg/l (Department of Environment and Conservation, 2010). Three of the four ponds providing water to the residents of the City of Corner Brook, and the student residents of the Grenfell Campus, are significantly above the national acceptable level for THM. The water treatment facility currently servicing Corner Brook is not technologically adequate to clean out these THMs. Simple chlorination does not eliminate the THMs in the water (Aquatell, 2011).

The federally funded Canada Economic Action plan has loaned money to the City of Corner Brook to improve its drinking water treatment system. This project was announced in 2009, with "more than $19.5 million in low-cost loans from CMHC's Municipal Infrastructure Lending Program" (CMHC, 2009). Though this loan was approved in 2009, no progress has been made since then, even though the original funding plan anticipated construction of the new water treatment plant to start in 2010. No progress has been completed on the project due to the significant increases in cost of the project. The City of Corner Brook website states that

treatment plant is scheduled to be commissioned in 2012. However, Mayor Greely stated in a presentation at Grenfell Campus, Memorial University that the council members were unsure of when the project was going to begin because of the lack of federal funding. It seems as though there is no actual starting date for this water purification system (Greely, 2011).

Many individuals in Corner Brook would like to see a proper filtration system. A paper was written "to measure household willingness-to-engage in municipal water quality projects" (Sabau & Haghiri, 2008). A significant portion of Corner Brook does not trust the drinking water provided through the tap. As of 2006, "the results of a research showed that about 75% of Corner Brook residents did not use unfiltered tap water for drinking; they bought home filtration systems, bottled water or consumed water from a local spring" (Sabau & Haghiri, 2008). If a proper filtration system was in the city individuals would not have to purchase extra products or go to a spring for drinking water.

Corner Brook households pay an annual flat rate of $60 for water and also pay a $60 sewer levy fee. These two taxes are included in the annual household property tax. Though residents pay a flat water and sewer fee every year, they are not metered at their home for water consumption. In Canada, "only 55% of residential water use is metered" (Sabau & Haghiri, 2008). This number is even less for Newfoundland and Labrador. Due to the lax metering system and taxing on the water in Newfoundland and Labrador, our province has the "highest consumption rates in Canada" (Sabau & Haghiri, 2008). With a metering system, accompanied by a taxing system based upon user-pay water consumption, a proper filtration system could be implemented earlier than the present unknown future date. The money from the paying of water would be put towards a system for clean drinking water. This capital that is needed for a system could be achieved through a metering and taxing system.

Several water treatment systems have been considered by City of Corner Brook within the last decade. One system designed for Corner Brook would considerably surpass the expectations of the old system and would be a "full conventional system" with UV at the end of the treatment. A full conventional water treatment system is a series of seven stages which the water goes through. The first stage takes the raw water and removes the large debris such as twigs and leaves. In the second stage, pre-sedimentation, water moves slowly through the reservoir, this is where sand and silt is left behind. Third, "a coagulant, aluminum sulfate, is added to the water as it flows to sedimentation basin" (Washington, 2010). The aluminum sulfate makes the suspended particles consolidate and sink. During flocculation the water is gently stirred by large paddles that spread the coagulant, "this causes particles to combine and grow large and heavy enough to settle" (Washington, 2010). The water then flows through "quiet sedimentation basins where the flocculated particles settle to the bottom" (Washington, 2010). Finally is the disinfection stage, "chlorine is added with precision equipment to kill pathogenic microscopic life" (Washington, 2010). The City of Corner Brook intended to have an Ultraviolet treatment at the end of the line before its water is sent through the piping system to the residents of Corner Brook. The UV is stronger than the sun's UV and does not alter the water chemically. The UV "alters the nucleic acid of viruses, bacteria, molds or parasites, so that they cannot reproduce and are considered inactivated" (CMHC, 2011). Currently, Corner Brook has sent out a call for requests for proposal. This means that the initially proposed system may change depending on the contractor who is awarded the tender.

