

UBC Social Ecological Economic Development Studies (SEEDS) Sustainability Program

Student Research Report

**Mobility Patterns, Experiences, and Preferences of University Students:
Evaluating University of British Columbia Students' Use of Single Occupancy Vehicle and
Major Public Transit Routes**

**Kendall Andison, Sean Bailey, Craig Busch, Matthew (Matt) Callow, Michelle Cuomo,
Nidah (Nida) Dara, Desiree Givens, Laura Hillis, Emily Huang, Jacqueline Hunter, Emily
Johnson, Cody Kenny, Robbie Knott, Jordan Konyk, Sarah Labahn, Wendee Lang,
Mengying Li, Simon Liem, Geneva Lloyd, Sarah Lone, Katrina May-Yanitski, Tadayori
Nakao, Tanja (Tanya) Oswald, Halina Rachelson, Lily Raphael, Naomi Reichstein,
Maureen Solumndson, Jessica Todd, Anelise van der Veen, Pascal Volker, Jose Wong
Cok, Rachel Wuttunee, Kelsey Yamaski, Zakaria Zenasni, Stella Zhou**

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Mobility Patterns, Experiences, and Preferences of University Students: Evaluating University of British Columbia Students' Use of Single Occupancy Vehicle and Major Public Transit Routes



**Report to the UBC Alma Mater Society by
PLAN 522 Students
School of Community and Regional Planning
Under the Supervision of
Dr Leonora Angeles & Dr Penny Gurstein**

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EXECUTIVE SUMMARY:

Context and Goals: This study produced by PLAN 522 (Qualitative Data Collection and Analysis) students of 2017-2018 was supported by the University of British Columbia (UBC) Alma Mater Society (AMS) and the SEEDS Program. It evaluates UBC students' travel patterns and experiences on six (6) major bus routes: 41 (Joyce), 25 (Brentwood), 44 (Downtown), 33 (29th Ave), 49 (Metrotown), and 99 B-line (Commercial-Broadway). Six teams of Masters in Community and Regional Planning (MCRP) students at UBC were assigned to these routes and a seventh group focused on SOV users.

Research Questions: Two primary research questions and corresponding secondary or subquestions guided the data collection and analysis: 1. How can a mixed methods analysis of UBC students' travel patterns and experience inform the AMS advocacy work to improve public transit service to the University? 2. How can Single Occupancy Vehicle (SOV) student-commuters to UBC be encouraged and incentivized to use transit, cycling or walking instead of driving?

Methodology: To address these questions informed by existing literature on transport systems and travel behaviour, the seven research teams developed data collection instruments, and analysed qualitative and quantitative data on UBC commuters and their travel experience on these major capacity-constrained routes. Over the course of January and February 2018, data was collected through verbal-textual data collection methods (e.g. surveys, and in-depth interviews) and visual-spatial data collection methods (e.g. participant observation, Photovoice, mapping, etc.) Using mixed methods research, the study assessed information about the length of commute, transit choices, interface between major routes and other modes of transportation, how students choose routes, what characteristics they prefer about their chosen route, and how they choose their routes when multiple route options exist.

Findings and Recommendations:

Route # 25: This research centers on the student user perception and experience of the #25 bus route. The #25 bus route operates from Brentwood Station and the UBC bus stop, largely in an east-west direction. Findings were largely consistent across the three data sets from participant observation, surveys, and in-depth interviews, as well as with existing literature. They pointed to a widespread perception of crowding during peak hours, the need for improved reliability, and the need for improved infrastructure and real-time information.

Analysis of findings led to the following recommendations: a) increased frequency (or greater bus capacity) at peak hours b) increased reliability c) improving or making available real-time update signage and information at bus stops d) exploring avenues to improve bus etiquette, and e) improved infrastructure at the UBC bus stop, with the aim of increasing comfort and accessibility. This infrastructure could include but is not limited to: improved rain cover, additional lighting, and improving the surrounding pavement and drainage.

Route # 33: The #33 bus route serves UBC students commuting from a variety of neighbourhoods, including West Point Grey, Dunbar-Southlands, South Cambie, Riley Park, and Kensington-Cedar Cottage, as well as cities and neighbourhoods connected to the Canada Line and Expo Line Skytrains.

The use of a mixed methods research approach, including participant observation, two different intercept surveys, and interviews, found that the most pressing issues students wanted addressed were issues of reliability, frequency, and speed. Students taking the 33 bus route consistently experienced delays, bus pass-ups, and overcrowding, and a majority of students mentioned that the bus did not come as often as they would like. Several students mentioned buses not showing up at all. These factors, along with over-crowdedness, led to concerns about safety for some transit users as well. The experiences of students varied at different times of day, with some students experiencing more concerns about low bus frequency late at night and slower speeds/increased delays during rush hours.

Recommendations to AMS include further research on where users of the 33 bus route live and how they access the route; begin lobbying Translink for increased transportation services along the 33 bus route; and improving the bus route for Translink to increase the frequency of the bus, thereby addressing various other issues including pass-ups, no shows, long wait times, delays, safety, and comfort.

Route # 41: Methods of analysis include a literature review as well as observation, survey, and one-on-one in-depth interviews. Results of data analysed (verbal-textual and visual-spatial) show the UBC students' rider experiences, route choice factors and their incentives to use Route #41 over other routes.

The findings provided a general understanding of users' information, such as their profile and where they take the bus. The project also collected information about how other modes of transportation interface with this bus line and the reasons they chose #41 or not, compared with other routes and what characteristics they prefer or dislike about #41. Recommendations discussed include increasing the size of bus, weekend service, real time data of bus arrival time, and free wifi. Understanding what informs user satisfaction of transit is integral to making meaningful and targeted improvements to transit service.

Route # 44: The Route #44 study reveals varying levels of student satisfaction and some discrepancies between service perception and actual quality. Methods included 5 hours of participant observation, 33 intercept and/or online surveys, and 7 in-depth interviews with student riders.

Findings indicate that students prioritize speed, frequency, and comfort when choosing transit, and experience frustration when buses are perceived to be late or crowded. Based on these conclusions, we recommend that AMS advocates for increased frequency of Route 044, expanded service to include weekends, and improved

infrastructure at the Route 044 bus stop on campus, including a shelter and live bus information.

Route # 49: The 49 (Metrotown-UBC) is among 14 Translink bus routes originating or terminating at UBC and services hundreds of students daily from areas in the southern part of City of Vancouver and Richmond. Information gained includes the length of commute, transit choices, interface between other modes of transportation with the 49 bus route and reasons governing students' choice of taking the 49. The research employed a mixed methods approach, consisting of gathering survey data, spatial mapping using GIS, observation, and in-depth interviews, to reveal both greater trends and rich, qualitative information to evoke feelings, concerns, or detailed experiences among students.

Though initial qualitative data did not provide sufficient clarity of students' perceptions of transit, we attempted to gain additional qualitative feedback. To elicit students' specific comments on what they would improve about the 49 bus route, we conducted further intercept surveys. This appreciative inquiry approach was incorporated as a framing tool to guide students to see potential for improvement, despite any negative experiences. Trends gathered from the aforementioned methods, particularly from students' personal positive, neutral, and negative experiences taking the 49 bus, were coded and analyzed for key themes.

Findings were compared to results in available literature focused on transportation user satisfaction and factors that influence ridership in the analysis stage. Detailing students' common and diverse experiences taking the 49 bus route could guide decision makers and planners at the AMS and Campus and Community Planning by ensuring the provision of high quality service of local transportation routes that meets the needs of frequent users such as UBC students.

Route #99BLine: This report examines the attitudes and behaviours of University of British Columbia students who commute to and from campus using the 99 B-Line. Data from observations, surveys, and interviews generated valuable insights that will be of use to the Alma Mater Society (AMS) in its efforts to advocate for improved transit service for UBC students. Some of our key findings include that reliability (e.g., short headways) is the most important feature of a bus route for students, discomfort on the bus is frequently experienced but does not affect transit choice, and students would choose alternate routes if the reliability of those routes were improved.

These findings underlie the core recommendations of how to improve the travel experience of UBC students who ride the 99 B-Line; increasing the reliability of other buses could alleviate pressure on the 99 B-Line, which would give students more comfortable options for commuting to school, either on a less crowded 99 B-Line or on a more reliable alternate route. Findings could support further study of transportation patterns of UBC students in areas outside of the scope of this report, such as targeted study of multi-modal students who live outside of the 99 B-Line's catchment area and

analysis of how transit could be improved during peak transit hours. This information can aid AMS' advocacy for student public transit users.

Single-Occupancy Vehicle Use: This report describes research and findings on the experiences and motivations of students who commute in single-occupancy vehicles (SOVs) to the UBC Vancouver campus. This research examines why some students choose to drive to school despite the availability of public transit and the provision of a U-Pass. A second purpose is to make recommendations to AMS for advocating with TransLink, the area's transit agency, for improvements to service that could serve as incentives to switching to transit. In this report, we describe the intercept survey and semi-structured interviews used as research methods and the coding system used for analysis.

Time, comfort, flexibility, health, distance and safety constituted the primary reasons (or themes) explaining the choice to drive, with time being the most common. Patterns of contributing reasons (or subthemes); for example, distance, multiple stops and health factors contributed to time burdens. Recommendations included the creation of a mobile application for carpooling, and with suggestions for future research including the role of cost-benefit analysis in students' decision-making and the role of gender in students' transportation patterns.

Mobility Patterns, Experiences, and Preferences of University Students: Evaluating University of British Columbia Students' Use of Single Occupancy Vehicle and Major Public Transit Routes

I. Introduction

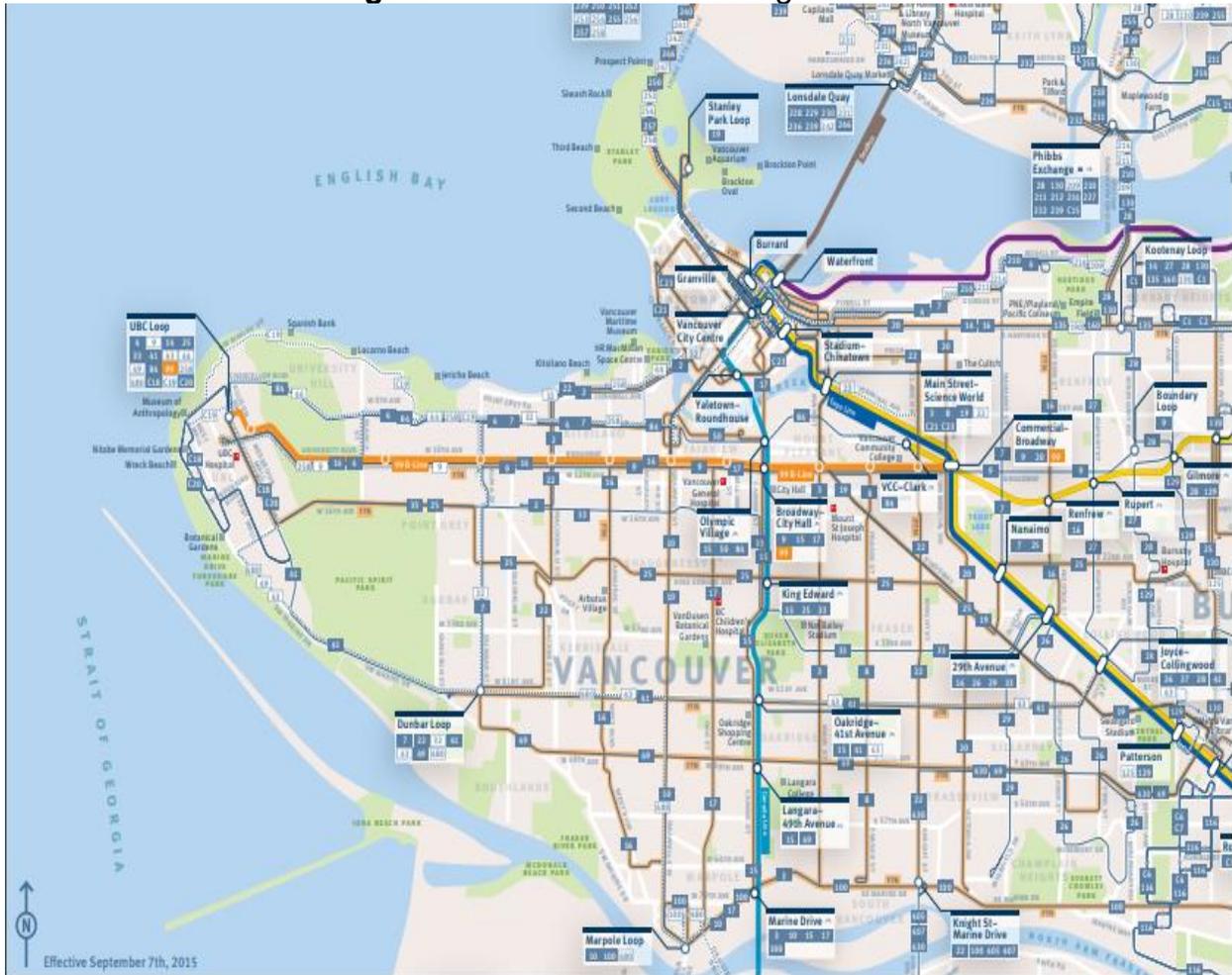
The University of British Columbia (UBC) has approximately 44,000 students and 4000 staff, who live, work and study on its Vancouver Point Grey campus. While some of them walk or bike to campus, majority commute regularly by car or public transit. The Alma Mater Society (AMS) of UBC worked with other university and college students' government councils across the Lower Mainland and Translink, the transportation authority serving Metro Vancouver region, to introduce the monthly subscription U-Pass. The U-Pass introduction increased bus ridership among students. According to the 2017 UBC Transportation Survey, 74% of 772 student respondents took public transit regularly. This result demonstrates a high demand for public transportation services and the potential to advocate for better transit connections to UBC. AMS data show that 93% of students have U-Pass subscription, but some U-Pass holders still opt to drive or carpool to campus.

As TransLink ridership continues to increase (i.e. 4.5% in 2016), overcrowding, service interruptions, and delays on key routes present pressing challenges for the public transport system. The AMS, following the 2014 UBC Transportation Plan, aims to have 66% of all trips to UBC be made by cycling, walking, or public transportation by 2040 (Campus + Community Planning, 2017). Policies to increase capacity and improve riders' experiences on significant routes can incentivize and accommodate increased demand. Emboldened by its successful 2017 campaign to retain bus #480 (UBC-Bridgeport) service, the AMS continues to advocate Translink and the BC Provincial Government for route modifications to further increase public transit ridership and better serve student needs. However, the AMS still lacks sufficient data concerning important UBC-bound trips to inform their decisions and advocacy work.

