

Incentives to Winter Cycling

ENVS 3502

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Executive Summary

Dalhousie University's recent Greening the Campus Movement has included many steps to reduce carbon emissions and promote sustainability. One way to continue this process is to encourage active (non-fossil fuel sourced) transportation such as walking or cycling. The university's current cycling population of 5% drops further in the winter months due to perceived and real barriers such as snow and bike maintenance (Unicycle, 2001). This study investigated what possible incentives would make cyclists and non cyclist students more likely to commute to campus in the winter via bicycle. Focus groups were held on Studley Campus, while open-question poster boards were placed on all three campuses. The focus groups as well as poster boards revealed that many students perceive cycling in the winter as more dangerous, yet improved bike lane infrastructure and end-of-use facilities such as indoor/sheltered bike racks would make them more likely to cycle in winter months. These findings indicated a strong need for the University to work closely with city planners to build better bike lane infrastructure.

Introduction

Cycling is a beneficial mode of active transportation for a number of economic, social, and environmental reasons. Economically, it is an affordable form of transportation because it does not require the high costs associated with vehicular transportation such as fuel, parking, and repairs. Socially, cycling promotes an active lifestyle and increases health and fitness. Environmentally, cycling imposes a smaller ecological footprint than vehicular transportation by contributing zero carbon emissions to the atmosphere if bicycle manufacturing and road development is not accounted for. Benefits go beyond the environmental realm to include physical fitness incentives. Cycling in particular is an efficient method of active transport simply due to speed of transport.

In recent years, Dalhousie University has taken strong action towards the greening the campus movement and has strived to implement environmental impact-reducing planning through the creation of the College of Sustainability, signing of the Taillores Declaration, and new Sustainability Office. A major aspect of environmental assessment campus wide is that of transportation. Active transportation, defined as transportation without the use of fossil fuels (like walking and bicycling), is an inexpensive alternative to fossil-fuel-dependent methods of transportation (Pabayo, R. 2010).

Currently, 5% of Dalhousie staff and 5% of Dalhousie students use bicycling as a main form of commuting to campus (Wright, 2011; Mans 2010). While these percentages seem low already, they are noticeably less during the winter months (Unicycle, 2007). Research at Dalhousie University has examined the barriers to winter cycling, but few studies have investigated how to increase ridership in winter months (Unicycle, 2007). This information is critical to implementing new projects that encourage ridership through the winter months. Commuters choose their mode of transportation based on total utility, which factors in travel time, cost, comfort, and convenience (Mans, 2010). In the winter months, the utility associated with cycling is low due to physical and attitudinal barriers (McKechnie, n.d.). Therefore, we sought to answer the following research question: What do students, staff, and faculty view as the most favorable incentives to encourage winter cycling to and from Dalhousie campus?

Hypothesis

Any incentives to promote winter cycling will likely result in increased ridership, however there remains many physical barriers (weather), which will always prevent a portion of students from cycling during the winter months.

Background & Rationale

Beth McKechnie from Resource Conservation Manitoba describes the physical and attitudinal barriers that commonly influence commuter travel choices in the winter (n.d.). Common physical barriers to active transportation are snow build-up, cold winds, and shorter daylight hours. Some Manitobans have a negative attitude about winter and feel that being outside in the cold should be avoided (McKechnie, n.d.). In terms of winter cycling, attitudinal barriers exist because people recognize the physical barriers and lack the motivation to overcome them.

A cycling backgrounder document released by the Dalhousie University Office of Sustainability outlines the current bicycle facilities at Dalhousie along with recommendations for further developments (2009). A Campus Bike Center was established in the fall of 2009 as a pilot project with Clean Nova Scotia. The goal of the Campus Bike Center is to promote cycling and offer students the opportunity for active involvement in bike maintenance (Campus Bike Center, 2011). The only existing end-of-trip bicycle facilities are bike racks and commuter accessible showers. Currently, there are 544 bike racks on campus, many of which are in poor condition (Office of Sustainability, 2009). Furthermore, there are no bike lanes on campus. The Dalhousie Campus Master Plan aspires to create a two-way bike lane connecting the Carleton and Studley campuses (Mans, 2010). In addition, a Bikeways Plan is currently being discussed by members of the community and is intended to link Dalhousie University, Saint Mary's University, Capital Health, and the IWK Health Center (Cities and Environment Unit, 2011). If this plan is implemented, it should motivate more commuters to choose cycling as an alternative mode of transportation.

Results from a 2009 Dalhousie Transportation Survey show that commuters living within 10 km of campus would prefer bicycle-related improvements as an initiative for encouraging sustainable transportation (Mans, 2010). Cycling is the most under-used form of alternative transportation at Dalhousie, with only 5% of students, staff, and faculty cycling to campus (Wright, 2011; Mans, 2010). It is evident from these findings and suggestions that efforts have been made to increase ridership at Dalhousie. While it is important to increase ridership in general, the focus should also specifically strive to increase ridership during the winter months because it is during these months

that a drastic drop in active transportation occurs. Since the winter comprises a large portion of the school year, it is critical to increase the percentage of students who use active transportation during these months in order to see a substantial reduction in Dalhousie's transportation footprint.

A group of students from the University of Waterloo conducted a study to investigate the reasons why people do not cycle to campus. An important objective of the study was to determine what changes to cycling infrastructure on and off campus would be necessary to increase ridership. The students investigated the possible deterrents to cycling on a broad scale, but did not specifically look at barriers to cycling in the winter months. However, in their survey the students asked how many days a week the respondents travel to school by bicycle in both the winter and the non-winter months. The survey showed that 7% of the respondents cycle in the winter, while 35% cycle during the summer (Russel et al., 1997). These findings suggest that barriers do exist in the winter to deter people from cycling. The student researchers also asked the respondents to rate how effective a list of potential items would be to encourage people to cycle to campus more often. The types of items on the list included bicycle storage, bike racks, bike lanes, and snow removal. The results from the survey demonstrate that 56% of 400 respondents indicated that snow removal is either a somewhat important, important, or extremely important issue. Furthermore, the students created a list of priorities for improving ridership to campus, with snow removal being ranked second (Russel et al., 1997). Feedback from this survey can be used as evidence that if physical barriers are overcome, for example through snow removal, ridership during the winter could increase.

Purpose

Our research was necessary to fill a gap in the literature pertaining to winter cycling on Dalhousie campus, and universities in the region in general. This study aimed to determine which incentives are likely to increase regular winter cycling to and from campus. Substantial research and data collection has already been completed at Dalhousie to promote active transportation. For example, the Office of Sustainability has collected data on sustainable transportation patterns and barriers. Our research regarding winter cycling may be later combined with the existent data and integrated into the decision-making process of the new campus master plan, which emphasizes Dalhousie's future of sustainable transportation.

Methods

Description of Study

To determine which incentives students at Dalhousie University felt were the most favorable to encourage winter cycling, data collection was primarily qualitative in approach. This was important because as previously mentioned, the barriers to winter cycling are attitudinal and not simply physical in nature, (McKechnie, n.d.). Therefore, a diverse research approach was deemed necessary in determining methods to combat all elements that prevent summer cyclists from riding through the months of November through March. (McKechnie, n.d.). Data collection included public poster forums, and focus group interviews.

Focus Groups

The primary method of data collection in the research study was achieved through the conduction of focus groups. Each focus group took place in room 316 of the Dalhousie University Student Union Building located at 6136 University Avenue. Room bookings were arranged through Shelly Brown.