The Town of Pasadena, a commuter town 30 kilometers east of Corner Brook has an excellent filtration system. This system should be implemented into the Corner Brook filtration system or into a system for the campus. In 2003, Pasadena received and implemented this filtration system, and the system now services a population of almost 3700 people. It is estimated that the project cost approximately six million dollars to implement. Pasadena takes its water from Blue Gulch pond, located about 10 km behind the town. This system is very close to the full conventional system described above but with a few differences. After the large particles are taken out of the water before it comes into the plant through a pre-filter, the water is then sent through micro thread filter system. A micro thread filter is comprised of tens of meters of thread tightly wrapped around a plastic section that diverts the water to an outtake. This micro thread filter tank is comprised of 3700 thread filters in each tank and the water is filtered for small particles, there are two of them at this plant. Then the water is exposed to UV, ultra violet prevents any new organisms from being created, and it stops any bacteria from reproducing. Finally, the water is treated with chlorine; Pasadena uses chlorine gas in their filtration system. Chlorine is what kills all the bacteria and pathogens in the water. Pasadena's filtration system can treat up to 1600 gallons of water a minute but usually only treats 240 gallons a minute. Normally Pasadena has an average consumption of 400 000 gallons per day. If this type of system was implemented for the City of Corner Brook, there would be no concern of unsafe drinking water. This system removes any THM's in the water and significantly reduces the chance of boil orders.

Bottled Water Free

Different groups are trying to influence individuals to use to tap water only. These active groups can be found across Canada and across the world, including the Student Union located here on campus. An Environmental Affairs Committee, a committee of the Grenfell Campus Student Union, at Grenfell Campus is advocating for a Bottled Water Free Day. The Bottled Water Free Day group is an organization that encourages individuals to pledge not to drink bottled water where tap water is available. Bottled water free day was on March 10, this was the second year for it (Bottled Water Free Day, 2011). Bottled water free day is a group bringing awareness to the public that bottled water is not better for you, and that the bottled water companies are less regulated than municipalities.

The Polaris Institute has been a huge advocate for clean free drinking water on campuses and has partnered with the Canadian Federation of Students to promote the Bottled Water Free Campus'. They ask students to consider why they spend $1.50 on a 750 ml bottle of water from the vending machine when they can use a new, functioning water fountain. They have a vision of bottled water free zones, "no more bottled water in vending machines, in cafeterias, restaurants and coffee shops or provided by conference services at university events" (Polaris Institute, 2009). Acadia University has joined the movement. On March 11, 2010, National Bottled Water Free Day, the K.C. Irving Environmental Center declared that it would be the first building at Acadia University to be a bottled water free building (Water Watch Acadia, 2010).

In 2009, Grenfell Campus partnered with several other universities in Canada to have a bottled-water-free orientation (Grenfell Campus, 2009). Although they were planning to eliminate the use of non-reusable bottles, it was difficult to implement because there are no proper refilling stations for the reusable bottles that were given out during orientation. The use

of reusable bottles dropped significantly by students because there was no where to refill the bottle with clean water and no fountain is equipped with the proper bottle filling neck.

Recycling

Drinking bottled water itself is one issue. A second related issue is the fact that very little is recycled on this campus including discarded water bottles. Grenfell Campus recycles 15 bags of refundable items a week. The only bottles that are recycled on Campus are from the residences. Sometimes more bottles are recycled, such as when Visuals Arts and Theatre Arts students are raising money to go to Harlow for a semester. A group of students take it upon themselves to take all the recycling around campus, clean it and bring it to the recycling depot. Currently the student housing office is the only group that is consistently recycling on Campus. They hire a student for three hours a week "to bag and empty all the recycling in the residence lounges" (N. Newell, personal communication, February 4, 2011). This recycling is not restricted to just water bottles but also pop bottles and beer cans, and an estimated 12-15 large bags are recycled per week (N. Newell, personal communication, February 4, 2011). Only 180 students live in residence, which does not include the students who live in chalets. The money that is collected from the recycling is put towards the student food bank.