Currently, 14 bus routes connect the UBC Point Grey campus to the surrounding region, with six major bus routes (#99 Blaine, #25, #33, #41, #44, #49) of interest to this study (see Figure 1.A & 1.B). Students residing outside the catchment of these six routes make at least one transfer by using another bus, ferry, bicycle, shared or private vehicle, or by foot. The average length of time spent on commuting by transit is 50.5 minutes, compared with 38 minutes by all modes of transportation. Respondents who use public transit less than once a week told the UBC Transportation Survey done in 2017 that more public transit, shorter travel times (60%), less overcrowding on buses (58%), and increased frequency of service (52%) would make them use public transit more often. Since Translink only collects tap-in data, but not tap-out data on commuters' Compass Cards, additional information on travel patterns and commuter and non-commuter

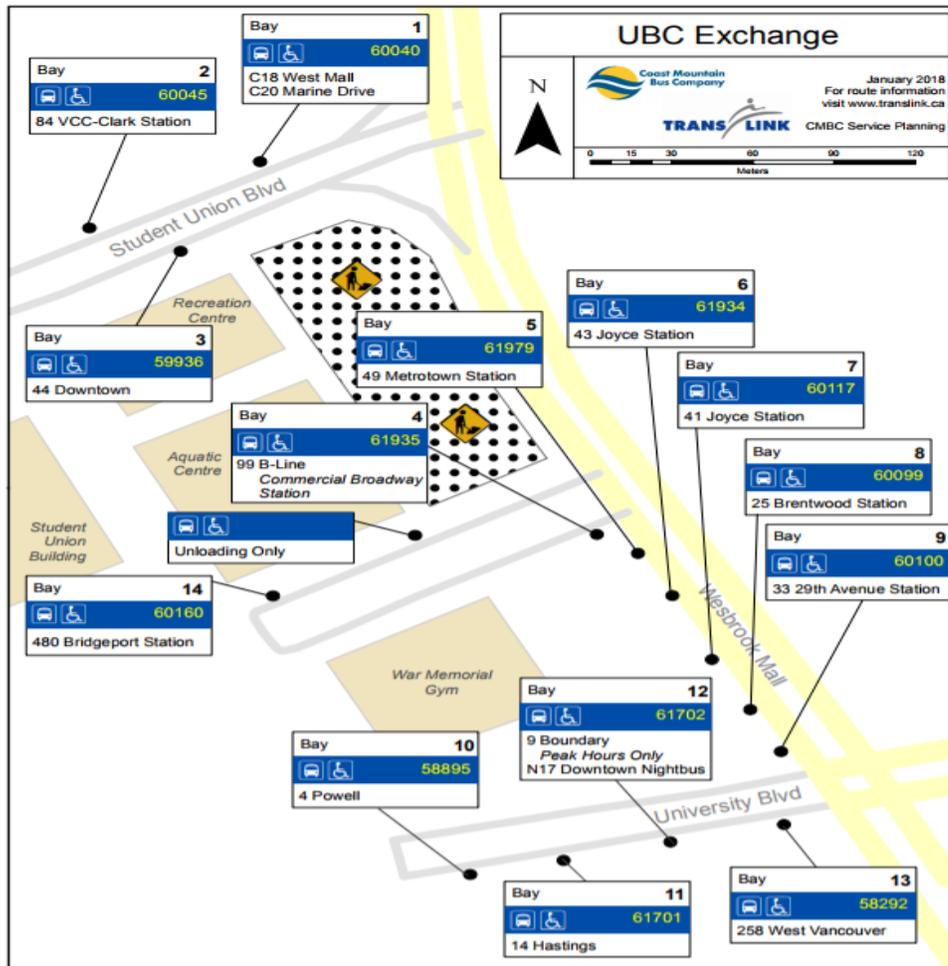
experiences is needed. Although UBC's Campus and Community Planning Transportation report (2017) provides information about commuters' general travel patterns, it does not include specific data about *student* transportation patterns. There is also no available research on why some UBC students opt out of the U-Pass and prefer to drive single-occupancy vehicles (SOV).

Figure 1.A: Public Transit Going to UBC



Source: <https://planning.ubc.ca/sites/planning.ubc.ca/files/images/transportation/V-Sep%202015.pdf>

Figure 1.B: UBC Transit Exchange Map



Source: <https://www.ubyssey.ca/news/ubc-bus-loop-closing-will-impact-major-bus-routes/>

To fill these knowledge gaps, this study evaluates UBC students' travel patterns and experiences on six (6) major bus routes: 41 (Joyce), 25 (Brentwood), 44 (Downtown), 33 (29th Ave), 49 (Metrotown), and 99 B-line (Commercial-Broadway). Six teams of Masters in Community and Regional Planning (MCRP) students at UBC were assigned to these routes and a seventh group focused on SOV users. In the UBC 2017 Vancouver Transportation Survey, 5% of student respondents indicated "driving alone" as their typical transport mode, terminating in any of the five (5) Parkades on campus. Only 6.2% of recipients responded to the transportation survey (with staff, faculty, students and all others included in this number), and consequently, the percentage of students who drive alone may in fact be higher than 5%. Why do some students continue to drive? Are there are ways to mitigate the barriers to ridership, and what could incentivize them to take transit? To what extent are the available services and offered capacity on these major routes to UBC adequate for student-user demand and satisfaction?

Two primary research questions and corresponding secondary or sub-questions were framed to guide our data collection and analysis:

1. How can a mixed methods analysis of UBC students' travel patterns and experience inform the AMS advocacy work to improve public transit service to the University?
 - a. What are the travel patterns of students traveling to UBC using the specific Bus Routes of interest to this study? How do UBC transit users address their "last mile" (i.e., from transit hub to final destination) travel needs?
 - b. What are the experiences of commuter UBC students on these Routes, particularly their wait and travel times, service frequency, timeliness, reliability, comfort and safety?
 - c. What route connectivity do students take on public transit, and why do they take these routes? What alternative routes do they take to address their travel needs?
2. How can Single Occupancy Vehicle (SOV) student-commuters to UBC be encouraged and incentivized to use transit, cycling or walking instead of driving?
 - a. What factors influence SOV commuters' decision to drive to campus instead of taking public transit or carpooling (e.g. public transit service quality, car ownership, car access, housing location, health, safety, socio-cultural, etc.)?
 - b. What service and amenities improvements might encourage SOV users to switch to transit?

To address these questions informed by existing literature on transport systems and travel behaviour (See Section II), the seven research teams developed data collection instruments (see Appendices) and analysed qualitative and quantitative data on UBC commuters and their travel experience on these major capacity-constrained routes. Using mixed methods research, the study assessed information about the length of commute, transit choices, interface between major routes and other modes of transportation, how students choose routes, what characteristics they prefer about their chosen route, and how they choose their routes when multiple route options exist (e.g. #44 instead of #4 or #14 from Downtown; #25 instead of #33 and vice-versa, #99 instead of #9). It collected data on SOV users to shed light on why some students choose to drive alone rather than to take transit. More detailed information on the research methodology is provided in each of the six teams' reports on the six major routes (See Sections III-VII) and on SOV users (See Section VIII).

II. What is Known about Travel Patterns and Behaviour: A Review of Related Literature

The decision to use public transit is complex and context-specific. Transportation disadvantage (TD) is a foundational concept in discussions around access and equity in the transit arena. Shay et al. (2016) describe TD as the limits on, or barriers to, access to destinations such as employment, education, healthcare, and nutritious food. Often TD is linked to poor health and lack of access to activities and opportunities key to well-being and health (Shay et al., 2016). Frank (2000) analyses the relationship between land use and travel patterns by emphasizing connections between land use and public health, examining degrees of proximity and connectivity between trip origins and destinations. As the UBC campus is an education hub for many people who may be at risk of TD, it is important to address areas of accessibility deficiency that may have a negative influence on student well-being and travel experience.

The limited research on youth or student commuter behavior shows common patterns. Students travelling to and from McGill University in downtown Montreal are more likely to take public transit than university staff or faculty, with age exerting a negative influence on public transit uptake (Eluru et al., 2012). Another study at McGill looked at how levels of satisfaction differed across six modes: walking, biking, driving, and commuting by bus, metro, or train (St-Louis, Manaugh, Van Lierop, & El-Geneidy, 2013). Investigators examined how external versus internal (attitudinal or personal) variables, mode preference and perceptions of value affected satisfaction and found that pedestrians and cyclists had the highest satisfaction, while train riders were more satisfied than drivers or bus/metro riders (St-Louis et al., 2013, pp. 160-161). While externalities such as “trip characteristics and travel time” played a part, satisfaction also hinged on internal variables such as “socio-demographic characteristics, travel and mode preferences, and influences of people’s social environment” (St-Louis et al., 2013, p. 169). In Vancouver, youth and young adults between age 16- 34 composed 55% of bus users, 52% of SkyTrain riders, and 45% of cyclists. Thomas (2010) found that these young dedicated transit users experience increased independence and better time-management skills. However, transit deficiencies force them to spend significant time planning and coordinating evening transit trips, with decisions influenced by trip length, weather, traffic, and travel times of friends. As a result, social activities tend to be concentrated in areas of high public transit service (Thomas, 2010). Likewise Diana (2012) found that while students are frequent users, they generally have a lower satisfaction with public transit than older users, attributed to students’ mobility patterns during peak times (p. 9).

In this review, we look at three related bodies of relevant literature. *First* is the literature on factors shaping public transport user satisfaction, satisfaction criteria, needs, desires, and perceptions of transport quality. We highlight the negative factors or experiences shown to hold disproportionate weight in transit user perception and services-amenities gaps that need to be addressed. *Second* is the literature on specific attributes of transit system services that concern multi-modal travelers, similar to UBC students who need to take various transport modes to reach their home, work, and school destinations. *Third* is the voluminous literature on travelers’ planned behavior, focusing on the gaps between

knowledge, attitudes, intention and behavior that can help us explain why despite increased environmental awareness among young people and the availability of public transportation services, some UBC students still prefer to drive to campus..

A. Public Transit User Experience: Satisfaction Criteria and Rider Perceptions

Multiple factors influence decisions on how and why people use particular transportation methods. Individual social fabrics and accessibility to different transport modes intersect to influence everyday travel decision-making (Guell, Panter, Jones & Ogilvie, 2012). Our literature review demonstrates that mixed methods research has focused on satisfaction variations across modes, the factors shaping needs- and desires-based satisfaction, and the salient negative user experience effects of transfers and overcrowding. Understanding traveler experience and what informs transit user satisfaction is integral to making meaningful and targeted improvements to transit service, and helps transit providers attract new customers and maintain existing ones.

While some research determined specific key attributes and criteria of transit user-customer satisfaction (Redman, et. al., 2012; Eriksson et al., 2013; Garrido et al., 2014; Hilden et al., 2016), other investigators took a “holistic” approach to traveller experience, arguing that customers’ travel perceptions hinge not only on “cognitive assessments” but on “sensorial and emotional components” as well (Carreira, Patrício, Natal Jorge, Magee, & Van Eikema Hommes, 2013, p. 233). Comparing touristic versus utilitarian bus travel, investigators found that “a rich set” of factors going “beyond traditional transit quality” shaped riders’ experience on buses, such as safety conditions, on-board entertainment, off-board services, and/or the social environment, as well as “positive emotions and pleasant sensorial feelings” (Carreira et al., 2013, p. 241).

There are differences between transit riders’ satisfaction criteria based on needs, desires, and needs perceptions in relation to available transport service attributes. Some of these attributes included, but are not limited to, service frequency, vehicle occupancy, travel time, cleanliness, comfort and driver behavior (Mouwen, 2015; Susilo and Cats, 2014, dell’Olio et al., 2011; De Ona, De Ona, Eboli, Mazzulla, 2016). The literature also points to the role of individuals’ subjective perception in determining user satisfaction. Needs-based as well as desire-based attributes are commonly valued by the user in assessing their transit satisfaction. The relative importance given to these attributes, however, varies depending on the individual user (dell’Olio, Ibeas, Cecin, 2011; Eriksson, Friman, Garling; 2013). Many transit users value criteria grounded in their essential transit needs that “depend on their commitments and constraints, both in terms of time and money, which vary across different socio-demographic variables, such as household composition, income level, profession, car availability and lifestyle choices, and also across different mode use” (Susilo & Cats, 2014). Additionally, research emphasizes that understanding user perception of present experience does not equate to understanding desires for future service. It is important to make this distinction and take both into account when determining improvements designed at enhancing user satisfaction and attracting

new transit users (dell'Olio, Ibeas, Cecin, 2011; Hilden, Ojala, Vaaranen, 2016, dell'Olio et. al., 2011).

Differences arise in many mixed-methods studies' methodological approaches, particularly in grouping and ranking of relevant factors underlying users' transit service quality perceptions. There is no standardized method or structure to categorize factors of transit service quality for users across different regions, as each study uses unique methods of organizing and analyzing data based on factors deemed essential to "service quality" (e.g., Lai 2011; De Oña et al 2012, 2013). Researchers' own qualitative and ethnographic perceptions can also be used to develop a grading system and judge comfort perceptions (Shen, 2016). Bordagaray et al. (2013) and Eboli & Mazzulla (2016) grouped variables into discrete sets of statistical parameters and compared correlation values, whereas Dell'Olio et al. (2010) analyzed survey information by characterizing users through a combination of self-identifying qualitative measures and their personal journey information. Lai et al. (2011) discussed perception of ridership ranking factors through the lens of marketing strategies for increasing ridership, focusing on strategic marketing interventions' potential leveraging capacity on rider perceptions. Finally, Muggenburg et al.'s (2015) theoretical framework for investigating key life events' impact on daily mobility choices suggested that many factors besides service reliability and comfort levels have destabilizing effects on rider perceptions.

The top ranked categories of factors in rider perception are around service reliability and overall comfort and safety. Dell'Olio et al. (2010) showed that "service reliability" and "waiting time" have a combined weight of 51.4% in the overall evaluation of the service. Bordagaray et al. (2013), Eboli & Mazzulla (2012), de Oña et al. (2013), and Nesheli et. al. (2016) placed higher rankings on perception of journey time, regularity, punctuality, and frequency. Iseki & Taylor (2010) determined that connection, reliability, safety and security (particularly at transit stops) were more important than design and amenities. Morton et al. (2016), Lai & Chen (2011) and Chou et al. (2014) conceptualized transit service quality as a mixture of convenience, cabin environment, and ease of use. Notably, public transport customers consider the vehicles' physical environment to be an important aspect of service quality.

Measurements in studies placing comfort levels at higher levels of service quality perception include: whether passengers are seated or standing and the length of in-vehicle time, thermal comfort and temperature (Shen, 2016); overall comfort and personnel (De Oña et al. 2013); driver's attitude (Bordagaray et al. 2013); and cleanliness (Eboli and Mazzulla, 2012). Eboli & Mazzulla (2012) note that transportation comfort measurements should include more factors (e.g. air-conditioning and degree of comfort on board), yet comfort is often measured solely by crowding levels. Results of perceived service quality also appear to vary significantly across socioeconomic classes, which suggest that citizens from different life-stages and conditions hold distinctive attitudes regarding the perceived service quality (Morton et. al., 2016).

A significant finding in the literature is the disproportionate impact of negative experiences on a riders' evaluation of transit. Neshelo et al. (2016) found that delay time has the greatest impact on a traveler's transit use decision and tested the degree to which transit users can tolerate operational tactics, e.g. "holding" or "skipping stops," used by transit providers. In a discourse analysis of focus group interviews, Guiver (2007) found that negative experiences have a disproportionate impact on user perception of bus travel overall. One negative experience can change a user's perception of a bus route and override impressions of many average or positive experiences. Experiences of physical vulnerability and feeling like a "second class citizen" can negatively impact perception of transit (Guiver, 2007). Stradling et al. (2007) found that unwanted arousal (e.g. harsh braking, noisy passengers, unwanted social interactions, unwelcome smells, and crowded buses) can impact user perception and concluded that social affective concerns can be stronger in determining transit user satisfaction than purely instrumental factors such as cost and frequency. These suggest that transit providers should focus on improving the worst aspects of their service to mitigate the outsized influence of negative experiences (Guiver, 2007).

B. Multi-Modal Traveler Satisfaction

Some UBC commuters use transfers and multimodal travel to and from campus. Transfers and overcrowding in multi-modal travel affect users in particularly negative ways. Susilo and Cats (2014) found that trips with larger number of stages were associated with lower travel satisfaction. Chowdhury and Ceder (2006) have identified "seamless transfers" as having the most impact on willingness to use integrated public transit. Transfers often create negative perceptions even prior to a user's experience, compounding the effects of comfort, safety, reliability, and effective information on the likelihood of returning to the system in future. In a study that acknowledges differences in commuter versus leisure experience, Tirachini, Hensher, & Rose (2013) found that overcrowding can also create dissatisfaction by causing systematic delays, higher levels of discomfort, and anxiety, as well as directly influencing users' choices of alternative routes. For existing public transport users using multiple modes, stop related service aspects such as overall station environment, station safety, and travel information at stops are most important. This suggests that waiting and transfer conditions are the service aspects most strongly correlated with higher satisfaction.