Originally, the scope of research included staff, students, and faculty of Dalhousie University. Therefore, two focus groups were planned; one for students, and one for staff and faculty. However, after poor attendance at the first student focus group, it was decided that advertising methods needed to be improved and a third focus group would be necessary to receive a complete collection of data. The finalized focus group schedule consisted of two student-only-attendance-based focus groups on March 18, and April 1, and one focus group for staff and faculty on March 24. All focus groups were held at noon, with the assumption that a greater number of participants would have lunchtime availability, and so that free food could become a greater incentive. Combined, the student-based focus groups produced twelve participants while the staff and faculty-based focus groups had zero attendance. Thus, on the advice of project mentor, Tarah Wright, the scope of the project was adjusted to focus only on which incentives students felt were favorable in encouraging winter cycling to and from Dalhousie University campuses.

For selecting focus group participants, purposive sampling through convenience and snowball sampling techniques were used (Palys & Atchinson, 2008). For convenience sampling, participants were sought through poster board advertisements erected in the lobby of the Student Union Building 30 minutes prior to the scheduled focus group. Personal contacts were also used as a tool to attract participants in the days leading up to the each focus group. Emails were forwarded to Tarah Wright, Scott MacPhee, and the Cities and Environment Unit of Dalhousie University who sent them to a wider mailing list of staff and students. The social networking website, Facebook, was also a useful tool for advertising to various cycling groups within the city and also to reach personal contacts who were known to be cyclists.

In order to entice participation in focus groups, lunch was offered free of charge to attendees. Funding was received from the Dalhousie Student Union Sustainability Office (DSUSO) (\$100)

and the department of Environmental Science (\$100) for a total of \$200 available funds. Several barriers were encountered in regards to food purchasing. The Dalhousie Student Union Building has a contract with the food services company, Sodexo. Due to this contract all food served in the building was required to be purchased directly through Sodexo. The original proposed lunch menu consisted of two large vegetarian pizzas and canned drinks for up to twelve people. This lunch would have cost \$71. For the first focus group, the menu was reduced to one large cheese pizza (approximately \$20) and water (free) to drink. For the second focus group, pending funding proposals were accepted and the budget was available to buy two large pizzas and two jugs of juice from Sodexo at a cost of \$60. Two large pizzas were also ordered for the final focus group at a cost of approximately \$40, but group members bought soft drinks off site at the risk of getting in trouble with Sodexo to save on costs.

During the focus group discussion, audio recordings ensured reliable and concise collection of information. All participants were informed of the recording and asked to provide consent prior to taping. The recordings will be destroyed at the end of the study to ensure that participants remain anonymous and to comply with Dalhousie University's code of ethics. All methods of research conformed to Dalhousie University's guidelines of ethics following the approval of an ethics review (refer to Appendix C).

The agenda of each focus group was identical. It began with the approved oral consent of participants and the distribution of a questionnaire (refer to appendix A). Originally, questionnaires were developed as a third data collection method within the study but due to time limitations, questionnaires were only distributed to focus group participants (Palys and Atchinson's [2008] group-administered questionnaire method). Using Palys and Atchinson's recommendations for successful surveys, the questionnaire was clear and structured in the wording of the questions to avoid ambiguity and empty responses. Double-barreled questions and bias were also avoided (2008). The Likert-type rating system was used because it gave participants an option to choose the degree to which they agree or disagree with a question, thereby eliminating variability and increasing reliability of the survey. In addition, participants were offered an even number of options to choose from (i.e 1: completely disagree, 2: somewhat disagree, 3: somewhat agree, 4: completely agree) as this has proven to eliminate neutral responses and force participants to choose a side (Wright, 2011). Single response and categorical questions were also used in the questionnaire. Second, after the participants had completed the questionnaire, they were asked to brainstorm as a group the barriers to winter cycling. These ideas were compiled on a bristol board. Third, the participants were asked to eliminate those barriers that were deemed unfixable such as winter weather. Fourth, a structured discussion was opened to talk about the specific (Likert determined) incentives as listed on the questionnaire.

Analyzing Data of Focus Groups

The procedure that researchers used to code the surveys was adapted from a previous cycling study done at the University of Waterloo (Russel et al., 1997). First, each questionnaire was given a code: number 1 through 13. Second, each question on the survey was designated a

coding number: 1 through 16. For example, the first question was given the coding number 1 and the last question was given the coding number 16. Third, each possible answer to every question was coded numerically, labelling the first possible answer 1. For example, for the age of participant question there are 6 possible age categories so the first category was labelled 1 and the last category was labelled 6. The coded surveys were then analyzed using Excel 2010. This will be further explained in the *results* section.

Public Poster Forums

In addition to the focus groups, unobtrusive data collection methods were used in the form of public 'poster forums' (refer to Appendix B). Pieces of poster-board with the research question in bold at the top were placed in a high-traffic area on each of the three campuses. High traffic areas were chosen according to judgment of researchers, or by suggestions from building attendants. Permission was required to place posters in each building. Markers were provided attached to strings on the board for students, staff or faculty to contribute written thoughts on winter cycling incentives. This method illuminated ideas for incentives not mentioned in literature review or focus group discussion. Due to the anonymous nature of this data collection method, relational trends across particular demographics could not be identified (ie. Do professors find more bike racks appealing while undergraduate students see heated indoor storage as a preferred incentive?). However, this method was still imperative to data collection, as it allowed for continuous data collection without researchers needing to be present. It may have also elicited the expression of opinions people may have been hesitant to express publicly (either on a survey or in a focus group). The posters were large and clearly stated the following above them: "What would make you more likely to bike to campus in the winter? (November-March)". The term 'winter' was operationalized/defined for participants as between the months of November and March to ensure equal understanding of the question. To attract people to the poster, a clipart image of a bicycle was included on posters. An email address was also created specifically for the study (cycledal@gmail.com). This email was displayed on the poster forums and also given to interested focus group participants. The email was useful in keeping researchers anonymous and keeping personal researcher information private while also allowing for a constant method of researcher-participant communication.

Analyzing Data of Poster Forums

To analyze data collected through poster forums, coding was used. To do this, researchers formulated categories and tallied the number of comments that fell into each heading. Some comments that fell into multiple categories and were tallied under all applicable categories and subheadings. Once the coding was complete, the categories were then prioritized according to how many suggestions fell within each grouping. The results were entered into Excel 2010 and graphs were formulated to create visual representations of the data. This will be further explained in *results*.

Validity & Trustworthiness of Research

Due to the fact that research was conducted using a qualitative approach, there lies a vast margin of opportunity for a lack of trustworthiness in results of the research. This is simply due to the observation that participants may choose not to be truthful with their answers, or may have their answers influenced by their peers. These observations can be true of both in the focus groups and the public poster forums. In sum, all data collection relied on participant honesty, which can be highly variable. This was dealt with by administering questionnaires at the beginning of focus groups so that participants could become acquainted with their individual positions and opinions before speaking within a group situation. Also, trustworthiness was addressed by giving each participant the opportunity to speak individually, making sure they understood that disagreement among participants was allowed.

Another issue of validity of research lies in the fact that the researchers, who may have subconsciously given cues or guidance to participants in order to fulfill preconceived results of the study, conducted the focus group interviewing process. Given lack of resources, there was no opportunity to have the focus groups conducted by a neutral third party. However, validity was improved by having a structured agenda for each focus group.

Limitations & Delimitations

Given the specific scope to answering our research question; 'What do students, view as the most favorable incentives to encourage winter cycling to and from Dalhousie campus?' there are a number of limitations and delimitations that were addressed.