Vending Machines

Food and beverage vending machines are located throughout campus, with at least one vending machine in every building of the school. In the Arts and Science building, there are four food and seven beverage vending machines, located throughout the building. Only two vending machines can be found in the Library building, one dispenses food items and the other dispenses beverages, including bottled water. In the Fine Arts building there are five vending machines, two food dispensers and three beverage dispensers. Finally, in the Forestry Center there are only two vending machines, one for food and one for beverages. This represents a total of 20 vending machines on the Grenfell Campus.

The contents of these vending machines are generally universal throughout the school. Within the food vending machines there are different brands of chips, chocolate and gum. Very few of these vending machines have healthy options in them. In the beverage vending machines there are soft drinks, energy drinks and water. Below, (in Table 1) you can see the nutritional value of the vending machines contents:

Table 1: Nutritional Value of Food Vending Machine Products

Type	Serving	Fat	Calories	Carbohydrates
Lay's Classic	1 oz	10g	150	15
Lay's Salt and Vinegar	1 oz	10g	150	15
Sun Chips	1 oz	6g	140	19
Ruffles	1 oz	10g	160	14
Doritos	1 oz	7g	140	17
Smarties	30 Smarties	4g	140	24
Kit Kat	2 Fingers	5.4g	107	13
Aero	1 Bar	11g	220	26
Rice Krispies	1 Bar	3.5g	150	28

Mars	1 Bar	6.2g	164	25
Gum	Per piece	0g	3.5	1

Also provided in the vending machines are different types of soft drinks, energy drinks and bottled water. These soft drinks and energy drinks are high in sugar and unhealthy to consume on a regular basis (Schultz, 2011). Only one type of juice can be found in the vending machines, orange juice. Below, in Table 2, profiles nutritional value for all of these beverages.

Table 2: Nutritional Value of Beverage Vending Machine Products

Type	Serving	Sugar	Calories	Fat	Sodium
Vitamin Water	20 oz	13g	50	0	0mg
Fuze Refresh	0	0	0	0	0mg
Smart Water	20 oz	0	0	0	0mg
Coca Cola	8oz	27g	100	0	30mg
Sprite	8oz	26g	100	0	45mg
Nestea	8oz	22g	80	0	30mg
Minute Maid Orange Juice	15.2oz	24g	110	0	15g
A & W Root Beer	20 oz	30g	110	0	50mg
Dasani Mineralized Water	20oz	0	0	0	.5mg
Monster Energy	8oz	26g	100	0	180mg
Monster Assai	8 oz	27g	100	0	180g
Powerade	20 oz	14g	50	0	100mg

Memorial University has the vending machine contents outsourced. For most of the vending machines on campus, the venders pay a rent to have their vending machines on campus and the venders take the profit. In the Grenfell Campus Student Union, the three vending machines located there pay a rent to the GSCU and the Union receives a per cent of the profit.

As Tables 1 and 2 show, contents of these vending machines are very unhealthy for individuals to be consuming on a regular basis. Many schools, particularly secondary schools, are removing the unhealthy snacks in vending machines and replacing them with whole grain, low fat and low sugar foods and beverages (HUMAN, 2011).

There is a concern when implementing healthier alternatives into vending machines, and that concern is for a loss of profit. In Ontario, a pilot project was done on the implementation of healthier snacks in secondary schools. In 2008, Ontario introduced Bill 8, which "require[d] schools boards to ensure that food and beverages sold in vending machines comply with the nutritional standard in regulations" (Callaghan, Mandich & He, 2010). Their pilot project included healthy snacks in vending machines while maintaining a profit margin. They implemented this healthy vending into four Ontario secondary schools. During the study both quantitate and qualitative measurements were taken, "products were tracked, and focus groups were conducted to obtain student's opinions about healthy eating and vending choices" (Callaghan, Mandich & He, 2010). The results were that students' sales ranged from 14% to 17% (Callaghan, Mandich & He, 2010). In all of the schools, revenues declined in a range of .7% to 66%. Although this is a large range, there was an indisputable drop in revenues. In the

focus groups, students preferred "to have 'real' healthy snacks, such as yogurt, fruit, and vegetables" (Callaghan, Mandich & He, 2010). Alternatively, this study found that, overall, if 50% of the vending machines were replaced with healthy alternatives there would be a decline in revenues, the general school population would prefer to purchase chips and pop.