Studying multimodal transfers is important for designing sustainable transport systems and policies, with implications for "reducing congestion, accidents, and pollution" (Diana, 2012, p. 2; Hernandez & Monzon, 2016, p. 1), amidst growing urban populations, sprawl, and climate change. Multiple studies have established that service quality provided by public transport has a direct influence on travelers' daily experience (Hernandez et al., 2016; Mao et al., 2016) and could "guide stakeholders toward the improvement of public transport networks that are more responsive to the user preference structures" (Anderson, Nielsen & Prato, 2017, p. 222). We have identified the following themes affecting multimodal travel satisfaction and decision-making relevant to our study of UBC students' travel patterns and experiences.

B.1. Multi-trip service satisfaction: attitudes and perceptions

User satisfaction is affected by a combination of time and effort factors, as well as multimodal flexibility. Time savings can be achieved by optimizing the search and use of information, and the trip itself. Effort savings comprise physical, cognitive and affective effort (Ceder, Chowdhury, Taghipouran, & Olsen, J, 2013, p. 113; Grotenhuis, Wiegman, & Rietveld, 2007, p. 29-30). Likewise, Mao et al. (2016) argue that flexible multimodal trips are most satisfying as they offer a larger choice set.

A survey of social public transit use patterns of 21 youth (aged 17-21) and young adults (aged 22-25) found that trip length and frequency greatly impacted respondents' satisfaction. All participants experienced lateness as a result of transit failure, and were forced to adjust their social activities to work with infrequent public transit service, or combine modalities, walking significant distances to return home late at night, which left users dissatisfied (Thomas, 2010). Bohte & Heinen (2014) found that attitudes toward bicycle use were positive among all transport modes (car, bicycle, public transit, and public transit/bicycle); however, attitudes toward car and public transit use were only positive if that was the individual's mode of transport. Interestingly, public transit-bicycle commuters, considered a distinct commuter group, had more positive attitudes toward public transport use than public transit-only commuters (Bohte & Heinen, 2014).

One study clusters mode use into five distinct categories, in which the multimodal suffix is "added if a considerable share of the cluster members uses public transport at least once a month" (Molin et al., 2016, p.24). There is a general negative attitude towards transportation modes that are not used by participants, but the study does not find a generally positive attitude toward cycling, which differs from Bohte and Heinen (2014). The more positive views towards driving than cycling could suggest multi-modal public transport users will switch to car use when they can afford it (Molin et al., 2016). Differences in these studies findings demonstrate a need for further review. A breakdown of public transport type is not discussed in all studies and could warrant further study delineating cohesive mode categories and distinctions within modes. Overall, these studies point to the multidimensionality of users' responses to transportation modes and the need for future research on various factors that play into satisfaction across modes in varying contexts.

B.2. Travel information and transit-route decision-making

Integrated multimodal travel information (IMTI) provides public transport users with information on more than one mode of travel within a single information service platform and minimizes travel planning efforts. It was found to be more relevant for users during the "pre-trip" stage and deals with the initial route choice and travel sequence. Frequent users (e.g. UBC students familiarized with routes) demanded more information at bus stops related to waiting times, approaching vehicles, and seat availability (Grotenhuis et al., 2007).

Researchers found that options offering the shortest journey and fewest transfers are most popular, while travel time on the bus is viewed to be more onerous than time spent on other public transport modes (Eluru et al., 2012; Anderson et al., 2017). Eluru et al. (2012) found that trips with low initial wait periods and shorter walks are most popular, while Anderson et al. (2017) noted that greater availability of route alternatives are preferred over a unique route that may take less time, to avoid delays and travel irregularity. With regard to multimodality, travelers often “use buses in the beginning or the end of the trips to reach the most attractive modes,” though different mode transfers are burdensome for public transport travelers (Anderson et al., 2017, p. 241). Findings are inconclusive on whether or not cycling, a mode that can extend public transport catchments while also being effective for short distances, when used as a mode transfer is considered burdensome (Bohte & Heinen, 2014, p.111).

Multimodal public transport travelers prefer routes with overlapping modes as they provide more opportunities to reach their destination (Anderson et al., 2017). Grotenhuis et al. (2007) confirmed this finding and noted that uncertainty about expected arrival time and ability to make connections is a cause of affective effort. Reliability, especially in out-of-vehicle times, was found to be the most preferred value for public transport users (Ceder et al., 2013, p. 121). The literature suggests that user satisfaction criteria vary across different user groups and are context-specific. The findings in the studies reviewed were limited to one country or city literature and should not be overgeneralized. Measurements of satisfaction criteria should be compared and contrasted across different countries, transportation networks and infrastructure backgrounds to better understand the variety of transit user needs and desires and how the general public might be persuaded to change their driving habits.

C. Why People Change Their Driving Habits: Linking Public Transit Users' Satisfaction, Intention and Behavioural Change

Although active transport and transit use are generally preferred from a public health perspective (Frank, 2000), a large proportion of people still drive rather than use transit. Studies of potential car or transit users reveal the wealth of psychological and cultural factors influencing modal choices. Beirão & Cabral (2007) found that users compare service quality of transit choices, such as bus and light rail against cars, in determining whether to take one or the other. Furthermore, individual preferences relating to comfort and convenience, as well as deeper meanings embedded in travel modes (e.g., freedom of mobility) influence individuals to drive versus taking transit. Hopkins (2016) extends such findings using social practice theory, focused on the under-35 population, adding that cultural meanings and materials (e.g. available infrastructure) are as important as driving competence in influencing the choice to drive over using other modes.

The question of why people change their transit pattern behaviour is often explained through the Theory of Planned Behaviour (TPB). This theory links individuals' beliefs with behaviours, hypothesizing that attitudes, subjective norms (societal perceptions of the

behaviour), and perceived behavioural control (the perceived ease or difficulty of the behaviour) shape an individual's behavioural intention, which directly precedes and informs behaviour. While TPB is useful in analyzing the cognitive intention to use public transit, many scholars turn to additional theories such as customer satisfaction, norm-activation theory, and the theory of social practice, in order to better explain the habitual and psychological reasons behind individuals' mode of transport (Fu and Juan 2017; Hopkins 2016; Lai and Chen 2011; Wall et al 2007). This literature review on TPB and its integration with other theories discusses case studies that have attempted to understand or change individuals' mode of transportation. The articles reviewed are from outside North America, with its unique history of vehicle-oriented transportation culture. As their findings are context-driven, caution must be taken in considering their applications and influences on our own study of UBC students' travel behaviour.

Within TPB, behavioural intention indicates an individual's readiness to perform a certain behaviour. Chen (2016) and Lai and Chen (2011) have studied the interrelationship of factors affecting the behavioural intention of transit passengers, integrating customer satisfaction theory into TPB. Chen (2016) analyzed two factors: (1) group service quality, being passengers' assessment of the standard of service delivered; and (2) customer satisfaction, being a passenger's affective judgment of the fulfillment of their desires, expectations, and needs as a result of their experience. Studying these same factors, Lai and Chen (2011) included (3) perceived value-- a customer's assessment of a service based on a trade-off of perceived benefits and costs-- and (4) involvement--the level of interest or importance that a product or service has for an individual. Both studies found significant causal relationships between these factors and behavioural intention. Understanding these factors is important, Lai and Chen (2011) argue, because favorable behavioural intention impacts not only an individual's behaviour but also their recommendations to others. Chen (2016) and Lai and Chen (2011) use the causal relationship of factors on behavioural intention to make recommendations to transit companies, including allocating resources to less urbanized regions, focusing on quality improvement, and increasing consumer involvement through marketing.

Fu and Juan (2016) integrated customer satisfaction theory and TPB, with the added consideration of *habit* as an influential factor on individuals' transportation mode choices. They concluded that habit and intention have the most direct influence on one's public transportation use behaviour, and habit especially has a significant role on the formation of intention to use public transit. For example, individuals with greater transit use habit tend to hold higher intentions to continue using public transit. The study suggests that local transportation departments should focus on service quality to facilitate individuals' habit formation to take public transit (Fu et al., 2016).

Wall et. al. (2007) used logistic regression and models based on Schwartz's norm-activation theory (NAT) in comparison with TPB in order to better explain drivers' intentions to reduce or maintain their car use for commuting. NAT explains altruistic behaviour and sacrifices made for others' benefits. While TPB stresses personal utility,

focusing on external norms and intentions, NAT prioritizes benefits to others over self-interest, focusing on *internal* norms, and does not include intentions. NAT better explains sacrificial intentions to reduce car use for the sake of others and the environment. In this study, a model using NAT and TPB is likely more accurate than either individual theory, and accounts for a range of influences on car-use intentions that neither individual theory fully captures. Wall et al. (2008) revealed that the influence of personal-normative motives on car-use intentions increased with perceived control. It reported a qualitative examination, interviewing participants from the same pool. It showed that the results were consistent with quantitative findings with regard to perceived control as a limiting factor on personal-normative motives' influence.

Another influence on behaviour drawn from market research studies for commercial enterprises are *switching barriers*, which are elements that keep customers locked into the current service provider (Williams et al. 2011). In the context of UBC students' transportation choices, this concept helps us understand why some students do not opt out of the Compass Card U-Pass, but instead choose to drive to school or use another mode of transportation.

In addition to factors influencing the cognitive intentions of consumer behavior, psychological factors, such as attitudes, subjective norms, perceived behavioural control and habits, have also been found to influence an individual's decision to take public transport. Chowdhury & Ceder (2006) noted the lack of a psychological model explaining users' willingness to make transfers and concluded that understanding current users' psychological aspects will directly influence the creation of effective methods to prompt car drivers to switch to public transit. Whalen et al. (2013) concluded that both good-quality shelters at transit stops, which increases travel comfort, and vehicles' physical comfort increase the probability that students will take transit over a car.

TPB has been used to look at these psychological factors (e.g., Bamberg et al. 2003, Donald et al. 2014, and Fujii & Kitamura, 2003). Donald et al. (2014) used an extended TPB model to look at participants' decision to drive or use public transit, adding moral norm and environmental concern as factors. The study found that car use was determined more by intention than habit. Using public transit is a more deliberate decision than driving. Fujii & Kitamura (2003) studied habitual drivers and hypothesize that if a temporary change leads to psychological change, then a lasting and permanent change in travel mode may occur. Their experiment gave drivers a one-month free bus ticket and concluded that the temporary structural change of offering drivers a one-month free ticket does have the potential to change people's habits, attitude, and travel mode. Bamberg et al. (2003) conducted a similar experiment, in which participants who had recently moved to a new residence were given an information package on public transit and a free bus ticket. They found that public transit use increased at the place of residence with this intervention, and car use decreased slightly. Bamberg et al. (2003) concluded that habit likely does not matter in shifting participants from frequent drivers to public transport

users. Instead, they found that specific interventions could assist in changing the habits of drivers. More research is needed to study habitual change over a longer time frame.

In line with TPB, Şimşekoğlu et al. (2015) studied travel mode users in Norway confirming that attitudes are a significant travel mode use predictor, with results revealing how priorities like flexibility, work schedules, and social status increase the odds of car use, while safety and security influence intentions to use public transport. Nordfjærn et al. (2014) used an extended TPB, which allowed for additional constructs, such as habit, to be used in examining car habits and resistance to change in various urban areas in Norway and suggested that social cognitive constructs are strongly related to public transit use. Similar to Bamberg et al. (2003), both Şimşekoğlu et al. (2015) and Nordfjærn et al. (2014) called for interventions that promote more favourable attitudes towards public transportation and challenge established car habits across populations.

Hopkins (2016) integrated TPB with theories of social practice to examine learning to drive as a planned practice amongst generation Y (18 - 35 year olds). Theories of social practice examine the socio-material intensity of everyday life (Shove et al., 2012), as in routine-driven activities and behaviours. The findings suggested that learning to drive is not solely a planned behaviour, but is predicated on a range of culturally-determined performances, including employability, adulthood, and capacity. These studies are limited in the extent that they do not include parental perspectives, as well as how changing life stages shift planned behaviour and the perceived necessity to drive. More research is therefore needed to ascertain how personal circumstance and family obligations drive transport choice.

D. Conclusions: Addressing Service-Amenities Gaps, Needs, and Desires

Transit performance evaluation is commonly used to capture unmet user service needs (Ona et al, 2016). From the attributes valued by users as discussed above, several service and amenities gaps appear to be important in determining public transport user satisfaction. More research is being conducted on users' perception of quality, in contrast to previous research focusing on transit agency performance measures. The literature reveals a significant gap between the establishment of quality indexes that measure users' existing needs and their perceived quality of public transit versus desired satisfaction. Desired quality reflects the maximum level of utility to which the users and potential users of public transport aspire. Luigi dell'Olio et. al. (2011) explain that existing users value waiting time, cleanliness, and comfort most, while driver kindness, bus occupancy, and journey time are less valued. Interestingly, in expressing their desires for transit and what might sway them to take it more often, potential users describe waiting time, journey time, and bus occupancy as the most influential factors. If the goal is to attract new passengers from private cars to the public transport system and of reducing traffic pollution (Guirao et. al., 2016), then it is important for transit authorities to focus not just in addressing gaps and needs, but also desires. For example, access to digital services or the ability to hang bags at the bus stops were not noted as criteria employed in evaluating present satisfaction with services. However, in their focus group of students

living in Finland, Hilden et. al. (2016) reveal that users would like to see the inclusion of these amenities in the future. Findings indicate that when users are engaged in activities on public transit, their overall experience is enhanced (Ettema, Friman, Garling, and Olsson, 2012). Bus users also stated they would rather have somewhere indoors to wait, as well as having a space to put their bags at the bus stop (Hilden et. al., 2016).

There is substantial literature on perceived qualities and priorities to address based on existing customer service satisfaction surveys and methods. A focus on desired or aspirational qualities of public transit will assist in the development of tailored marketing campaigns to effectively target new users, as well as positively impact the experience and satisfaction of current users (Dell'Olio et. al., 2011). Various qualitative studies on transit user experience have researched the importance of behavioural analysis when determining why and how individuals decide to take different routes or modes of transportation (Flamm & Agrawal, 2012; Sattlegger, & Rau, 2016). Variables that influence choice include reliability, safety, economic value, individual family and work responsibilities, location, routines, preferences, and environmental impacts (Fan, Guthrie, and Levinson, 2016; Flamm et al., 2012). Additionally, the emotional, social, and economic patterns of meaning that are developed during personal vehicle or public transit commutes also inform individual mobility choices (Sattlegger et al., 2016).

Although not the focus of this study, one mobility choice that could be promoted by AMS is biking to campus. Cycling as a form of transportation is recognized for its health benefits and is becoming more accessible to commuters through civic policy and infrastructure upgrades. Benefits include improved mental and physical health, fitness, sustainability, and affordability (Garrard, Crawford, & Hakman, 2006; Cavill & Watkins, 2007). The impediments to cycling have been identified as logistics (time, distance, level of organization, family responsibilities, dealing with weather, and safety); high volume and fast traffic, inconsiderate drivers, and pollution; cycling infrastructure and facilities (lack of on-road continuous cycling space, secure parking, shower and change facilities, and cycling paths); and cultural norms (verbal abuse, physical violence, and ridicule) (Daley, Rissel, & Lloyd, 2007). These studies have shown that while commuters have expressed willingness to cycle, the deterrents outweigh the benefits. However, students who have identified as cycling to campus only rarely (just once in the past year) said they would increase the frequency if barriers were addressed (Manaugh, Boisjoly, & El-Geneidy, 2017). Whalen, Páez, and Carrasco (2013) identify the positive utility of travel time as one major gap in current research, despite its growth in popularity. They suggest that cycling, while found to be the least utilized mode in their study, could benefit from further research on the utility of travel time, as cyclists often perceive their commute time as positive and valuable. Our study will identify local barriers to using active transportation, as well as how these barriers influence transit use to and from UBC.