First, the collection of data was originally delimited in the study to only include cyclists that commute during the spring, summer, and fall but chose other methods of transportation during the winter months. The study was also delimited to include only students, staff, and faculty who commute to Dalhousie University Campuses. Other cyclists were also not included in the original scope of the study such as those who commute to use the Dalplex or other Dalhousie Facilities, or those who cycle around the campus recreationally. However, when participation proved challenging, the scope was limited to include only students, and then broadened to include any Dalhousie University student with cycling experience, as a commuter or otherwise. It was concluded that this group could provide useful information based on experience but would allow an adequate amount of participants. Due to the nature of the poster forums, demographic information could not be provided for contributors, though it is estimated the vast majority were students with at least some cycling experience.

Due to time constraints and research requirements, detailed financial predictions are not provided based on the favorable incentives determined by findings.

A major limitation to research was the fact that there was no available sampling frame of Dalhousie student cyclists. While this became a significant challenge, it was made much more difficult by the season in which the research study was set: winter. Therefore, eligible participants for the study could not be picked out from the street, thereby requiring researchers

to illicit help to develop a sizeable sample. This was achieved through cooperation from personal connections and pre-established cycling social clusters, such as users of the Campus Bike Centre and members of the Halifax Cycling Coalition.

Finally, since each of the researchers involved in this study were full time students with jobs outside of their studies, a further limitation included time and money to complete necessary research. To address this limitation timelines were followed to the best of abilities, knowing that not every member of the group could be able to complete each stage of the research and delivery.

Communication with Client

The researchers practiced various methods of communication with the client. The first meeting with client, Scott MacPhee, of the Campus Bike Center and Clean Nova Scotia, produced a slight complication. The outlined course expectations of the research project and research question did not match the goals/outcomes that the client had articulated to the researchers. A second meeting ensured that the researchers and client had similar goals and that sufficient progress was being made on the project. However, after this meeting it was requested by the client that a further meeting would not be necessary as he was leaving his position with the Dalhousie Bike Centre and would no longer be interested in personally implementing protect results.

Results

Poster Forums:

Table 1

The table shows the comments that were obtained from the poster forum at the Carleton Campus.

| Comments | # of People Agreeing |
|--|----------------------|
| Shoulder cleaned of snow | 0 |
| Full-faced mask | 0 |
| Roads cleared for bike lanes | 0 |
| Living in a warm country | 0 |
| The death penalty for bike thieves | 0 |
| Bike lanes covered | 0 |
| Heated storage | 0 |
| Nothing | 2 |
| The city should clear the gravel off the streets so that they are useable. I love biking in winter. | 0 |
| A snowplowing strategy with HRM that doesn't fill/block the bike lanes with a 4 ft. ice bank for months on end. | 0 |
| Learning how to bike on ice and snow | 0 |
| Storage for my bike | 0 |
| New knees | 0 |
| Sitting in the front row | 0 |
| Live in Florida | 3 |
| Cleared Bike lanes | 0 |
| I always ask myself this question, how could they do it? Please tell me the answer | 0 |
| Safe roads | 0 |
| Covered bike racks | 2 |
| I bike everyday! (But I would like more bike lanes!) | 0 |
| Global warming makes winter warmer | 0 |
| Bike lanes that are separated from the main road by a curb, and that do not intersect with bus stops. This is how it is done in the Netherlands. | 0 |
| If it was warm and not winter | 0 |
| Not seeing cars run red light every time | 0 |
| A biking outfit | 0 |
| <u>SAFE</u> bike lanes that aren't covered by snow banks | 0 |
| No snow | 0 |
| Any biking infrastructure that this backwards city could offer! | 0 |
| Bike lanes! I biked for 4 months and almost got hit numerous times. Now I bus. | 0 |
| Bike lanes! | 0 |

| | |
|--|---|
| Indoor parking | 0 |
| Free bikes! | 0 |
| Not having my bike shed (with my bike inside) snowed in! | 0 |
| I walk | 0 |
| No more public nudity laws | 0 |
| Too cold, no way... | 0 |
| City-wide covered biking lane | 0 |
| Make Halifax more bike-friendly (i.e bike lanes), which means I can make it to school without dying. Dying = not good | 0 |
| Are you crazy? | 0 |
| A new bike! | 0 |
| A free bike? | 0 |
| More showers. Seriously. | 0 |
| My brake keeps freezing! | 1 |
| Indoor heated storage | 0 |
| One of those baseball card things that you stick in your spikes to make your bike sound like a car. And streamers. And a banana seat. And a muffin. And world peace. And your mom! | 0 |
| I can't ride a bike! | 0 |
| Bike lanes | 0 |
| Covered outdoor storage area | 2 |

Table 2

The table shows the comments that were obtained from the poster forum at the Sexton Campus.

| Comment | # of People Agreeing |
|--|-----------------------------|
| Global warming | 1 |
| Better/more bike lanes | 0 |
| Living farther than a 5 min walk | 0 |
| Living less than an hour away | 0 |
| Bus fee not included in tuition, or no bus service | 0 |
| Bus service is already non-existent on weekends yet we are forced to pay for it. Thanks Dal/HRM | 0 |
| Less sketchy bike racks | 0 |
| Less jerk-ass cops harassing cyclists instead of dealing with real crime! | 0 |
| Salt free roads | 0 |
| Develop a bike route (i.e demand/lobby the HRM) providing a conduit from the North end to Dal. From Robie + North to Robie + South OR Windsor + Cunard to Quinpool to Vernon to University Ave. And all of University Ave. should have a bike land. Many students live in the North end! | 0 |
| Nothing – too cold and icy | 0 |
| Better bike lanes around the city | 3 |
| Bike share | 0 |
| If biking was for cool people instead of foggy architects | 0 |

| | |
|--|---|
| If I owned the Infinicycle – Mech. Design group #8 | 2 |
| Magical floating bike lanes | 0 |
| It's fucking cold | 2 |
| A heated bike, a heat dome, heated roads | 0 |
| If I owned a bike I didn't mind wrecking | 0 |
| Bikes are for commoners | 0 |
| Underground heated roads | 1 |
| Ice free roads | 0 |
| Cleared bike lanes | 0 |
| Better ear warmers, goggles! | 0 |
| I already do | 1 |
| | 0 |
| Attending U of California | 0 |
| Indoor heated storage | 4 |
| Have a bixi bike (like in Montreal) system on both campuses with bike spaces where students are able to "rent" out bikes for free by swiping their Dal cards. If the bikes aren't returned to a drop-off location by a certain time, then an automated fee is charged to their Dal card. Pay for this service through money generated by car-parking spaces at Dal!...or with DSU salaries | 4 |
| Less slush | 0 |
| More bikes lanes and less crazy Halifax drivers | 2 |
| Better snow clearing of side of road | 0 |
| More aware drivers | 0 |

Table 3

The table shows the comments that were obtained from the poster forum at the Studley Campus.

| Comment | # of People Agreeing |
|---|-----------------------------|
| Tandem bike | 2 |
| Nothing | 0 |
| Live somewhere warmer (without snow) | 3 |
| Better paved roads | 0 |
| Money | 2 |
| More bike lanes | 3 |
| A bike | 0 |
| Lockers | 1 |
| Moving campus closer to home | 0 |
| Less vegans | 0 |
| Better snow cleaning from road edges where its best to bike | 0 |
| Bike path | 1 |
| Downhill both ways | 0 |
| More bike racks by LSC | 0 |
| Global warming | 1 |

| | |
|--|---|
| Not having a tamed lion to ride | 1 |
| If only I had a helmet that looked like my hair | 1 |
| Wish Graywood security weren't such dicks | 1 |
| Bike sharing between Sexton and Studley campus | 1 |
| Strict enforcement of the no cell phone while driving law (drivers don't pay close enough attention) | 0 |
| Heated indoor bike storage | 0 |
| Indoor bike storage | 2 |
| Covered bike racks | 0 |
| Shower facilities | 1 |
| If I owned a bike | 0 |
| Better cold weather bike clothing | 0 |
| Bike gear storage space | 0 |
| Better access to Greek life | 0 |
| I already do | 0 |