Some companies, such as H.U.M.A.N., have designed a new framework around healthy choices in vending machines. Some state that offering healthy choices can increase sales from health conscious consumers to make up for the loss of profit. They suggest ideas about items that you can put in the vending machines, given suggestions for beverages, non-refrigerated food and refrigerated food.

There are also new vending machines that can be found across North America such as the H.U.M.A.N. vending machines, Helping Unite Man And Nutrition. They belong to a company based in the United States which, to date, services only that country. These machines are healthy food machines with thousands of products to choose from. The company works with schools or businesses that are implementing them, and decides what is best for their area. Depending on your special requirements, the vending machine can be "100% organic, Gluten-free, allergen-free, low-fat, low-carb, [or] no sugar-added" (Human, 2011). These H.U.M.A.N machines have a LCD touch-screen, a debit paying system and an eco-friendly power device (Human, 2011). With this case specific vending Grenfell Campus can benefit significantly from these vending machines when they become available in Canada.

There is considerable waste from vending machines. All chip bags and wrappers that are used are put into the garbage and brought to the dump. Currently, only the Sun Chips bag is accepted to be completely compostable. These new compostable chip bags are made up of 90% plant materials and are 100% compostable (SunChips, 2011).

Vending machines also take up a considerable amount of energy to light and in the case of beverages, keep cool. These vending machines can use a considerable amount of energy, "a typical refrigerated vending machine consumes 400 watts" (State Energy Office, 2004). This means an average cost of $19 a vending machine per month. With 20 vending machines throughout the school, it totals an estimated $380 per month and an estimated annual cost of $4,569. The Grenfell Campus of Memorial University can lower its energy use by taking out some of the light bulbs that light up these dispensers around the clock without affecting vending capabilities.

Some companies in Europe have invented vending machines that make recycling significantly easier. These vending machines are able to read the barcodes on the bottle and return the proper amount back to the customer or a receipt. These recycling vending machines are "fully automated recycling machines that utilize advanced technology to identify, sort, collect and recycle use beverage containers and a unique voucher dispense system and smart card technology" (Reverse Discovse, 2006).

These changes to the vending machines would be a step towards a healthier university. Implementing vending machines that have healthy alternatives could be a significant idea that the university advertises. Also, with the use of a recycling vending machine most of the work is done. This would significantly reduce the change of items not being recycled.

Recommendations

Memorial University of Newfoundland's St. John's campus has already implemented bottled water free zones on its campus. Although there is an attempt here to have bottled water free zones at Grenfell Campus, enough is not being done to implement comparable measures. Grenfell Campus needs to work hard with school groups, businesses, and facilities management to install more water fountains and to fix the water fountains that already exist on campus. The recycling concern would not be such an issue if students could bring reusable bottles and had on-campus access to free and clean drinking water. The idea of city wide filtration would only work if the city were to provide drinking water that was free of THMs.

An awareness campaign can be planned and implemented across the Grenfell Campus. Many of the students at this campus are environmentally concerned and with the knowledge of recycling on campus they may think twice about purchasing a bottle of water or improve recycling efforts. It has been suggested that a formal proposal to the MMSB (Multi Materials Stewardship Board) to fund such as awareness campaign may be received favorably if it is matched with financial investment from Grenfell Campus.

A campus-wide filtration system is also warranted. Fully 28% of students who took the survey stated that while they purchase bottled water on campus, they do so only about once a month. If 28% of the student populations, 336 students, purchase bottled water once a month for the term, it represents a cumulative investment of approximately $3024 for students. This was calculated by multiplying the number of months per semester by the cost of a bottle of water. In one full year, just 28% of students waste approximately $6,048 to purchase unnecessary bottled water. A filtration system at the fountain could help this issue of clean drinking water on campus. In this way students could fill their bottles with free clean drinking water.