The uncertainty and stress driven by potential schedule changes and long wait times often contribute to negative perceptions of public transportation services (Fan et al., 2016; Watkins, Ferris, Borning, Rutherford, & Layton, 2011). Travel time is a significant motivator behind peoples' transportation mode choice and often, wait time is perceived negatively by both transit riders and non-transit riders (Fan, Guthrie, & Levinson, 2016).

Providing basic amenities at bus stops in addition to real-time transit data can help to reduce perceived wait times and increase customer satisfaction and safety (Stelzer, Englert, Horold, & Mayas, 2016; Watkins et al., 2011). “Bidirectional communication” of real-time data exchange is beneficial for both riders and transportation companies; where riders receive information about delay notifications, route changes, and damage reports that help inform their travel decisions, transportation companies receive feedback and report updates that may be used to inform dispatching decisions (Stelzer et al., 2016). Unfortunately, the capacity of smartphone technology and high performance servers to collect data regarding user travel behaviour and experience is limited. Currently, the primary data sources are collected by scanning transit passes, communication via social media, and feedback received from staff in crew vehicles (Stelzer et al., 2016) – sources which are not readily available, or at best, unevenly used, in urban centres like Vancouver. Although access to real-time data can enhance the travel experience of transit users, the amount of data collected can become overwhelming for transit service authorities to manage and to synthesize into useful information (Nunes, Galvão, & Cunha, 2014; Stelzer et al., 2016). In order to avoid information overload, it is essential that these new data collection methods be integrated in a user-friendly manner as dispatchers will need to adjust to more complex systems (Stelzer et al., 2016).

Data collection and analysis of transport use patterns and experiences present methodological issues and challenges. Consideration of transit user behaviours and social experiences allows researchers to “capture both enabling and constraining societal influences on individuals’ mobility choices” within a broader situational context (Sattlegger et al., 2016, 28). For example, gender is a significant factor in perceptions of wait time in relation to safety, which we hope to capture in our research. Perceived levels of safety and security, ranging from feeling “somewhat safe” to “not safe at all,” increased the perceived wait time of female respondents (Fan et al., 2016).

The way transit maps are schematically presented may influence passengers’ perceived travel time and present an opportunity to strategically influence users’ transit choices using various visualization tools (Fayne, Fuhrmann, Rice, M. T., & Rice, R. M., 2015). Physical maps, such as paper and cloth, serve as a visualization tool for delivering transit information that evoke emotional responses and present affordances which can have an impact on students’ modal choices (Guo, 2011). Georeferenced qualitative data can be combined with GIS quantitative spatial data as a representational tool to better understand transit choices made by UBC students and how individual behaviours influence them (Mennis, Mason, & Cao, 2013). Deepening understandings and comparability across transit service research and data sets will inform adaptable quantitative methods and technologies to be used by decision makers and analysts for future studies (Daraio, Diana, Di Costa, Leporelli, Matteucci & Nastasi, 2016). Transit research can be used as an effective tool to inform policy decisions. The use of participatory photo-mapping (PPM), focus groups, interviews, and Mobility Biographies Research (MBR) have been used in various transit studies to examine vehicular mode usage as well as the perception of wait times and customer satisfaction with transit options (McAndrews & Marcus, 2014; Sattlegger et al., 2016).

Informed by these findings, the next seven Sections highlight the patterns, perceptions and evaluation of SOV users and transit user experience to guide transit advocacy and planning concerns of students from the UBC community.

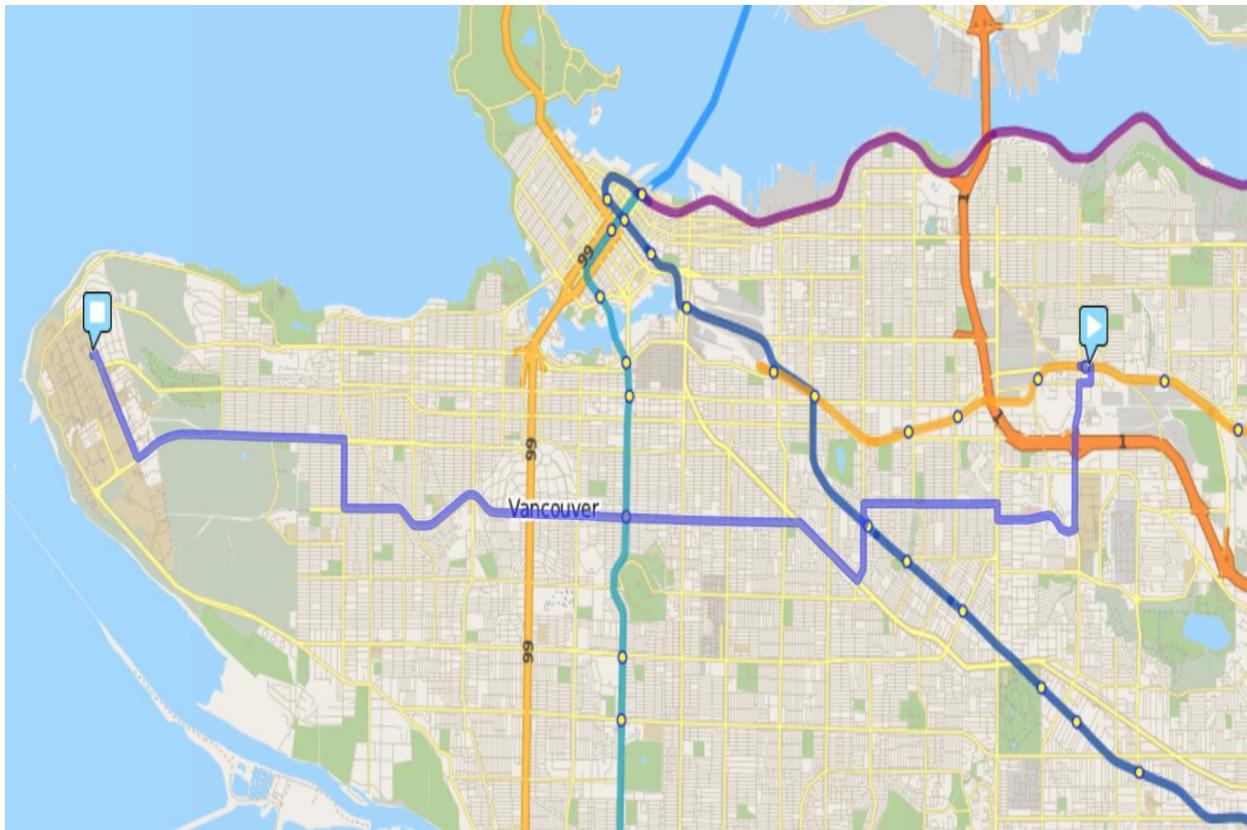
III. Route # 25 (UBC/Brentwood)

Emily Johnson, Annelise van der Veen, Zak Zenasni, Kendall Andison and Wendee Lang

A. Introduction

How can the Alma Mater Society (AMS) best represent the student voice to TransLink? Effectively focusing AMS's advocacy efforts requires a firm understanding of the student perception and experience of different routes. This paper provides an analysis of data collected for the purpose of better understanding UBC student perceptions and experiences of the #25 bus route. The #25 bus route operates between Brentwood Station and UBC bus loop (**Figure 2**), generally in an east-west direction. This line has three sub-routes, which offer three different end-destinations (unloading only) in the eastbound direction and two in the westbound direction (**Table 1**).

Figure 2. *The 25 Bus Route from UBC to Brentwood Station*



All of the #25 bus routes operate 7 days per week, even during holidays. The all-day service provided by the #25 starts as early as 5:33am and runs until 12:08am the following day. This high-frequency route has an approximate headway time of 5 minutes during peak hours (6am-9am and 3pm-6pm) and 10-15 minutes during off-peak hours.

The #25 has a flexible route, which allows it to connect two higher education institutions (UBC and BCIT), two different SkyTrain lines (Canada and Expo), and allows for bus transfers at key intersections such as Granville St., Cambie St., and Main St. Apart from being a well connected and multimodal route, the #25 also offers bike racks, allowing riders to use bikes in addition to the bus.

The intent of our research is enable the AMS' advocates to better understand and request improvements to the transit system on behalf of students. The ultimate aim is to increase student user satisfaction with their commute to campus.

Table 1. *Sub-routes of the #25 Bus Route*

East-Direction	West-Direction
Brentwood Station	UBC
Nanaimo	Granville
BCIT	

B. Methodology

Over the course of January and February 2018, our research group collected data specific to the #25 route. Data was collected through participant observation with an element of photo observation, surveys, and semi-structured interviews (**see Appendix A, B and C**). The data was primarily collected by individual group members and later amalgamated to facilitate a collective analysis by five graduate student researchers.

Participant observation took place at the UBC bus loop, stop #60099 (**Figure 3**), using a complete observant approach to data collection. Observations took place over one dry and one wet day during the evening rush hour when the transit system is at peak demand.

Figure 3. Participant Observation Protocol



The primary information collected includes how many people boarded each bus, whether the bus left at its scheduled time, and how the physical infrastructure influenced students waiting in line in different types of weather. The participant observation tool can be found in **Appendix A**. We analyzed this data to look at trends of capacity, wait times and delays.

Surveys were then utilized to collect student rider demographic data and to gather preliminary data about student experiences on route 25. The survey tool can be found in **Appendix B**. These surveys took place over a number of days within peak hours, as defined by TransLink. After combining the data into one spreadsheet, we were able to see trends and pull conclusions about the service along the route.

In order to explore student transit values and other issues that arise for students when taking public transit, we carried out seven in-depth interviews. These interviews included students from a range of faculties and education levels and were held one-on-one or with a pair of interviewers. They ranged in length from 10 to 20 minutes and were voice-recorded before being transcribed. Transcriptions were combined and coded based on themes decided in conjunction with students and instructors in PLAN 522. In-depth interview questions and coding values are found in **Appendix C**. Through the practice of coding, dominant themes arose as trends that support survey analysis. The analysis also revealed unique information that had not been previously considered as a potential issue or bus route (25) experience.

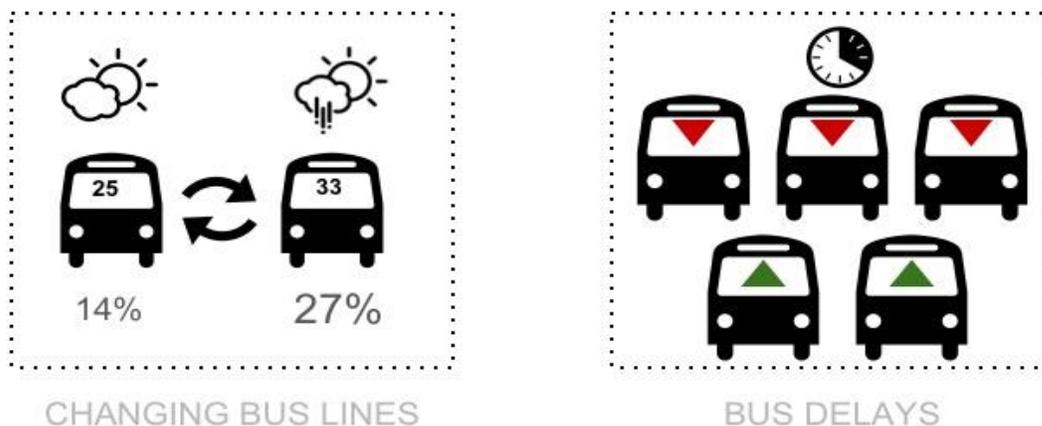
While the methodology provided a variety of data for collection and analysis, focus groups may have offered additional relevant information. Unfortunately, assembling focus

groups was not feasible given the time allotted for this research. However, using this tool may have provided further insight into student experiences, potentially expanding upon issues that arose in in-depth interviews.

C. Visual - Spatial Data and Analysis

C.1. Participant Observation

Figure 4. Route Switching and Delays

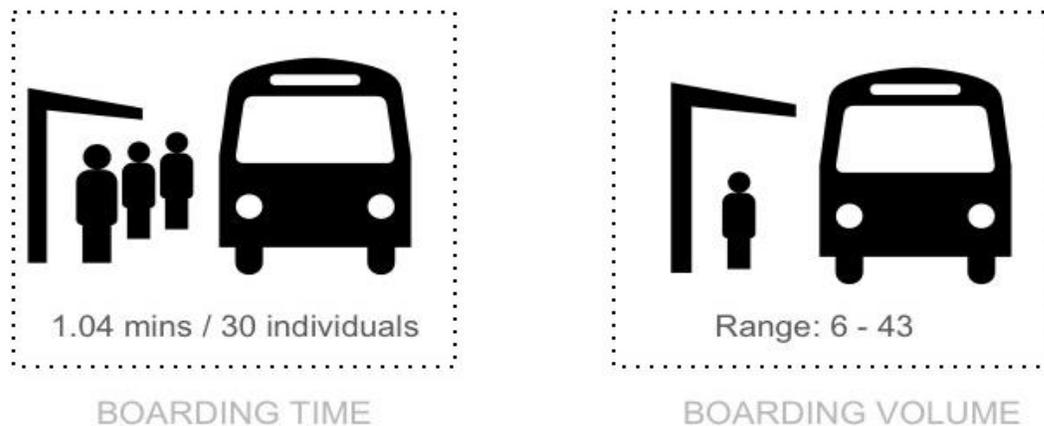


As outlined above, the first method of data collection used was participant observation, with five graduate researchers assuming the role of complete observant. Prior to the initial participant observation, we assumed there would be a low percentage of users switching buses, yet we noticed a variation between the number of people waiting and the number of people changing buses. As seen in **Figure 4**, on a dry day, 14% of passenger changed from the (25) to the (33), and on a wet day during the same times, 27% of passengers left for the (33). The (33) route appears to provide a secondary option for (25) riders. As this bus travels approximately eight blocks south of the (25) route, this may indicate an acceptable distance for route switching. This can be linked to studies that suggest options offering the shortest journey and fewest transfers are most popular. This is particularly relevant in the context of this study, as bus travel time is viewed to be more onerous than time spent on other public transit modes (Eluru et al., 2012; Anderson et al., 2017). Furthermore, Eluru et al., (2012) found that trips with low initial wait periods and shorter walks are the most popular. Anderson et al. (2017) disputes this, noting that greater availability of route alternatives is preferred over a unique route that may take less time, to avoid delays and travel irregularity.

The next observed feature was the occurrence of schedule delays despite several buses idling at the UBC bus loop. On two separate days during 5pm rush hour, 3 out of 5 buses were late by over 1 minute (**Figure 4**). Grotenhuis et al. (2007), found that uncertainty about expected arrival time and the ability to make connections can lead to unsatisfactory perception of transit, while Neshelo et al. found that delay time has the greatest impact on a traveler's decision to use transit (2016). While we would expect that

the bus could arrive a few minutes prior to the scheduled time in order to board and leave on-time, this was not the case. Other research has demonstrated a direct link between service availability and transit users' perception of service, such as, Dell'Olio et al. (2010) who found that "service reliability" and "waiting time" have a combined weight of 51.4% in the overall evaluation of the service. Bordagaray et al. (2013), Eboli and Mazzulla (2012), de Oña et al. (2013), and Nesheli et. al. (2016) also emphasized the importance of the perception of regularity, punctuality, and frequency.

Figure 5. Boarding Time and Volume



Observers recorded the rapid loading of buses and an average boarding time of 1.04 minutes per 30 persons (**Figure 5**). The ease of boarding through a preloaded Compass card may remove user anxiety and likely streamlines the boarding process, as the majority of people tap their card rather than allocating appropriate coin change. These may affect a positive perception of transit service among riders. Morton et al. state that service quality is a mixture of convenience, cabin environment, and ease of use. These categorizations were also supported by Lai and Chen (2011) and Chou et al. (2014).