To code the poster forum comments, researchers formulated categories and tallied the number of comments that fell into each heading. For example, the “road maintenance” category included snow removal and de-icing on roads with salt and gravel. The “covered storage” category includes incentives such as covered bike racks, indoor parking, and heated bike storage. Heated bike storage was also given a subcategory because some people asking for covered storage specified heating, whereas other people suggested covered storage in general. The “silly suggestions” category was used to group all non-cycling related comments. Furthermore, the “bike lanes infrastructure” category included comments about covered/uncovered bike lanes, new bike lanes, and existing bike lanes. The “nothing” category included any comments people made that suggested they would strongly never considering cycling, such as the distance to school being too long or too short for cycling to be a practical mode of transportation. The “safety concerns” category included comments about unsafe winter weather conditions, unsafe road conditions, and interactions between drivers and cyclists. The “access to bike” category included comments about needing to own a bike or having access to bikes through a loan share program. The “end of use facilities” category includes greater access to showers and lockers. The remaining categories not described are either self-explanatory, such as “warmer weather”, or contain only a few comments. Some comments fell into more than one category, so they were tallied under all applicable designations. Once the coding was complete, the categories were then prioritized according to how many suggestions fell within each grouping. The results were entered into Excel 2010 and graphs were formulated to create visual representations of the data.

Table 4

The table shows the type of incentive, the total number of comments associated with each incentive, and a percentage representation of the amount of comments for each incentive. These results represent the comments from all three poster forums combined.

| Incentive | Total Comments | % |
|---------------------------------------|-----------------------|----------|
| Road Maintenance | 11 | 6.70 |
| Bike Maintenance | 2 | 1.20 |
| Covered Storage (heated or unheated) | 20 | 12.1 |
| • Specifically heated covered storage | 8 | 4.85 |
| Warmer Weather | 23 | 13.9 |
| Bike Lane Infrastructure | 23 | 13.9 |
| Education | 2 | 1.21 |
| Access to bikes | 17 | 10.3 |
| End of use Facilities | 5 | 3.03 |
| Safety Concerns | 9 | 5.45 |
| Winter Cycling Apparel | 4 | 2.42 |
| Policy Changes | 2 | 1.20 |
| Stigma/Popularity | 3 | 1.82 |
| Nothing | 12 | 7.27 |
| Silly Suggestions | 24 | 14.6 |

Based on the poster feedback, the following list shows the priority of each incentive (omitting silly suggestions) in order of most important to least important. Incentives with equal priority rankings are listed as the same number and separated with commas.

1. Bike lane infrastructure, warmer weather
2. Covered storage (heated or unheated)
3. Access to bikes
4. Nothing
5. Road maintenance
6. Safety concerns
7. Specifically heated covered storage
8. End of use facilities
9. Winter cycling apparel
10. Stigma/Popularity
11. Bike maintenance, education, policy changes

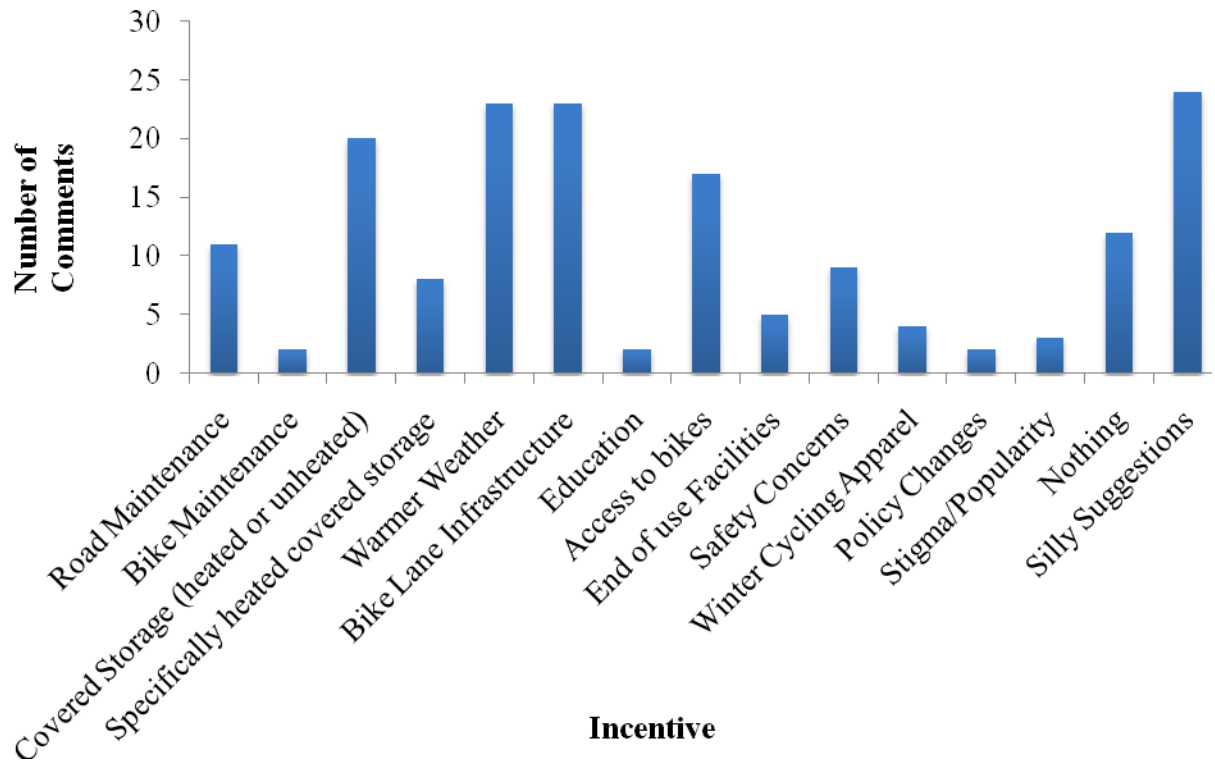


Figure 1. The bar graph shows the total number of comments for each category of incentive on all three posters combined.

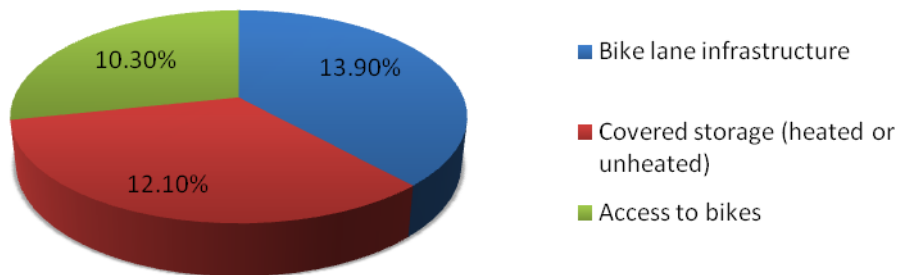


Figure 2. The pie chart illustrates the top three controllable incentive suggestions gathered from the posters.

Survey

As discussed in *methods*, coding was used to analyze group-administered questionnaires. Below illustrates the coding method used.

ENVS 3502 Barriers to Winter Cycling Survey – **Example of Coding Method**

Name & Email _____

Age (Please circle): 15-25 26-35 36-45 46-55 56-65 66+
1 2 3 4 5 6

Gender (Please Circle): Male Female Other
1 2 3

What is your affiliation with Dalhousie University?