A city–wide filtration system will contribute clean free drinking water from the tap. This project was initially projected to cost $36 million but now the project has been advertised again. This project's projected cost may increase again when the tender is received. Since this project is back out on tender there is no projected cost of the project. Also, this project is unlikely to be finished within the next five years. The City of Corner Brook will need to continue to save money to make this project come true.

The City of Corner Brook is able to make the money it needs to build this filtration system. Residents of Corner Brook are willing to pay double what they are currently spending on water resources. This double in tax could be banked to put towards a proper filtration system that is much needed. Students who live both on and off campus could fill their water bottles up and bring them to school. Instead of having a campus-wide, or fountain, filtration system, students can fill up throughout the city.

Lastly, the placement of water dispensers throughout campus would make clean drinking water readily available to the students and staff of Grenfell Campus. The dispensers would be freestanding dispensers and hold five gallon bottles that are reusable. This way of distributing water would not be economically feasible. Having to continuously purchase bottles of water would be a large bill to continuously pay. Each free standing dispenser costs approximately $200, having to put at least 11 throughout campus to account for the fountains, costing $2200 as a startup fee. Each five gallon bottle to have delivered and filled costs $11, $7 to rent the bottle

and $4 to fill it. Using one bottle per week day, excluding the cost of renting bottles, it would cost $200 per week, equaling $880 per month costing $10,560 every year.

As students and staff wait for a filtration system to be implemented into either Grenfell Campus or into the City of Corner Brook, the issue of water bottles has to be dealt with. There are many options when it comes to recycling. Already, students are accustomed to separating their items into garbage and recycling (assuming it is recycled). Recycling containers are placed throughout the school; the issue now is actually transporting the containers to the recycling depot.

One way of actually recycling these items is hiring a student of the University to clean, de-cap and separate the recyclables. Already there is a student who works for housing and recycles all of the bottles in residence. If one student was given a proper facility, given a MUCEP position of only 80 hours for the term, this would mean six hours a week at minimum wage. The student would have to recycle 750 bottles a week to make this position pay for itself. This means that half of the school population would have to drink and recycle approximately one bottle a week, and the paid student position would be self-sustaining.

If a student group, such as the GCSU, is willing to take on the recyclables it would be a reliable and sustainable way for them to raise funds. However, the student group could be required to commit to do it throughout the full school year, and not as an occasional special event fundraiser. Currently, students going to Harlow recycle, but only at certain times throughout the year, particularly when they are about to leave. It is not a consistent way of recycling.

Something has to change with the current vending machines. Administration can speak with the existing owners that stock the vending machines to discuss and potentially implement healthier items into the vending machines. If the current vendors at the school administration cannot achieve this, administration could look into contracting another company.

Administration at Grenfell Campus also has the option to purchase outright healthy vending machines. This way all the revenue will go directly to the school, instead of the vendor. It may, however, take more effort from a staff member to be the organizer of the vending machines yet, it may be as simple as setting up an ordering schedule to have a distributor come in and fill the vending machines with healthy items.

Conclusion

This idea of sustainability is possible for this campus, other campuses in Canada have achieved some form of sustainability, so why not Grenfell Campus of Memorial University? A new science building is currently being built to expand the Grenfell Campus providing an opportunity to set a precedent set for the rest of the buildings on Campus. An emphasis on sustainability is important and feasible. The inclusion of a series of gooseneck water fountains would be a significant and sustainable start.

There are many options for this campus to become a more sustainable school. At a minimum, this campus can start achieving this practical and responsible goal by reducing the reliance on bottled water and making the new science building a bottled water free zone. With the installation of water fountains and proper goose neck bottle filling attachment, the reliance on bottled water will significantly diminish.

With a new building being built here on campus there is the ability for change to be made. Before this new building opens, the call for tenders to install and supply the vending machines

should include healthy eating options, and should require less energy use than the machines currently installed in the other buildings.