Finally, while bus delays were recorded, we observed that no passengers were left behind as a result of maximum capacity. Research suggests there is a threshold to which a transit user can tolerate operational tactics such as "holding" or "skipping stops" (Nesheli et al., 2016). None of those issues were recorded at the UBC departure. This is sharply juxtaposed to the (99) which is sometimes full upon departure from UBC.

Overall, participant observation was a valuable preliminary tool to analyze the survey area. It allowed us to gain insight as to how people use and move within the UBC bus loop while waiting and boarding the bus.

C. 2. Photovoice

These photovoice images (**Figures 6 through 10**) were captured at the UBC (25) bus stop along Westbrook Mall and University Blvd. They represent the everyday issues with the (25) bus route and provide another perspective in terms of "what the user is feeling or seeing while waiting to board the bus".

Figure 6. *Photovoice Observation #1*

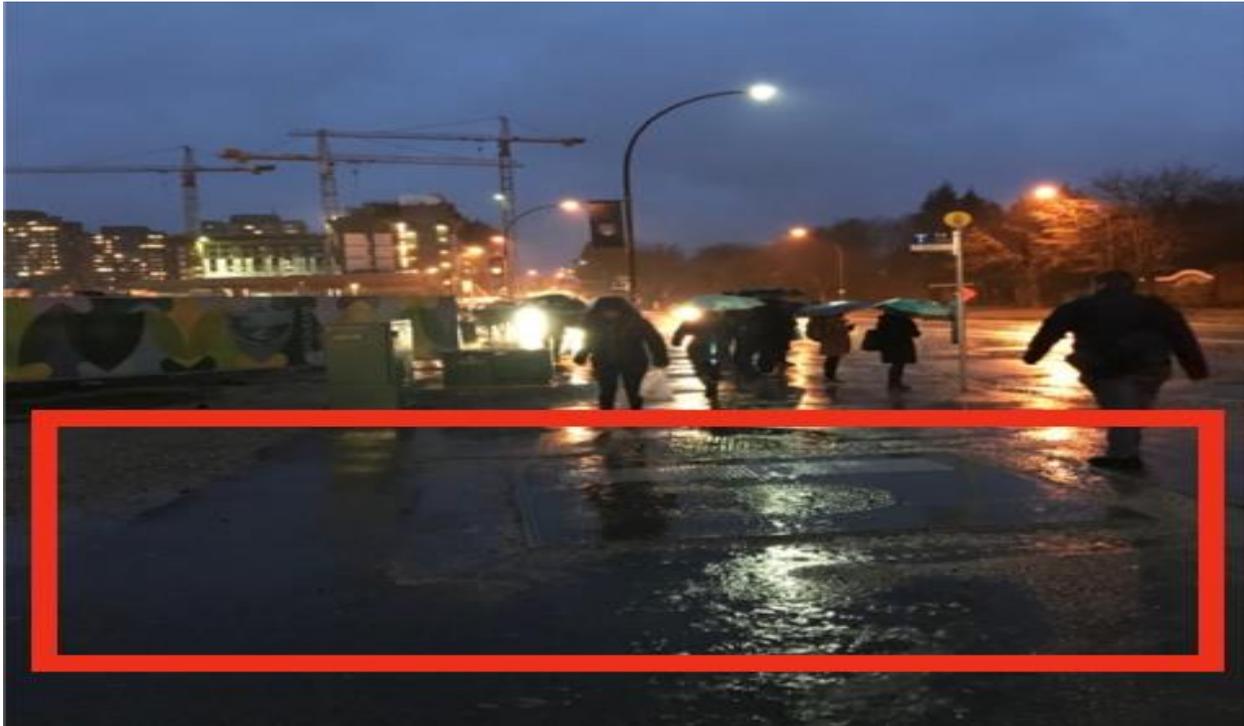


Figure 6. This Photovoice image depicts potential accessibility issues for bus (25) users. The sidewalk is unevenly paved, the materials switch between asphalt and gravel, and there are several puddles along which (25) users must pass to access the bus.

Figure 7. *Photovoice Observation #2*

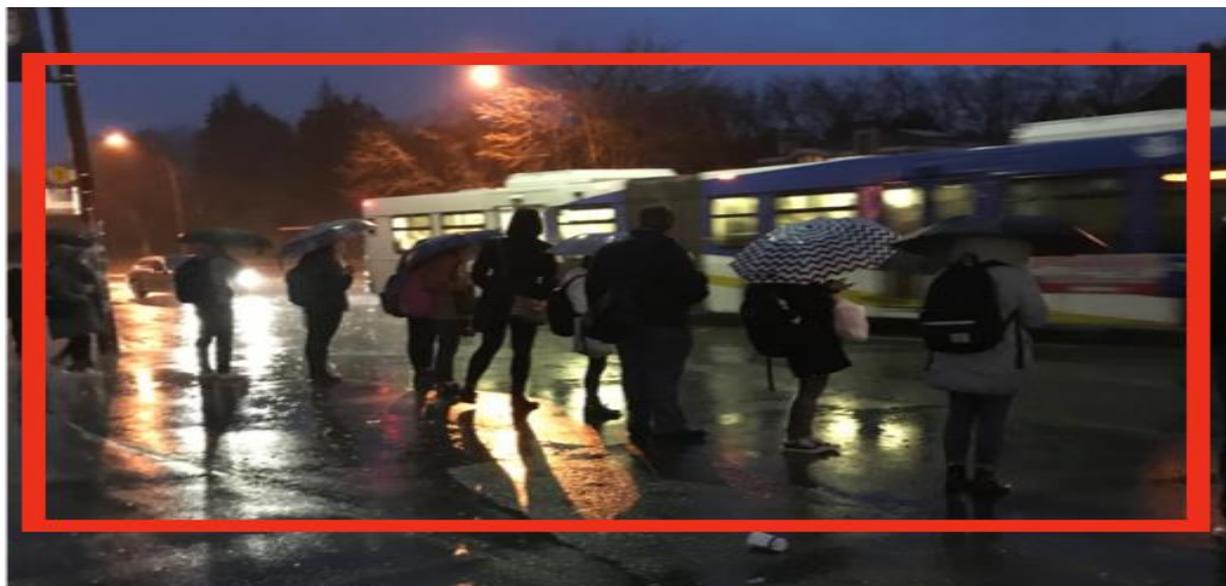


Figure 7. This Photovoice image displays the lack of shelter and protection from environmental conditions while waiting for bus (25). It also displays the lack of lighting for people waiting, and how proximity to the road leads to unintentional splashing from vehicles.

Figure 8. *Photovoice Observation #3*



Figure 8. This photovoice image depicts the length of the (25) bus line at the UBC stop during a rush-hour period. There is no rain cover, little entertainment and no seating while waiting for the bus to arrive.

Figure 9 *Photovoice Observation #4*



Figure 9: This Photovoice image depicts the level of crowdedness on the bus during a wet rush-hour evening, and the availability of seats. This is the first stop and the bus has very little sitting remaining. This suggests that passengers at future stops will have to stand.

Figure 10. *Photovoice Observation #5*

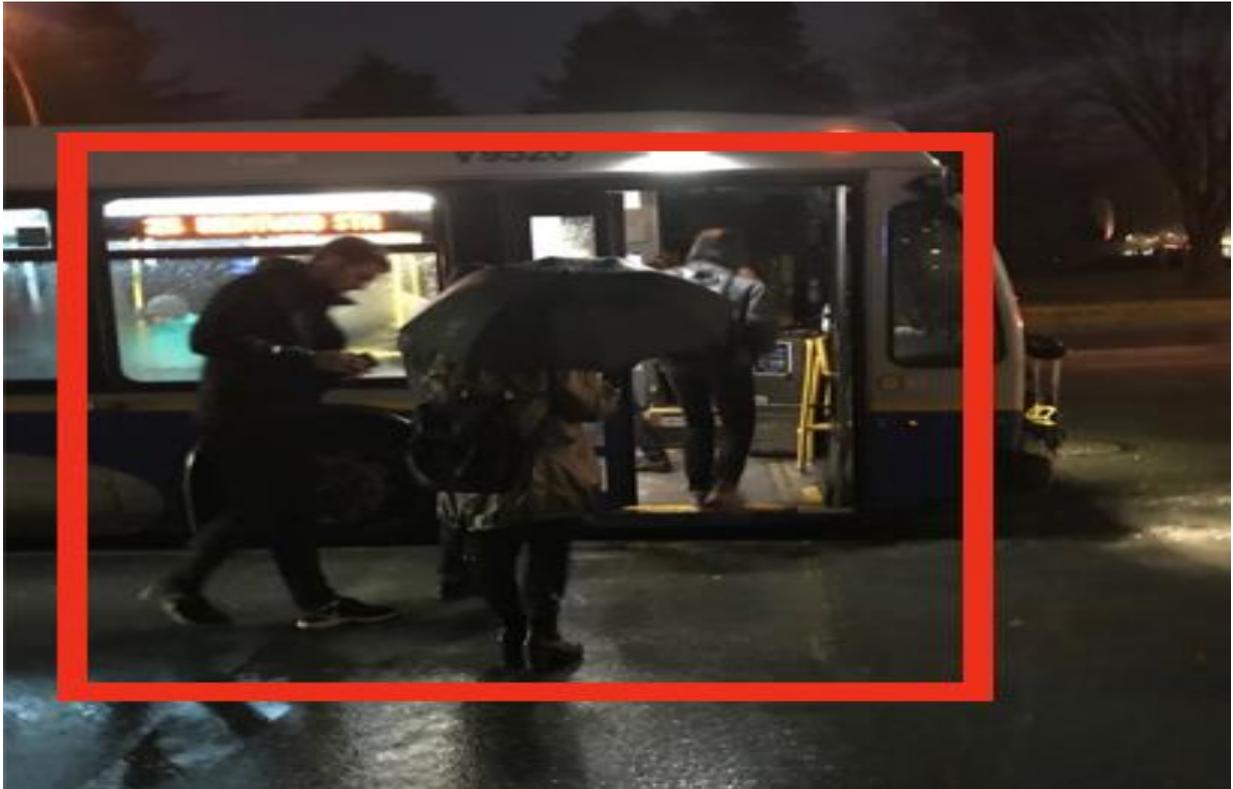


Figure 10. This is a photovoice image of the bus (25) boarding. It displays individuals getting their compass card prior to boarding as well as an individual waiting just beside the beginning of the line since it was so long. It appears they chose to wait for the next bus over joining such a long line.

D. Survey Respondent Data

Following participant observation, our research group proceeded to collect data through surveys. Students were primarily approached while in line for the #25 bus at the UBC bus loop, with a few additional students reached through social media. In total, 30 students participated in the survey portion of data collection. This data provided us with a high-level understanding of different perceptions of #25 service, and highlighted areas for further exploration during in-depth interviews.

Figure 11. *Spatialized Postal Code Data, Transfer Routes and Alternative Routes*

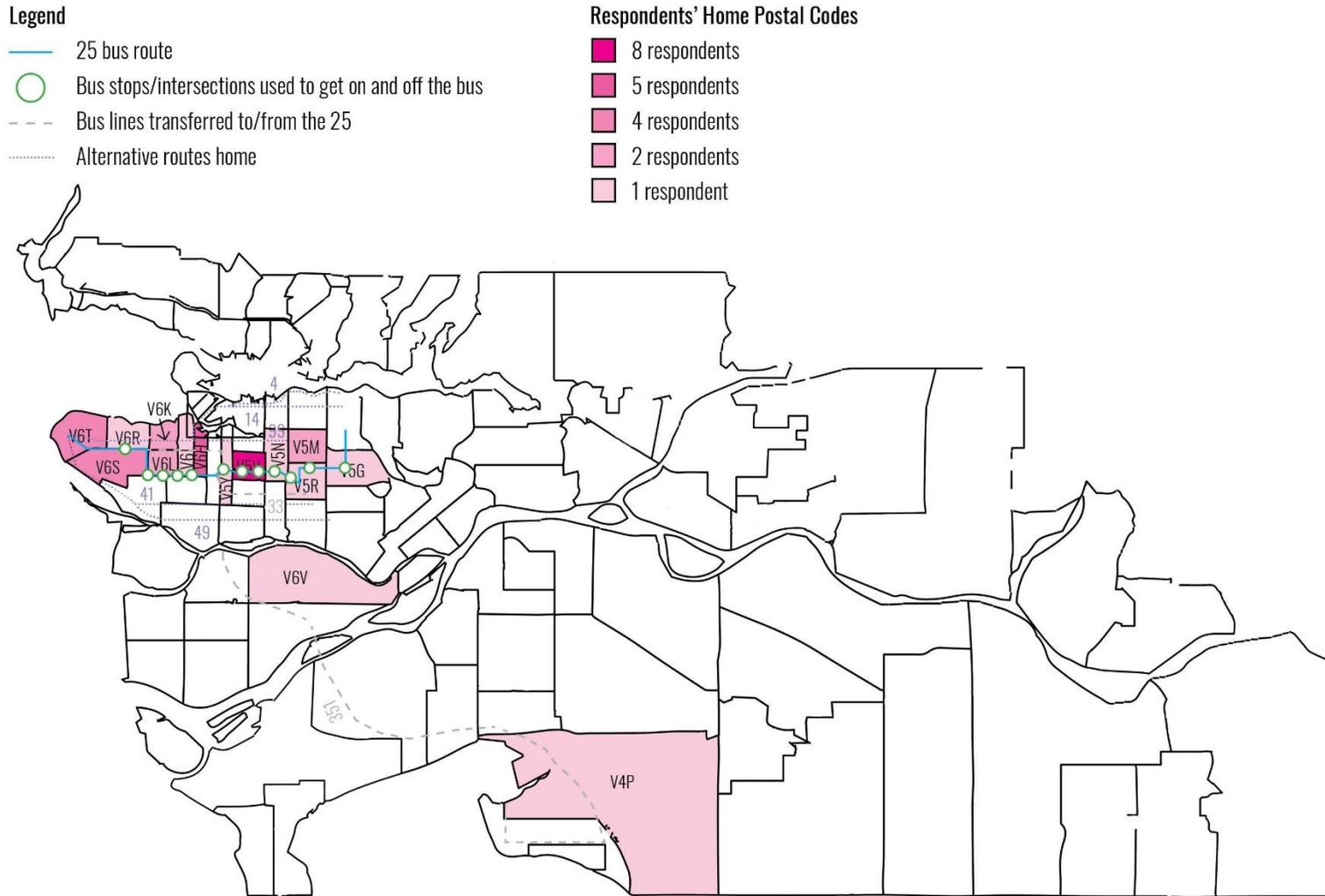
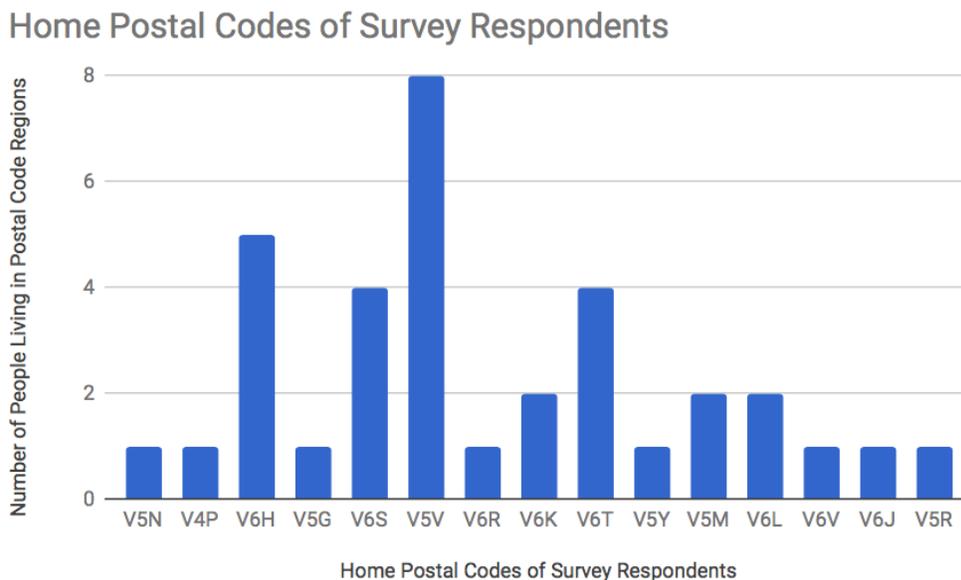


Figure 11 illustrates the entirety of route #25, the home postal codes of survey respondents, transfer routes and alternatives to route #25. These latter two topics are discussed further in the visual-textual analysis.