Student Staff Faculty
1 2 3

How would you rate your cycling abilities? (1=Novice, 6=Expert)

1 2 3 4 5 6
1 2 3 4 5 6

Do you own a bicycle in Halifax?

Yes No
1 2

How far do you commute to get to Campus?

| | | | |
|----------------|-----------|------------|------------|
| Less than 5 km | 5.1-10 km | 10.1-25 km | over 25 km |
| 1 | 2 | 3 | 4 |

Which campus do you use most often between November-March?

| | | |
|------------------|-------|--------|
| Studley Carleton | Kings | Sexton |
| 1 | 2 | 3 |
| | | 4 |

What is your primary mode of transportation to/from Dalhousie campus during the winter months (November – March)?

| | | | | | |
|------|-----|-----|---------|---------|-------|
| Walk | Bus | Car | Carpool | Bicycle | Other |
| 1 | 2 | 3 | 4 | 5 | 0 |

What is your primary mode of transportation to/from Dalhousie campus during the summer months (April - October)?

| | | | | | |
|------|-----|-----|---------|---------|-------|
| Walk | Bus | Car | Carpool | Bicycle | Other |
| 1 | 2 | 3 | 4 | 5 | 0 |

The following asks you to rate the likeliness that something would make you cycle in the winter months. For the purposes of this survey, “winter” months are defines as November-March.

1(very unlikely), 2(somewhat unlikely), 3(somewhat likely), 4(very likely)

Indoor heated bike storage in at least 1 building on your campus:

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| 1 | 2 | 3 | 4 |

Free use of bicycles on ‘loan’ from Dalhousie Studley Campus Bike Center:

| | | | |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| 1 | 2 | 3 | 4 |

Bike Lanes connecting from near your home to your campus:

1 2 3 4
1 2 3 4

No cars allowed to park on University Avenue in winter months:

1 2 3 4
1 2 3 4

Snow-free bike lanes on University Avenue:

1 2 3 4
1 2 3 4

Stylish winter cycling apparel:

1 2 3 4
1 2 3 4

Wind-blocking shrubbery planted along University Avenue:

1 2 3 4
1 2 3 4

Table 5

The table shows the coded survey results.

| Participant | Survey Question | | | | | | | | | | | | | | | |
|-------------|-----------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 1 | 1 | 2 | 1 | 3 | 1 | 1 | 1 | 2 | 5 | 3 | 4 | 4 | 4 | 4 | 2 | 4 |
| 2 | 1 | 1 | 1 | 4 | 1 | 1 | 1 | 1 | 5 | 3 | 1 | 4 | 4 | 4 | 4 | 4 |
| 3 | 2 | 2 | 1 | 5 | 1 | 1 | 1 | 1 | 5 | 4 | 4 | 3 | 3 | 4 | 2 | 2 |
| 4 | 1 | 1 | 1 | 5 | 1 | 1 | 1 | 1 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 5 | 1 | 1 | 1 | 4 | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 2 | 2 | 3 | 3 | 3 |
| 6 | 1 | 1 | 1 | 4 | 2 | 1 | 1 | 1 | 1 | 3 | 4 | 4 | 3 | 3 | 1 | 2 |
| 7 | 1 | 2 | 1 | 4 | 1 | 1 | 1 | 2 | 5 | 1 | 1 | 4 | 2 | 3 | 4 | 2 |
| 8 | 2 | 1 | 1 | 6 | 1 | 2 | 1 | 5 | 5 | 4 | 1 | 1 | 1 | 2 | 4 | 2 |
| 9 | 1 | 1 | 1 | 5 | 1 | 1 | 1 | 1 | 1 | 3 | 2 | 4 | 3 | 4 | 1 | 2 |
| 10 | 1 | 2 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 2 | 2 |
| 11 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 2 | 3 |
| 12 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 3 | 4 | 4 | 4 | 2 | 3 |
| 13 | 1 | 2 | 1 | 4 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 1 | 1 |

Table 6

A legend of the coded question numbers and the corresponding questions.

| Question Number | Question |
|-----------------|---|
| 1 | Age |
| 2 | Gender |
| 3 | What is your affiliation with Dalhousie University? |
| 4 | How would you rate your cycling abilities? (1=Novice, 6=Expert) |
| 5 | Do you own a bicycle? |
| 6 | How far do you commute to get to campus? |
| 7 | Which campus do you use most often between November-March? |
| 8 | What is your primary mode of transportation to/from Dalhousie campus during the winter months (November-March)? |
| 9 | What is your primary mode of transportation to/from Dalhousie campus during the summer months (April-October)? |
| 10 | Indoor heated bike storage in at least 1 building on your campus |

| | |
|----|--|
| 11 | Free use of bicycles on 'loan' from Dalhousie Studley Campus Bike Center |
| 12 | Bike lanes connecting from near your home to campus |
| 13 | No cars allowed to park on University Avenue in winter months |
| 14 | Snow-free bike lanes on University Avenue |
| 15 | Stylish winter cycling apparel |
| 16 | Wind-blocking shrubbery planted along University Avenue |

The respondents who participated in our surveys reported a wide range of cycling abilities, but all participants ranked themselves as being higher than novice. The study had equal participation by both genders, with six of the respondents being female and 7 of the respondents being male. All of the respondents were students from the Studley campus; no staff or faculty members participated in our survey. All of the respondents, with the exception of one, only have to commute < 5 km to get to campus. Furthermore, all except for one of the respondents own a bicycle in Halifax.

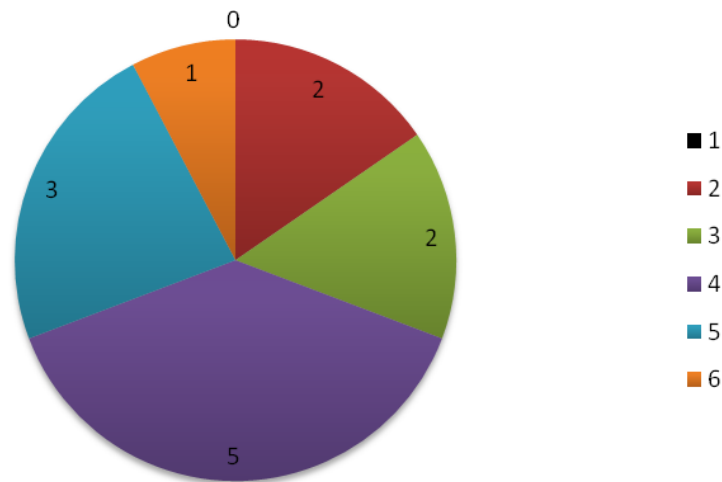


Figure 3. The pie chart shows how the respondents ranked their biking abilities, with 1 being novice and 6 being expert.