Students should begin to campaign and push the topics of sustainability. Let the information about recycling and clean drinking water be widely available to the student population. Many students will not find this information on their own but are very willing to help spread the word. Sustainability is an attainable option for the campus; we do not need to settle for the current status, nothing will happen if nothing is said. It is time to push the envelope of sustainable practices.

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Appendix A

SURVEY regarding the purchase of food and beverage from vending machines at MUN, Grenfell Campus

1. Do you purchase FOOD from the vending machines available on campus?
___ Yes ___ No

2. If you answered YES to Question 1, how often do you purchase food from vending machines on campus?
___ Always (1x or more/day) ___ Most of the time (3-5x/week) ___Sometimes (1x /month)

3. If you answered YES to Question 1, what type of food do you purchase? (Please select three of your top choices)
___Lay's classic
___Lay's Salt and Vinegar
___Lay's Ketchup
___Sun Chips
___Ruffles
___Doritos
___Smarties
___Kit Kat
___Aero
___Rice Krispies
___Mars
___Trident gum

4. If you answered NO to Question 1, why don't you buy food from the vending machines? (Please indicate a maximum of three reasons)
___ I do not buy food on campus
___ I do not buy junk food
___ It is too expensive
___ It is fattening
___ It is not healthy
___ Other (please specify): _____

5. If food vending machines contained other food items, would you purchase them?
___ Yes ___ No

6. If you answered YES to Question 5, what type of food would you purchase? (please indicate your top three choices)

___ Fruit
___ Milk
___ Nuts
___ Yogurt
___ Sandwiches
___ Salads

7. Do you purchase BEVERAGES from the vending machines available on campus?

___ Yes ___ No

8. If you answered YES to Question 7, how often do you purchase them?

___ Always (1x or more/day) ___ Most of the time (3-5x/week)
___Sometimes (1x /month)

9. If you answered YES to Question 7, what type of beverages do you purchase from the vending machines? (Please select three of your top choices)

___ Vitamin Water
___ Fuze Refresh
___ Smart Water
___ Coca Cola
___ Cplus Orange
___ Sprite
___ Fresca
___ Nestea
___ Minute Maid Orange Juice
___ A&W Root Beer
___ Dasani Mineralized Treated Water
___ Monster Energy
___ Monster Assai
___ Powerade

10. If you answered NO to Question 7, why don't you buy beverages from the vending machines? (Please indicate a maximum of three reasons)

___ I do not buy beverages on campus
___ I do not buy bottled drinks
___ They are too expensive
___ They are fattening
___ They are not healthy
___They are not environmentally friendly
___ Other (please specify): _____

11. If you had another option to quench your thirst on campus using vending machines, what would your preferred option be? (Please indicate a maximum of three options)

___ Purified water from a dispenser using disposable cups
___ Purified water from a dispenser using your own mug
___ Fruit juice from a dispenser using disposable cups
___ Fruit juice from a dispenser using your own mug
___ Milk from a dispenser using disposable cups
___ Milk from a dispenser using your own mug
___ Hot tea/coffee/hot chocolate using disposable cups
___ Hot tea/coffee/hot chocolate from a dispenser using your mug
___ Other (please specify): _____

12. If you had the option to quench your thirst on campus FREE OF CHARGE, what would your preferred option be?

___ Purified water from a dispenser using disposable cups
___ Purified water from a dispenser using your own mug
___ Purified water from a campus-wide centralized water system distributed through water fountains/on tap
___ Purified water from a city-wide centralized water system distributed through water fountains/on tap

13. In your opinion should purified water be available FREE OF CHARGE on campus?

___ Yes ___ No

14. What is your position on campus?

___ Student ___ Faculty ___ Staff

15. If you are a STUDENT, what is your year of study?

___ 1 ___ 2 ___ 3 ___ 4

16. What is your gender?

___ M ___ F

17. What is your age?

___17-22
___23-30
___31-40
___41-50
___51-64
___65+

18. Do you have comments or suggestions?

_____

_____

_____

Thank you very much for your cooperation!