As demonstrated in **Chart 1**, most route #25 survey respondents live within Vancouver, and of these, the majority travel from V5V. As seen in **Figure 11**, V5V extends from Ontario Street to Knight Street (west to east) and 16th Avenue to 33rd Avenue (north to south). Only three participants live outside Vancouver, hailing from Burnaby, Surrey and Richmond. Participants from Surrey indicated that they use route 351 to connect to the #25, while the Richmond resident occasionally uses Car2Go to connect, if available. The most common intersection to (dis)embark at is on Dunbar Street, followed by Granville Street at King Edward Boulevard.

Chart 1. Home Postal Codes of Survey Respondents



When asked if students use the same route to travel to and from UBC, 58.6% of respondents said yes, for reasons such as directness, convenience and proximity to residences. For those who did not, the 33, 41, 49, 14 and 4 bus routes provided alternatives. Two of the 12 individuals who responded in this way stated this was due to the fact that the 25 is often full. This builds upon our observational data, as we saw many bus users switching from the 25 line to the 33 line. This point towards students switching from their initial route of choice (the 25) to other bus routes as a result of dissatisfaction with present service.

E. Visual-Textual Data Analysis

E. 1. Survey Results

Travel surveys were completed between January 24 and February 7, and took place largely at the UBC bus loop, stop #60099 between 3-5PM, a time identified as bearing ridership in the top 25% of all bus services (TransLink, 2016). As highlighted earlier, a total of 30 active UBC students were surveyed. As indicated in **Table 2**, the majority of

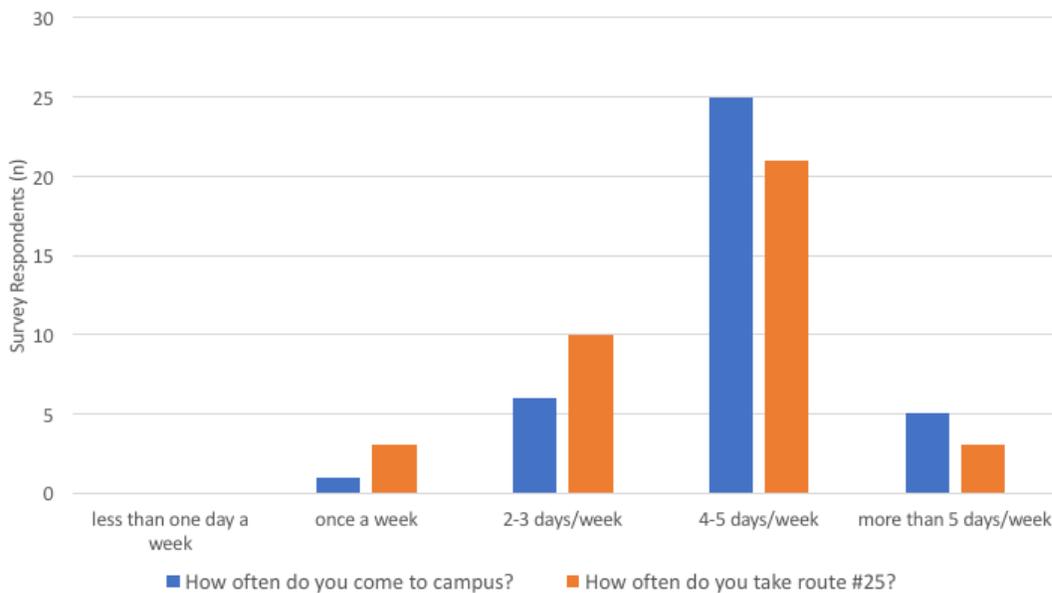
participants surveyed identified as female (70%, n=21), while those between the ages of 20 to 24 were most commonly represented (53%, n=16).

Table 2. Participant Demographics

	N	%
Gender		
Female	21	70
Male	8	26
Prefer not to say	1	3
Age		
19 or Younger	5	17
20-24	16	53
25-29	6	20
30-39	3	10
40-64	-	-
65 +	-	-

N=30

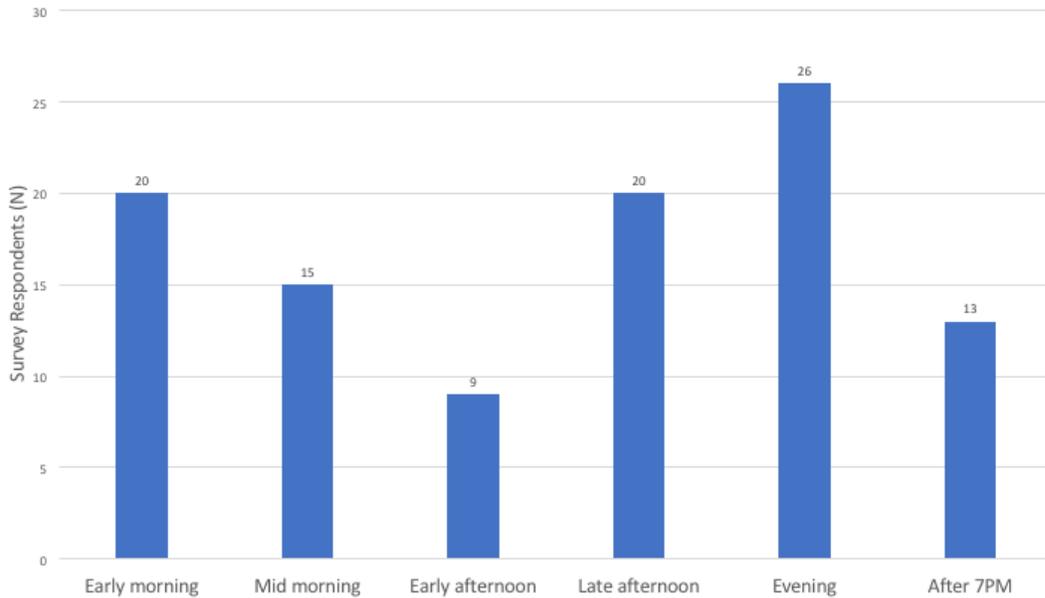
Chart 2 *Number of Weekly Commutes on Route #25*



Of the 30 students surveyed, 68% (n=25) indicated they travel to campus four to five days per week, though only 57% (n=16) use route #25 at this frequency (**Chart 2**). Other bus routes cited by participants include #99, #33, #41, # 44, # 4, while Car2go serves as an alternative transit mode. Route #4 was specifically mentioned as useful when

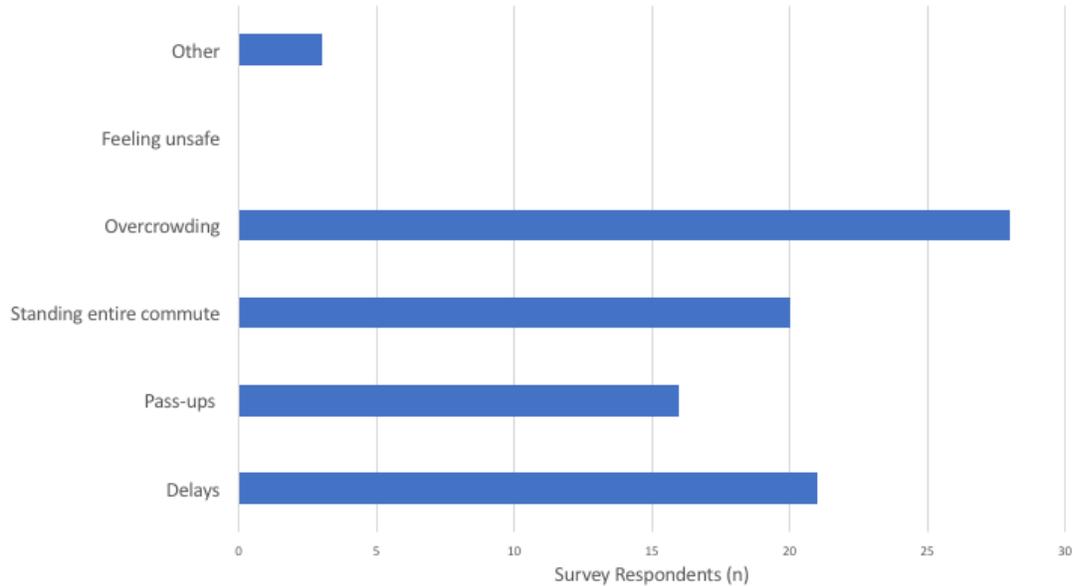
commuting to and from work, whereas other routes serve as alternatives to the #25 when commuting to and from campus.

Chart 3 *Time of Day and Travel on Route #25*



The time at which students commute to and from UBC varies significantly, though 70% (n=26) of survey respondents travel between 5-7PM (**Chart 3**). Early afternoon and late evenings after 7PM are the most uncommon times to travel. These results are consistent with TransLink’s assessment of peak hours, and likely reflect the time at which sampling took place. Understanding the time of day when student ridership is highest should help AMS focus their efforts in advocating for service changes (e.g., greater frequency, higher capacity buses, etc.).

Chart 4 *Factors Experienced by Students Travelling via Route #25*

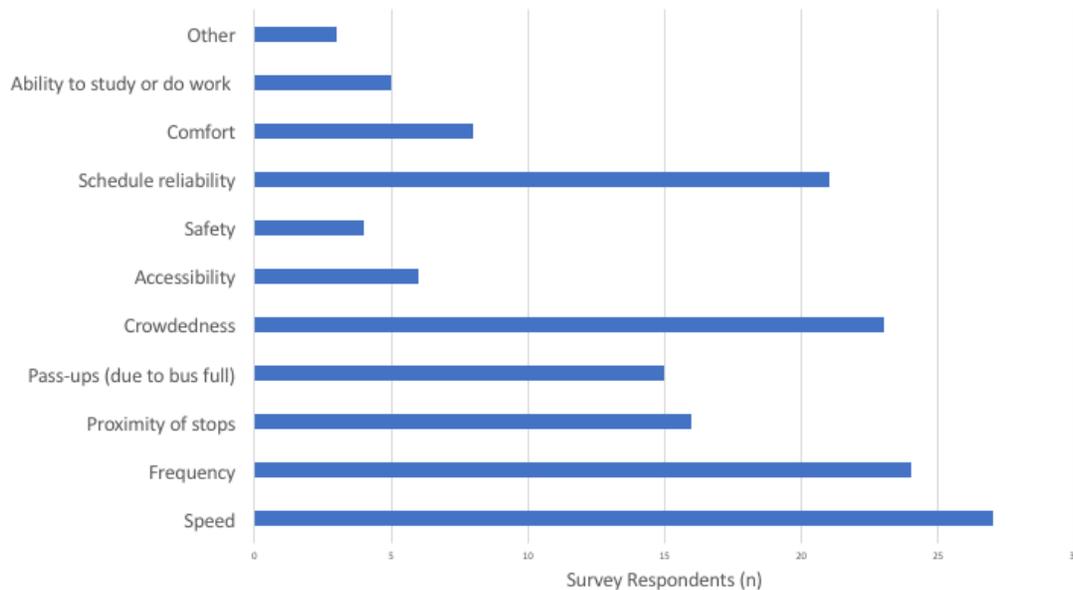


Note: *Other: 1 participant cited uneven distribution of buses

**Factors were experienced by students at least once per week

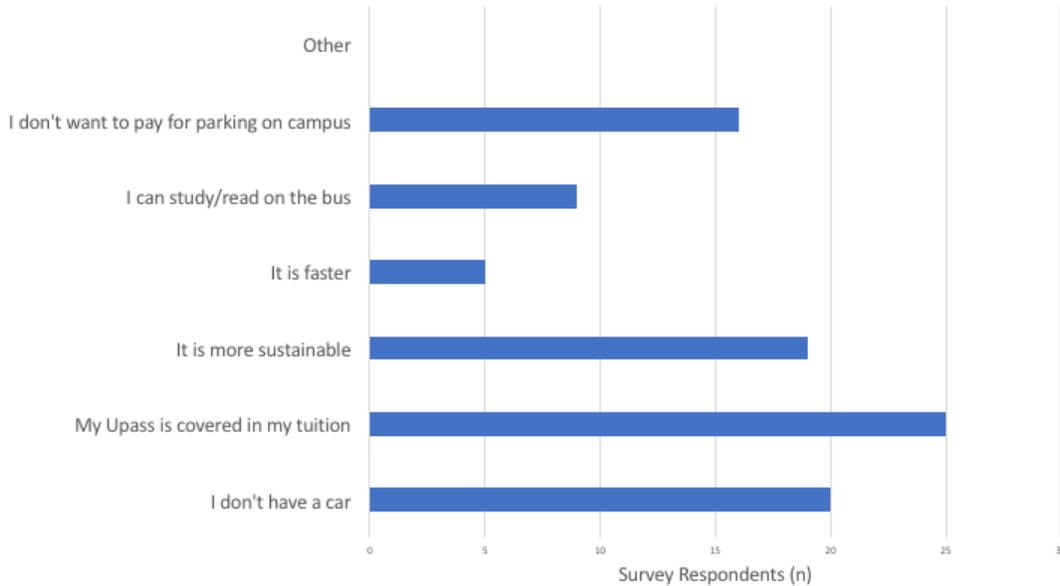
The majority of survey participants (77%) cited overcrowding as a recurring experience on route #25, followed by delays and bus pass-ups (i.e., when a bus elects not to allow additional riders to board due to capacity restrictions) (**Chart 4**). Feeling unsafe was not identified as a factor by respondents.

Chart 5 *Factors Influencing Use of Public Transit*



With regard to factors that influence respondents' route choice, speed, frequency, crowdedness, and schedule reliability were the most commonly cited factors (**Chart 5**).

Chart 6 *Reasons for Taking Public Transit to UBC*



Reasons for choosing to take public transit to and from campus varied across survey participants, with the fact that the U-pass is already covered by tuition being the most common reason (**Chart 6**). Few respondents indicated that they choose transit because it is the quickest mode of travel.

E.2. Survey Results Analysis

The purpose of this survey was to establish the reasons why students choose public transit, and specifically route #25, as a mode of travel when commuting to UBC. We also sought to understand which alternative routes student use and why, and how service on route #25 affects these choices. The goal of this survey is to build upon the observational data in order to more effectively inform AMS advocacy efforts towards service improvements to route #25.

As demonstrated in **Chart 2**, though students cite route #25 as the most direct route to campus, it is not always the preferred bus. This information, combined with frequently cited overcrowding and delays, may indicate that capacity along this route is insufficient, a problem that could be remedied by additional or higher capacity buses at peak hours.

Students cited speed, frequency, reliability, and crowding as most affecting route choice, findings that are supported by previous research (**Chart 5**) (Mouwen, 2015; Morton, Caulfield, & Anable, 2016). As Tirachini, Hensher and Rose (2013) found, overcrowding can create systematic delays, high levels of discomfort, and anxiety, all of which may result in rider dissatisfaction that heavily influences route choice. Alternatively, safety, a factor infrequently considered important by young people (Thomas, 2010), was mentioned as a deciding factor by only four participants. As safety was typically listed by student users that identified as female, conducting further gender-based research on this topic is likely worthwhile. Accessibility was a similarly low priority for students and cited

by only 6 participants. However, in retrospect, requesting that participants identify as able-bodied or otherwise could have provided greater insight into this result (e.g., able-bodied travelers may view accessibility as less important than those with diverse accessibility needs).