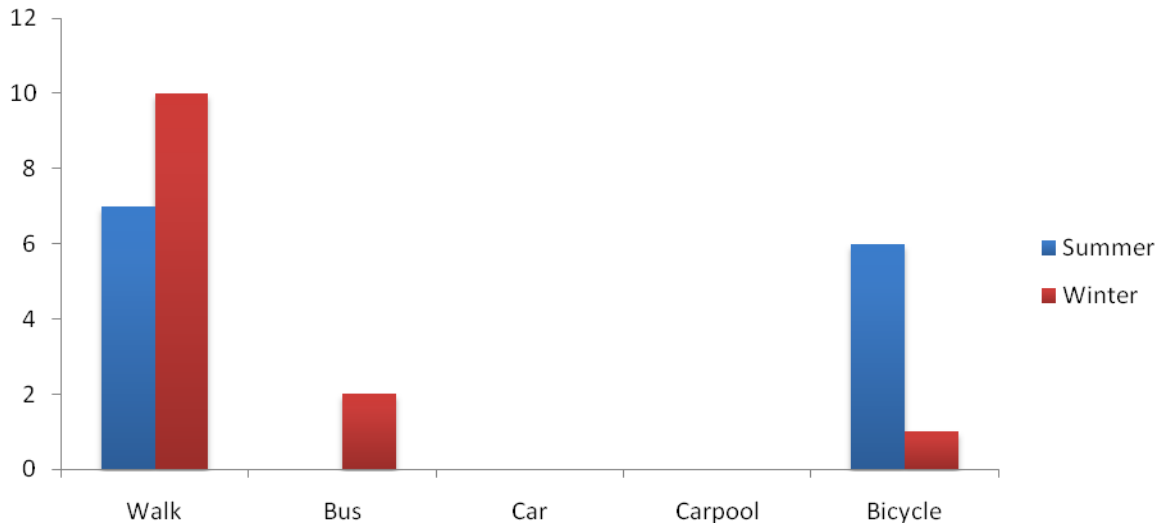


Figure 4. The bar graph shows the respondents' primary modes of transportation in both the summer and the winter.

Incentive Ratings from Surveys

The following pie charts show what percentage of respondents would be 1(very unlikely), 2(somewhat unlikely), 3(somewhat likely), and 4(very likely) to increase ridership during the winter if each of the seven following incentives were implemented:

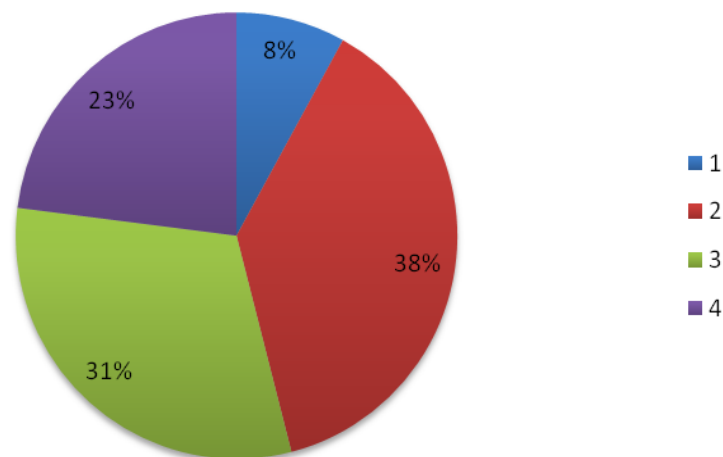


Figure 5. Indoor heated bike storage in at least 1 building on campus.

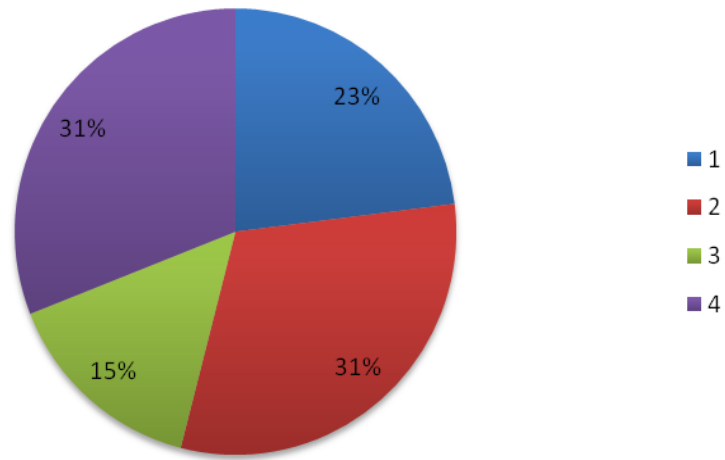


Figure 6. Free use of bicycles on loan from Dalhousie Studley Campus Bike Center.

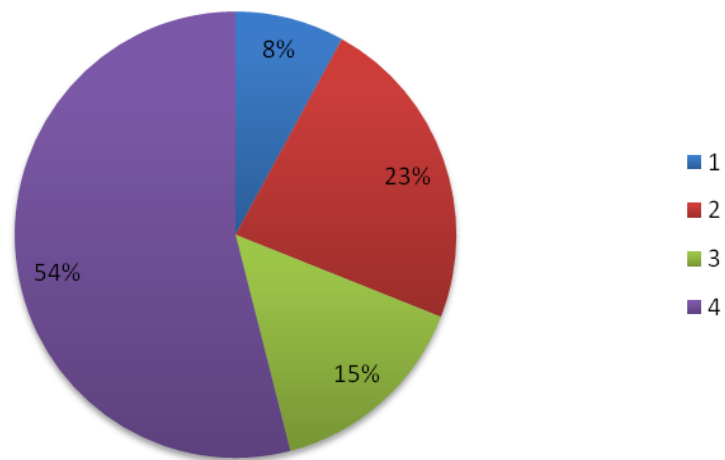


Figure 7. Bike lanes connecting from near your home to your campus.

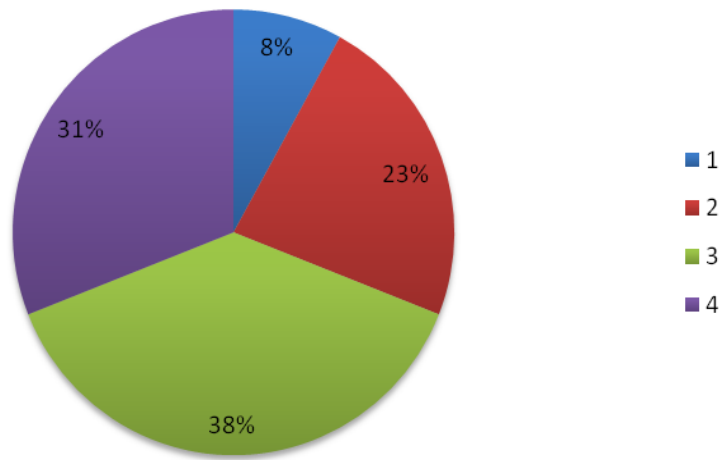


Figure 8. No cars allowed to park on University Avenue in winter months.

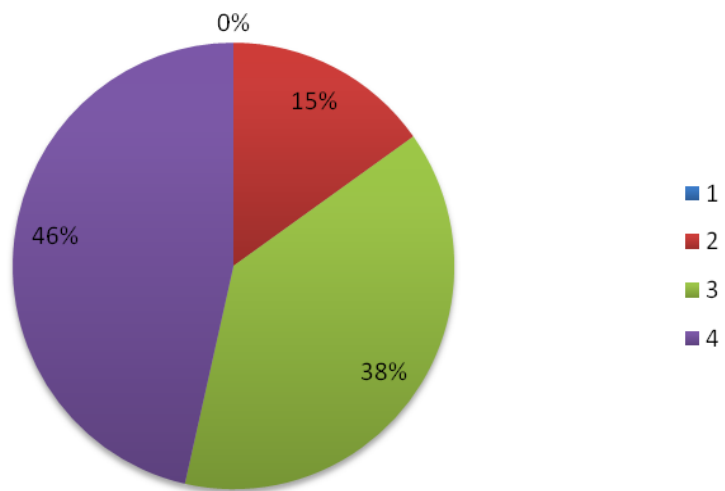


Figure 9. Snow-free bikes on University Avenue.