Regarding demographics, while the survey does capture data on the age and self-identified gender of participants, it does not provide insight into experiences specific to either of these categories. This is a potential area of future research, as Fan, Guthrie & Levinson (2016) found gender to influence perceived wait time, which could be related to frequency, a key factor influencing use of public transit (**Chart 5**).

Collectively, the repeated experiences of overcrowding, delays, bus pass-ups, and standing during bus duration all point to a need for increased capacity on route #25 (**Chart 4**). To achieve this, survey respondents suggested increasing arrival frequency, using high-capacity buses such as those used on route #99, and/or creating an express bus to improve speed. An east-west rapid transit option was also mentioned, but with little belief in this idea's validity. Finally, additional and easy-to-access communication about bus arrival was frequently proposed as a way to improve rider experience.

F. In-Depth Interviews

In line with the established group methodology, our final step in data collection was to conduct in-depth interviews. We conducted seven in-depth interviews with UBC students. In order to capture a breadth of experiences, we conducted interviews with two students at the undergraduate level, four students at the graduate level, and one student working towards completing their PhD. Interview questions were formulated in partnership with the PLAN 522 class.

F.1. Interview Data Analysis

In-depth interview transcripts with appropriate coding are included in **Appendix A**. The in-depth interviews primarily reinforce and expand upon the conclusions drawn from the surveys, but they also provide a few insights regarding the motivating factors behind transit use and detailed suggestions for improvement that the surveys were unable to elicit from respondents.

In order to advocate successfully on behalf of students regarding transit, the AMS should have an understanding of the factors that encourage students to take public transit in the first place. Based on interviews, we found the main drivers for at least five of seven students to be reliability, cost, and directness. These factors influence their decision to take public transit in general, and in some cases inform their choice of the route #25 (25) bus. While only about half of interviewees find the 25 reliable, at least during peak hours, almost all mentioned reliability as an important factor, indicating they would enjoy the commute more if the bus was more reliable. This is consistent with Bordagaray et al.'s (2013) findings, which suggest that interventions to improve customer satisfaction should focus on reliability.

We identified cost as a significant factor for the students, as all interviewees identified this as a primary motivator for taking public transit to UBC. Five students explicitly pointed to the UPass as a convenient cost savings, while four students suggested transit is cheaper overall and three indicated parking costs inhibit driving to campus. This built on our preliminary understanding that cost is a factor influencing student mode choice (see **Chart 6**), by providing the added insight that it can be a determining consideration. As Ona et al. (2012) highlight, understanding the relative weight users give different attributes is central in understanding what determines user satisfaction.

F.2. Interview Data Analytical Themes

Delving into the details of decision-making around specific routes, we find that some influencing factors are interrelated, such as reliability, speed and directness. This data aligns with previous research, which found that customer satisfaction is influenced primarily by on-time performance, travel speed and service frequency (Mouwen, 2015).

These factors come together when considering trip options, such as those requiring transfers. For example, even if a route with multiple buses might be faster, two students interviewed consider making transfers to be one of the most inconveniencing aspect of riding the bus and avoid it as much as possible:

IR8AV: "I'd rather just take one bus, even if it's just 5 or 10 minutes longer, it's just the uncertainty of that transfer I'd rather avoid...I hate transferring, especially in the rain. And then that adds that element of unpredictability - you never know if the next bus is actually going to come, so direct route is great with the (25)."

EJ: "What do you value most when selecting a mode of commute to campus?"

IR22EJ: "Transfer is one, I would pick a bus with less transfer even if it might take longer."

For interviewees, the 25 is considered a direct route as the bus goes directly to UBC and allows most of these students to take only one bus. This ties into the concept of comfort as well, as three students noted that staying on the bus allows them to read or sit and relax on their way to or from school, a factor positively influencing their experience.

Though most students indicated the proximity of 25 bus stops to their home and the bus' directness as benefits of the route, they also echoed negative factors identified by survey respondents, primarily overcrowding, delays and frequency. Five of seven interviewees discussed capacity issues such as overcrowding, delays and even pass-ups due to at-capacity buses. Delays did not appear to be a frequent issue along the route itself, once the students were on the bus, but students attempting to board at bus stops and Skytrain connections expressed frustration. While respondents seem split on the issue of frequency, with three specifically pointing to a lack of frequency and three suggesting sufficient frequency, it was an important factor in each student's experience.

The reason for disparate experiences may be due to the fact that frequency is tied to the time of day:

KA: "Suggestions?"

IR39KA: "More buses more frequency. In the morning, really the morning is the tricky one is around school hours...If it was a little more frequent and a little less crowded i'd probably take it even more and it would probably be faster."

EJ: "What conditions would conditions would encourage you to continue taking this route or try other routes?"

IR22EJ: "If 25 becomes less reliable, then I might opt for 33...I would definitely hope for more even distribution of frequency. Like even not just coming frequently, but coming like regularly. Like if the bus is every 5 minutes, not like 1 comes and then 20 minutes later three busses come. So I don't know if there is a way to make just even during peak hours, make sure the bus comes frequently, but also actually regularly."

The above quotes illustrate that perceptions are related to the temporal experience of students, especially if they take the bus during off-peak hours. Another reason may be that some students suggest more buses more often, while some suggested longer buses to hold a greater capacity of students, which would likely have similar results overall.

While the in-depth interviews reinforced many of the themes found in the surveys, they provided additional information and travel considerations that we had not thought to include in the survey or interview questions. For instance, the significance of cultural differences arose in two interviews, the idea of bus etiquette in three interviews, and the impact of driver attitudes in two.

Transportation habits of passengers and bus drivers as they relate to cultural differences is a potential area of future research, as personal space, definitions of "crowded," and language barriers arose as factors in student experience:

ZZ: "What do you like least about these routes?"

IR30ZZ: "The bus is usually overcrowded and it is hard to understand the street names when said by the bus speaker. I am a non-English speaker and the bus is usually crowded, windows are open. Also, the board to read the name is only at the center- entrance of the bus so if you are seating and the bus is very busy, you can't really see the board. I wish messages were displayed in a customer friendly way which more clarity, space and different locations of the bus."

EJ: "And do you think people don't move to the back for a particular reason? Or?"

IR22EJ: I don't know I almost think it might be a cultural thing, cause growing up in Hong Kong and china, when people are coming up, you just go and push and pack like sardines. But I think probably here we are more hesitant to be kind of pushy moving back, because then you are intruding on people's personal space...I think here we are just more conscious about like like personal space...especially for stranger's, and people get really uncomfortable when you get too close, which I totally get, but it's like what you need to compromise sometimes to just, get to your place."

The discussion of personal space and defining what “crowded” means on a bus tie closely to the influence of driver attitudes on rider satisfaction. The interviewee IR22EJ negatively interpreted driver attitudes when, according to their cultural perception of personal space, the driver appeared to pass students when the bus did not appear to be at capacity. This may relate to a driver’s willingness to tell people to push to the back to allow more passengers to board, along with bus etiquette, (discussed later). Two other students also identified driver attitudes as having an effect on their commutes:

ZZ: “Why do you take public transit instead of driving?”

IR30ZZ: “...Compared to other cities I have been, people are so much more polite to the bus driver and between each other, it makes me feel safe.”

WL: “What specific suggestions do you have to improve your travel experience to and from UBC?”

IR7WL: “I guess, I don’t even know if this is something they can fix, but sometimes I feel like the bus drivers are like angry at, just like the passengers, and they’ll like slam on the breaks and stuff when there’s like, so many people standing in the bus and everyone’s like falling over and it’s like they forget they’re driving a bus full of people so...that’s the only that I feel like, is annoying or like the main thing that annoys me.”

The perception of driver attitudes by riders is related to bus etiquette, a concept that also emerged from interviews, though this was not incorporated into our questions. Three interviewees mention their frustration with the lack of bus etiquette on route #25 without prompt from the interviewers. The primary concern was that students distracted by their phones failed to take off their backpacks and/or did not give up their seats to those in need. These students, interviewee perceived, take up too much space on already crowded buses.

The role of bus etiquette is reinforced by the findings of (Carreira, Patrício, Natal Jorge, Magee, & Van Eikema Hommes, 2013). Their research indicates that sensory and emotional components impact user perception of the transit experience. While, these concepts may not be something TransLink can change directly, they could influence future rider awareness campaigns.

Students suggested system and specific bus (25) route improvements TransLink could enact to make the commute more enjoyable. Most of the suggestions revolve around higher frequency and consistent reliability, as well as extending the bus into late night hours. This is line with Watkins, et al.’s (2011) finding that frequency and reliability are determining factors in transit satisfaction. Additionally, half of the students suggested improving or making available real-time update signage and information at the bus stops. This suggested improvement was also noted in the survey data collection process. This is consistent with the work of Susilo and Cats (2014). Their research highlights the importance people attach to stop-related services. For some students, this would help them make decisions between different bus routes. For other students, it would simply make the trip more comfortable and less stressful. This is especially true in the case of

delays. A suggested structural improvement was improved lighting at bus stops, especially the stop at the UBC loop. This improvement may increase feelings of safety and comfort.

We found that the interview results supported the survey responses. Consistent with the work of Clifton and Handy (2011), we found the interviews provided insight into travel choice factors not captured by the survey. Our interviews also served to obtain concerns and detailed suggestions that students have regarding the specific bus (25) route. We anticipate that this information will allow the AMS to gain a more complete picture of the concerns and suggestions that are shared with other bus routes.

G. Conclusions/Recommendations

Examining the visual-spatial data in conjunction with the visual-textual data provides interesting insight into the #25 student user experience. The in-depth interviews reinforce and add nuance to the data gathered through surveys and observation. The findings across all three methods of data collection are largely consistent. The in-depth interviews offer added insight into the reasoning behind student choices and the weighting they attribute to different satisfaction criteria.

The #25 serves a variety of students from relatively diverse locations and as a result, student user experience is subjective and prone to differing opinions. However, our findings point to several commonalities that inform clear recommendations for the #25 bus service:

- 1) Increase capacity (bus size, rapid transit option, express bus) or frequency during peak hours
- 2) Increase reliability
- 3) Improve or make available real-time update signage and information at bus stops
- 4) Explore avenues to improve bus etiquette. This could take the form of a TransLink-initiated consultation and campaign. We suggest TransLink take the lead, as student feedback highlighted that the problem of etiquette involves bus drivers and many secondary school students who rely on this specific route.
- 5) Improve infrastructure at the UBC stop, with the aim of increasing comfort and accessibility. Specifically, the following may increase positive transit perception:
 - a) Improved rain cover
 - b) Additional lighting
 - c) Improved pavement and drainage

Students reliant on the #25 for cost reasons may not change their behavior, regardless of improvements. However, these improvements directly respond to the criteria students cited as determining their satisfaction with #25 bus service. By targeting AMS advocacy efforts to these areas will likely result in increased comfort and satisfaction among #25 student riders.

Our findings are largely consistent with the existing literature. Moreover, they highlight areas worth further exploration. In particular, our research underscores the need to apply an intersectional lens to transit research. Whalen et al. (2013), highlight that there is a specific need for further research on university students' perception of travel. Additionally, work needs to be done in understanding how to improve transit service for female students, non able-bodied students, and that reflecting culturally-relevant needs and perspectives.

IV. Route # 33 (UBC/29th Avenue Station)

Craig Busch, Sarah Kristi Lone, Tanja Oswald, Jessica Todd, Stella Zhou

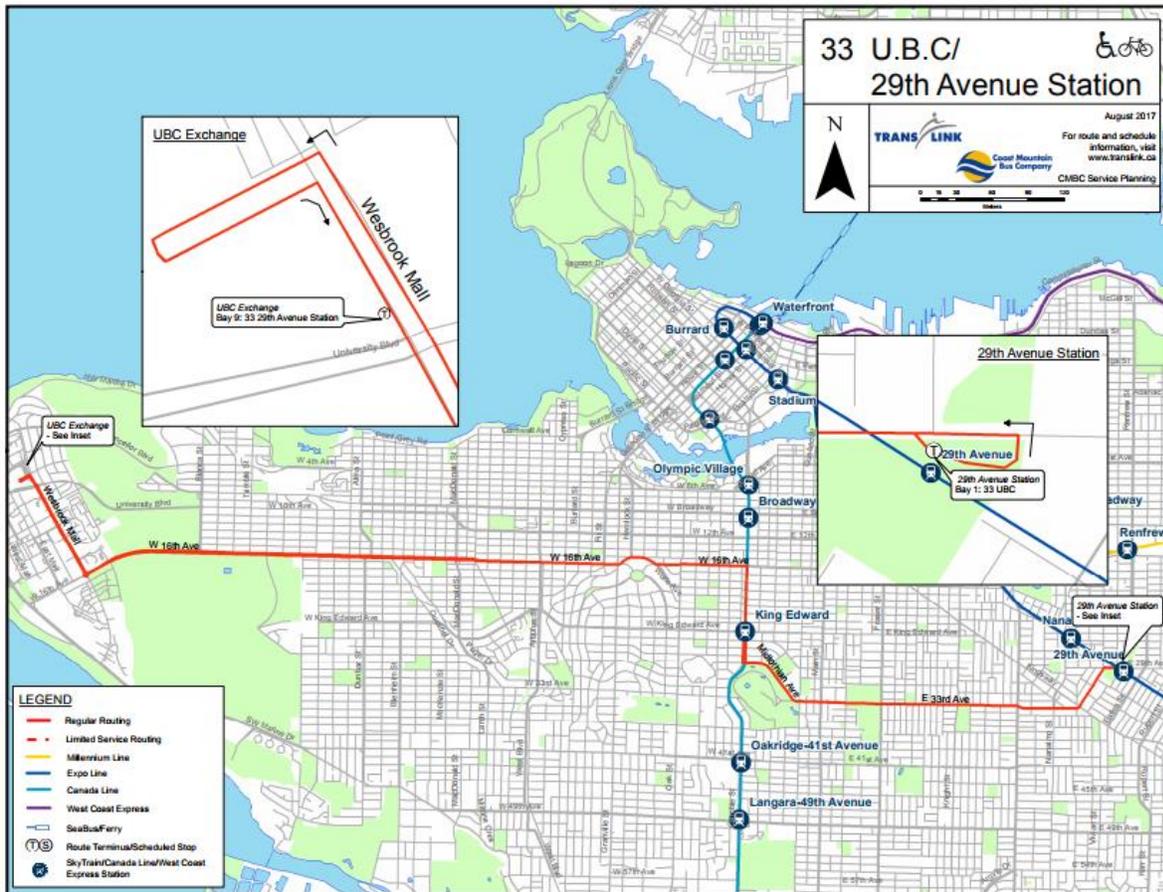
A. Introduction

Our group focuses on studying the transit patterns and experiences of student commuters on bus route 33. The following cross-sectional analysis incorporates both verbal-textual and visual-spatial data related to UBC student user satisfaction along the 33 bus route, pictured below (**Figure 12**). This bus services between UBC and 29th Avenue Skytrain station with 46 stops in between. It connects with the Canada Line at King Edward Skytrain Station and the Expo Line at 29th Avenue Skytrain station. The headway is around 10-15 minutes during rush hours (7am - 7pm), and up to 30 minutes during early mornings and late at night.

It is important to note that some sections of bus 33's route coincides with bus 25; specifically from UBC bus loop until 16th Avenue at Dunbar Street, as well as at King Edward skytrain station. Since bus route 33 runs on 16th avenue before Cambie street, and on 33rd avenue afterwards, other competing routes may include bus 99 on Broadway and bus 41 on 41st Avenue. The main neighbourhoods served by the 33 bus route include: West Point Grey, Dunbar-Southlands, Kitsilano, Arbutus Ridge, Shaughnessy, Fairview, Mount Pleasant, South Cambie, Riley Park, and Kensington - Cedar Cottage. Many of these neighbourhoods host a large student population living in their rental units, which makes bus route 33 an important student commuter route.