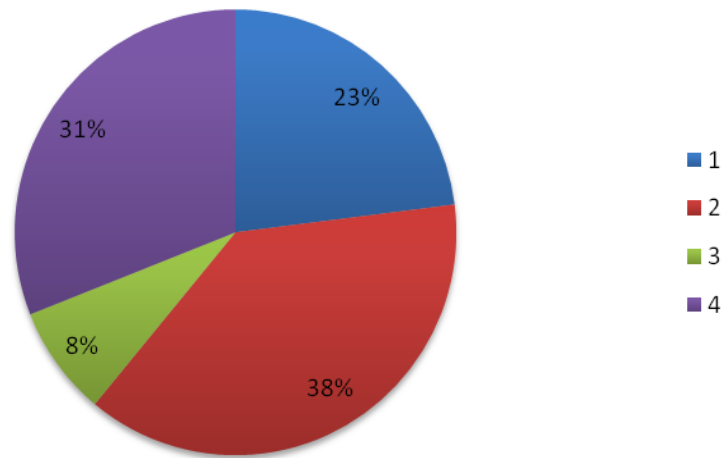


Figure 10. Stylish winter cycling apparel.

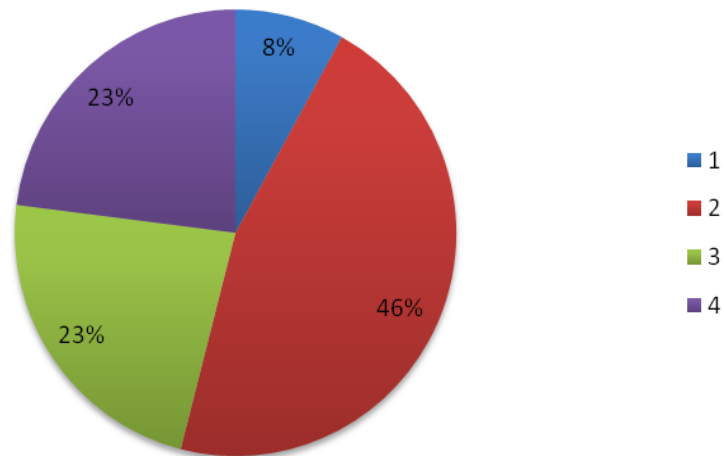


Figure 11. Wind-blocking shrubbery planted along University Avenue.

Focus Groups:

Data gathered from focus groups is more qualitative than quantitative; therefore it is represented as a discussion, rather than as charts and tables. At the beginning of each focus group, researchers carried out a mind mapping exercise where all participants were asked to say what they believe are barriers to winter cycling. These suggestions were then categorized in the

same manner as the poster forums. The “winter weather” category includes snow, cold, and winter wind. The “bike damage” category includes salt damage, frozen chain, and locked up gear shifters. The category “unsafe roads” includes barriers such as ice, unplowed bike lanes, and bad winter drivers. The “lack of end of use facilities” includes lockers, showers, and bike storage. The remaining two categories, “visibility” and “lack of bike lanes”, are self-explanatory.

Table 7

The table shows the barriers to winter cycling that were identified during both focus groups and the number of people agreeing that these barriers prevent them from wanting to cycle to school during the winter.

| Barrier to Winter Cycling | Number of People Agreeing |
|-------------------------------|---------------------------|
| Winter Weather | 12 |
| Unsafe Roads | 12 |
| Bike Damage | 6 |
| Lack of End of Use Facilities | 12 |
| Lack of Bike Lanes | 12 |
| Visibility | 6 |

All of the participants, except one, agreed that the barriers discussed would deter them from willing to cycle to school during winter. Bike damage and visibility were only discussed during the first focus group, not the second, which is why only six people agree with these barriers. It should be noted that one avid cyclist respondent agreed with the barriers that were identified, however these barriers do not prevent him from riding his bike all year round. Since these barriers do not physically prevent him from commuting to school via bicycle during the winter he was not included in the table above. However, his suggestions for how Dalhousie can overcome these barriers were incorporated qualitatively into our discussion of the focus group results.

Discussion

Summary of research question or purpose of the research

As previously stated, the purpose behind the study was to identify incentives which were most likely to encourage students to continue cycling to and from campus throughout the winter months (November – March). The primary goal of study outcomes is to aid in driving positive change. Supported by previously conducted research studies, the researchers hope to provide subsequent information to raise awareness about how both physical and attitudinal behaviours of winter cycling may be changed through the implementation of researched-based incentives. The ultimate goal of the study would be to motivate a ‘green’ shift towards a campus that encourages transportation demand management (TDM), and is supportive of user and environment-friendly active transport. To motivate bicycle transport, the campus would ideally

discourage and make the use of vehicles more difficult, providing an easier commute though active transport methods such as bicycling

Overview of significant findings

Throughout the focus group sessions mentioned above, the following were identified as the most prevalent initiatives that would encourage one to cycle to and from Dalhousie University campuses during the winter months;

1. *Indoor Bike storage*

Indoor bike storage was one of the initiatives frequently raised during the focus groups. The majority of students claimed that if the proper storage facilities were available, this would be a factor in increasing ridership during winter months. However, on the survey's only 23% of respondents said they would be "very likely" to increase ridership if it was implemented. When discussing the topic, there were debates regarding whether storage facilities required heating or not – most agreed a simple 'garage-style' storage/shelter facility with no heating would be sufficient. Another important issue raised regarding bike storage facilities was the access to showers and lockers. This was shown to be another factor that came hand in hand regarding bike storage, as being able to clean up, and maintain proper hygiene is important. Another complaint which arose consisted of the insufficient size and/or lack of lockers – with nowhere to hang a towel.

The benefits that may be provided by the implementation of bike storage facilities around campus would be; improved security, protection from the elements, convenience to store overnight, and ability to change/clean up after the commute. Overall, from the findings recorded, this initiative is a promising way to encourage winter cycling, and promote cycling year-round.

2. *Free use of bicycle on loans*

Another incentive noted most likely to drive change was the implementation of a bike share program – based on successful examples in Europe. This is the concept of installing strategic locations around the city where students can borrow a bike, cycle to/from school, and return it to another convenient location. However, students quickly raised doubts as theft, availability, and accessibility of these bikes would be a primary concern. Therefore, solutions were discussed such as implementing a 'Dalcard' system, where users would electronically sign the bike out using their card, which holds the individual accountable. Similarly, a credit card system may be applied for the general public. Another concern that arose was the issue of students wanting to bike directly home. Participants felt a policy where a bike could be rented for a maximum period of 24 hours would be ideal. This would allow one to hold onto the bike overnight, and cycle back to campus in the following day.

Other issues that were discussed were the high cost of implementation, and the conflict of redistributing bikes evenly to all locations. Students who live on campus felt the bike share program to be useless for commuting, however could use it recreationally to visit locations such as Point Pleasant Park.

The Dalhousie Campus Bike Centre is currently in the beginning stages of implementing a bicycle share program. It will not operate using a high-tech 'Dalcards' or credit card system and duration of rentals has not yet been announced. Researchers recommend a follow up research study to examine the success of Dalhousie's future bike share program after a year of operation.

3. *Bike lanes connecting home to campus*

Another identified incentive was implementing bike lanes in and around Dalhousie campuses. This would not only provide encouragement to cyclists, but like one participant said in the focus group, "simply creating the presence of bike lanes would start a culture of cycling". It was agreed upon that the implementation of bike lanes would improve overall ridership throughout both winter and summer seasons. It was also agreed upon that there will always be less people willing to bike during the winter months, as there are also people who don't like to drive in the winter (ice, snow, danger, risk increased) – and it will take a lot more effort to change the minds/behaviours of these specific individuals. An interesting point brought up was the comparison of Halifax versus Ontario drivers – where the majority found Halifax drivers to be more cautious and trustworthy on the road. However, an individual disagreed with this fact, as one felt large cities such as Toronto have designated lanes/paths (including ravine paths) that are not only enjoyable and safe, but convenient for commuting purposes. Halifax lacks this, as the streets are not very wide, (especially when there are parked cars and accumulating snow banks) which makes less experienced cyclists nervous and fearful for their safety.

The implementation of bike lanes across campus provides various benefits which lead to the overall encouragement of winter cycling, and cycling in general. It would allow less confident cyclists to feel significantly more comfortable, raise cycling awareness, increase safety, and promote the much needed shift to active transportation.

The main suggestions from focus groups regarding bike lanes were initiatives such as implementing isolated bike lanes off the road, separating from traffic, and turning one side of University Avenue into an active-transport-only street. The implementation of 'bike boxes' (i.e. a solid lane for cyclists at busy intersections which provides them the right of way, and allows one to turn safely ahead of vehicles) was also discussed and agreed upon. Finally, the last important suggestion was the need to improve the overall relationship between cyclists and motorists, and cyclists and walkers.

4. *Stylish winter cycling apparel*

Stylish cycling apparel was suggested during the focus groups which 38% of respondents stated as "somewhat unlikely" to increase ridership on the survey. However, others mentioned if for example; the Dalhousie Bookstore offered incentives to purchase their own brand of 'stylish cycling apparel' (by promotion or a worthwhile discount) that this would be an incentive that would appeal to them. The main factors found in order for this to work would be that the gear must be more affordable than for example that of Mountain Equipment Coop (considering the target is of a student audience). Therefore affordability, attractive visual appearance, and offering discounts/incentives to promote cycling on campus are the keys to success of this initiative.

5. *Snow free bike lanes on University Ave.*

Snow free bike lanes were another incentive that was raised, and 46% of survey respondents strongly agreed this would increase ridership into the winter months. Respondents claimed it would be nice to bike across campus on University Ave., however felt there might not be enough room for parking, a bike lane, and driving on this street.

6. *Wind blocking shrubbery*

Wind blocking shrubbery was another incentive that arose throughout the focus groups as one individual suggested they would to be an excellent and appealing way to create bike paths that also have the benefit of blocking wind/elements. Respondents suggested it would be a good opportunity to implement this along University Ave., especially if one lane is designated car free. However, respondents also questioned the effectiveness of shrubbery for wind protection, concluding that it may create wind tunnels, and make the issue of winter winds worse. Nevertheless, all participants agreed that shrubbery would be an aesthetic facelift for the entire campus.

A consideration of the findings in light of existing research studies

The 'green' shift is relatively new societal trend, despite decades of studies supporting human-created harmful effects on the earth's atmosphere. But it appears that the majority of Canadians are finally coming to realize and witness the devastating effects they have directly contributed to climate change, and the critical importance to strive for a sustainable future. Studies such as this one will provide research to help promote, encourage, and lead sustainable change.

Implications for theory and/or practice

Dalhousie can use this research study to implement cycling infrastructure on campus. Due to winter cycling apparel being an incentive, as mentioned by respondents in focus groups, the Dalhousie University Bookstore/Bike Center may benefit from the findings presented. They can capitalize on the opportunity to sell winter cycling merchandise which will also likely increase winter ridership. Additionally, the Halifax Regional Municipality may also find results useful in planning for city's Bikeways Plan.

This study helps to fill the gap missing from the current literature on winter cycling promotion in cities and on University Campuses, including Dalhousie University. Besides implementation of suggestions on Dalhousie University, findings may prove extremely beneficial to other Halifax Universities and Institutions such as Saint Mary's University because the report pays special attention to the unique weather conditions of a Halifax winter.

Conclusion

The general outcome of the research study was that students at Dalhousie University perceive many incentives as most likely to make them cycle in the winter; particularly improved bike lane maintenance and implementation of covered bike shelters on campus.

The study utilized non-probabilistic purposive sampling of Dalhousie staff and students with varying levels of cycling ability and experience, creating a very heterogeneous sample population. Focus groups and poster board forums were used to engage the student community in answering the research question. Each individual also differed in age, occupation, needs and/or motivations to cycle, winter cycling knowledge, cycling experience, bike maintenance skills, and quality of bicycle.

Although a considerable amount of 'silly' responses from the poster forums, respondents in the focus groups agreed unanimously on almost all incentives and common barrier of snow; adding considerable credibility to the outcome of the study. The findings supported the hypothesis that incentives are likely to increase winter ridership, yet a portion of students will be held back from cycling in the winter due to weather barriers.

Proposed Research

There is very little investigative research would aid in understanding the trends in active transportation at Dalhousie University. There has already been sufficient analysis on cycling trends at Dalhousie University done by previous ENVS 3502 students, as well as the College of Sustainability and BikeWays program. All of these groups have aimed to understand cycling behaviour and overall increase ridership at Dalhousie and in Halifax. The next step will be implementation of recommendations of these reports; turning research into feasible action and positive change.

What's Next? Action at Dalhousie University

The potential for a Bike Share program has been observed by ENVS 3502 students in the winter of 2010. They recommended the planning of a Bike Share Program at Dalhousie on the most populated campus (Studley) because one on all three would be too expensive. While they admit it would be an expensive endeavour, the researchers support it's usefulness as an environmental movement and student-supported program (Brougham, 2010).

The ENVS 3502: 'Campus as a Living Lab' course offered at Dalhousie University is a positive medium for investigating environmental issues on campus and has the ability to create positive change within the university and community. However, more attention needs to be brought to these studies, as many have had powerful messages, yet have simply been forgotten on the Dalhousie website and never implemented. Advertisement of these studies is necessary to the broader Dalhousie community to increase chances of the research being used for change.

A strategy that has been proven successful at helping to overcome attitudinal barriers to active transportation is Bike to Work Week. The Bike to Work Week initiative was franchised across British Columbia and the event in Victoria was the most successful behavior change model in North America (J. Luton, personal communication, June 3, 2009). However, the event in Victoria takes place in June so it encourages cycling as a mode of active transportation in summer weather, but it does not focus on reducing attitudinal barriers associated with winter cycling. Therefore, it is important to implement strategies such as Bike to Work Week that are directed at increasing the number of winter commuter cyclists.

The common issue of bike lanes in Halifax was certainly significant in our study. For this incentive, it would be necessary for Dalhousie to work with the Halifax Regional Municipality to develop safe, well maintained commuter bike lanes leading to campuses. Current plans from the Cities & The Environment unit at Dalhousie are considering paths for an 'Institutional District' composed of Halifax's major universities and hospitals (Cities & Environment Unit, 2001).

Promoting Halifax as Bike Friendly city is incredibly important to increasing ridership and decreasing perceived risks of winter cycling. Another ENVS 3502 group that focused on winter cycling this semester developed bicycle ads for the local radio station to promote bicycle awareness. This is supported by the research; education was mentioned at least once in focus groups. Education is essential in enlightening the general population with information on winter cycling, reasoning behind initiatives, and general shift towards a more sustainable society.

All of the above suggestions aim to make active transportation easier on campus and promote a shift away from society's addiction to fossil fuels. Hindering vehicle use on campus may add a modal shift towards a higher statistic of cyclists. The currently proposed 'car free' University Avenue proposal should be pushed and realized. As part of a TDM plan, there could be a tax to have cars in the city, making it more difficult for vehicle transportation.

The results of this study are only a part of a larger global change towards a more sustainable society. They can be extrapolated to be used on the university, community, or arguably global scale.

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