Following an overview and comparison of the mixed methods used in this research, this analysis is organized according to significant thematic areas that we coded for analysis, including reliability and speed, perception of service, quality of service, quality of experience, how people choose specific routes, incentives to use transit, and temporal experience. Please note that not all themes contain visual-spatial data results, because some themes do not have sufficient visual-spatial data to support our analysis.

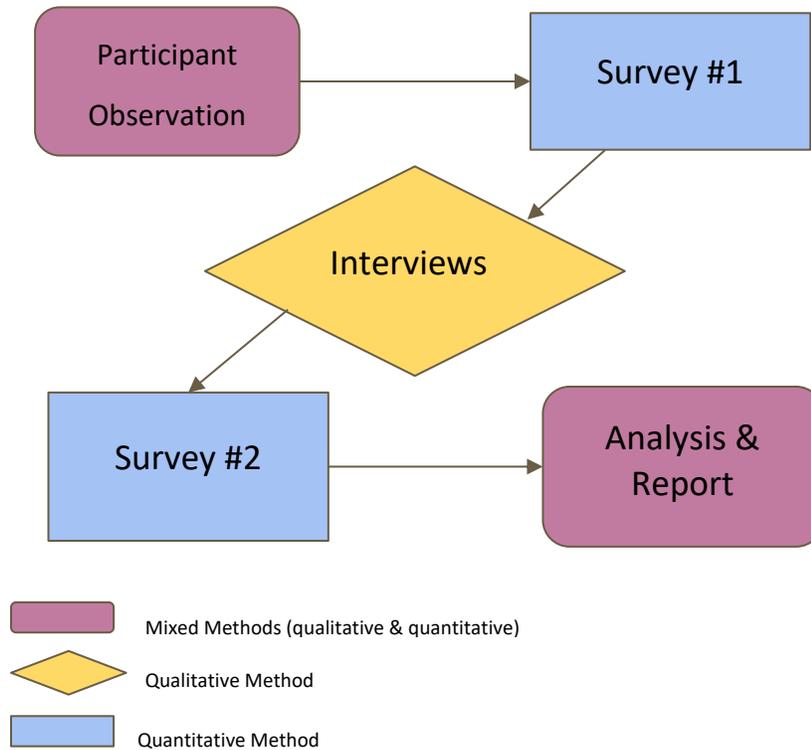
Figure 12. Route of Bus # 33



B. Methodology

To better understand student travel patterns and experiences on the 33 bus route, we used a mixed-methods research approach. We conducted participant observation, 2 different intercept surveys, and in-depth interviews. Our research process is depicted in **Figure 13**.

Figure 13. Methodology Used in Study of 33 Bus Route



We began by conducting participatory observations standing near the 33 bus stop at the UBC Bus Loop. We observed how transit users behaved and what they experienced at the stop. We conducted two observations: one for 15 minutes, and one for 30 minutes, each between 4 and 6 PM on a weekday (once in January, and once in February). Our observation collection tool is in **Appendix D**. Additionally, observations were made when we were at the bus stop to survey students. The bus stop observations were used to understand what types of issues students may face. We observed waiting times, activities occurring in the line, the number of students switching which bus they lined up for, and the number of students passed up by the bus at the stop. Ultimately we found that the observations led to more questions rather than answers. For instance, as seen in Figure 9, we found that many passengers arrived at the stop during the bus loading period, but we did not know the reason for this. Was this a usual occurrence? Was the bus timed well with the end of classes? Did people simply know the schedule and only come to the bus stop close to the departure time? Because we decided that the information gleaned from the observations were limited, we decided to focus our effort on the surveying and interviewing aspects of our research.

For the survey method, we initially conducted 36 intercept surveys that were 15 questions long over the course of several days at the 33 stop at the UBC Bus Loop (2 of these surveys were conducted online instead of as an intercept). When the survey was

given in person, the questions were delivered orally. These questions are in **Appendix E**. In future studies, the survey tool could be adapted to solicit better feedback, particularly by shortening the length of the intercept survey. Especially during poor weather conditions, respondents generally seemed to want to get through the survey quickly which may have impacted the quality of their responses. For example, asking when students took the bus was too long of a question for an intercept survey: students often have varied schedules and would either say it was mixed or list their daily schedules, leading to less time for more qualitative answers.

From the initial survey, we found 7 respondents who were willing to participate in a longer interview process. The interviews were 16 questions long and generally lasted about 15 to 25 minutes. The interview questions can be found in Appendix 3. The interviews varied in their contribution to the data. Several team members felt that conducting an interview with someone they had previously surveyed allowed them to find out more about comments made in the survey. The interviews also gave a chance for the respondents to rationalize their suggestions. However, one researcher found that she did not get much more information from the interview than from the surveys; this was perhaps because the respondent was for the most part satisfied with transit provisions, and preferred to ride her bike rather than take public transportation.

After both the initial survey and the interview, we did not feel that we had a good grasp on the most pressing issues of the 33 bus route or suggestions to improve transit. Because we found that the initial survey allowed us to hear from a greater number of students in comparison to the interview method, we decided to create a secondary survey. Knowing that the longer initial survey was long and ineffective at generating the top frustrations and suggestions, this secondary survey was only 2 questions long - these questions are in Appendix 4. In the span of less than an hour, we administered 35 surveys to students at the bus stop. Both these surveys will be referred to in our report on the 33 bus route.

Considering the methods used and the understandings gained from UBC student ridership experiences, we think that future research could be refined by asking students more pointed survey questions to better understand their needs. We would suggest using the methodological approach favoured by Guest et al (2014), who indicate that in a mixed methods study, it is important to understand the dominance or weight of various factors discussed. A weighting component could be used to understand the dominance of certain frustrations and suggestions for improvement with transit.

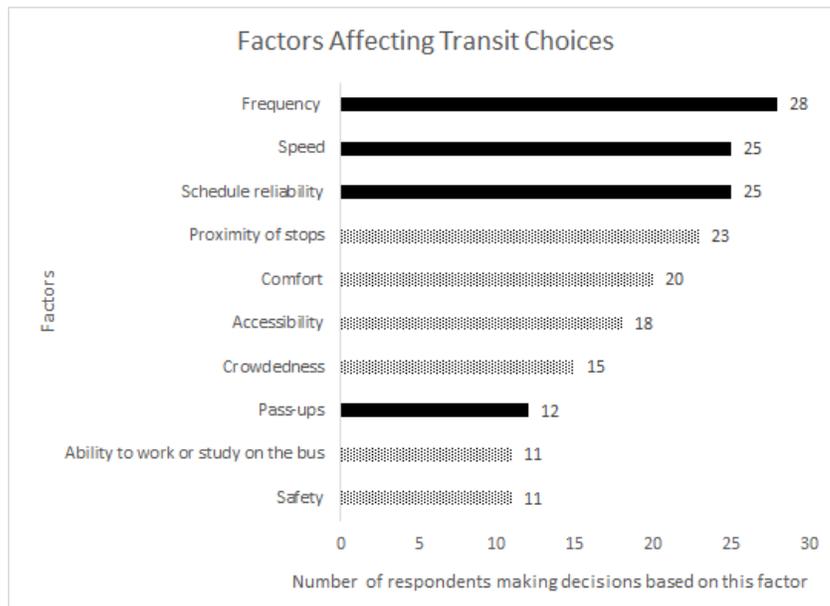
Additionally, a focus group might allow more students to elaborate on their ideas and communally rank the importance of suggestions made by their peers. While there is room for improvement of research methodology, our research processes provided valuable insights into the needs and preferences of UBC student riders, which are outlined thematically in the following sections: reliability and speed, perception of service, quality of service, quality of experience, how people choose specific routes, incentives to use transit, and temporal experience.

C. Findings & Analysis:

C.1. Reliability, Frequency, and Speed

During the initial intercept surveys, respondents were asked if they encountered certain experiences on transit routes at least once a week. Delays were mentioned by 28 transit users out of the 35 surveyed participants: only 5 riders who completed the survey did not experience delays at least once a week. Respondents were also given a multiple choice question regarding factors that affected their transit decisions.

Chart 7. Factors Affecting Transit Choices



As evident in the chart above (**Chart 7**), the top three factors affecting transit choices were reliability-related: frequency, speed, and schedule reliability. Proximity of stops follows, which may explain why transit users continue to take the 33 despite their many concerns about its reliability. In interviews, several transit users elaborated that they put up with conditions of the 33 simply because of the proximity factor: no other buses come close enough to their home to make it worth it to switch buses.

Typical transit perception studies focus on ranking specific elements and understanding their performance, rather than simply understanding all the factors that impact a decision (dell'Olio et al, 2010; Bordagaray et al, 2013; de Oña et al, 2013). Since we found that in the intercept surveys we had little time to collect good data, we decided that in the second phase of surveying we would collect the most pressing concerns rather than having each person rank many factors. To this end, in our secondary survey we asked transit users what their biggest frustration was and found that reliability of the bus - in terms of frequency, consistency, and speed - was a primary concern for the majority of users, as shown in **Chart 8** below. Note that while several respondents mentioned two or more frustrations, each person was counted only once and was categorized based on if they mentioned any reliability-related frustrations or not. Additionally, when the second

survey responses for both frustrations and suggestions were combined, the top emergent themes related to frequency and schedule reliability, as seen in **Chart 9**.

Chart 8. Frustrations with Route # 33

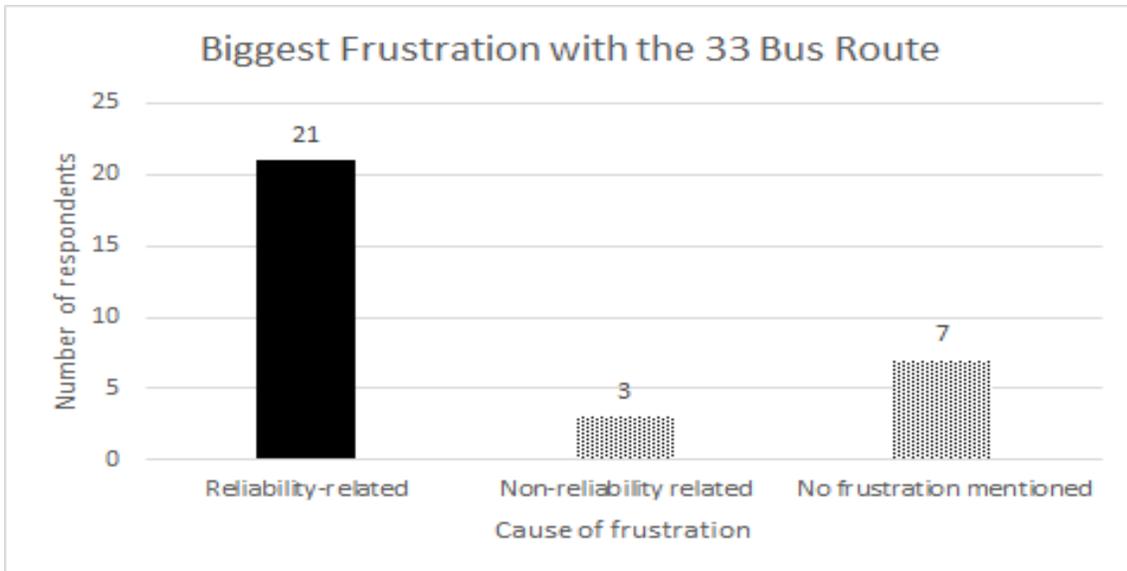
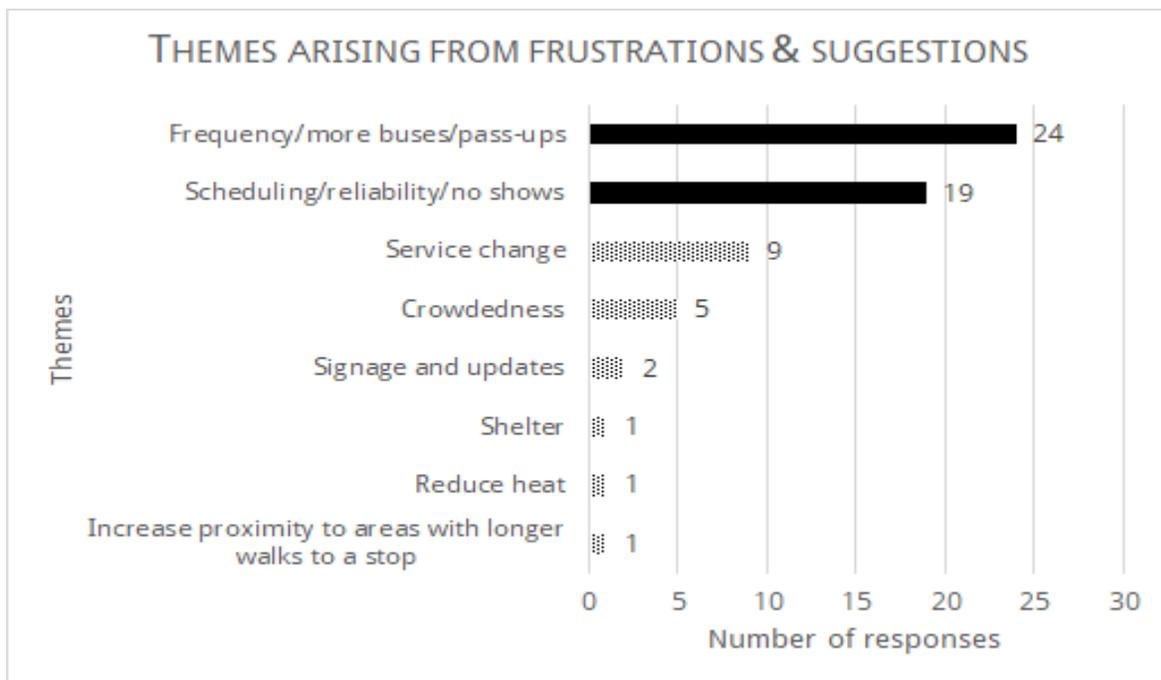


Chart 9. Frustrations with Route # 33



Common concerns about the 33 bus route were that it was inconsistent. A student living in Arbutus Ridge elaborated on this in an interview: “Sometimes an overcrowded bus would come, but then no bus would come for the next 15-20 minutes...and then suddenly 2-3 relatively less crowded bus would show up and same time, but the line at the bus stop would have already piled up.” Furthermore, several comments revealed surprising and concerning information: buses were not showing up on the 33 bus route. One user said, “Sometimes it doesn't come when it's on the schedule. The 4:05 pm bus has not come for several months.” Another pointed out that “the bus doesn't show up. It is late coming from the terminal. It is really slow, and it never matches the times on the schedule.”

The primacy of reliability-related factors can also be seen in the types of suggestions made. Suggestions made regarding reliability included increasing the frequency of buses, adding buses in the morning, during rush hours, and in the late evenings; increasing service on weekends; adhering to the schedule; and having up-to-date information when delays are occurring. In total, 16 of the suggestions put forth in the initial survey were regarding reliability, and only 2 were not about reliability. In the second survey administered, 19 people gave at least one reliability-related suggestion, with 8 giving only suggestions on other issues (such as crowdedness).

The lack of reliability concerning the 33 led some transit users to choose other routes for some of their journeys, but this often meant choosing routes that were associated with longer walks to the bus stop, in some cases compromising safety. One woman said that due to the low frequency of 33 buses at night, she often took the 99, but had to walk home for 15 minutes on a street that was not well lit. This story is undoubtedly not unique, as many frustrations and suggestions offered were related to temporal aspects of the reliability of the 33 bus route. There were multiple requests for increased frequency at certain times of the day, and these are detailed in our section on temporal aspects of the bus route.

Some visual-spatial data on reliability was also collected through observing the scheduled departure time and the actual departure time of the 33 bus route. In total there were 5 buses that departed from the UBC bus loop during our two participation observation periods (**Table 3**). Referencing the Translink official schedule for the 33 bus route and comparing to our observation data, it is evident that at least during the observation period, the 33 bus tends to depart on time from UBC. Notably, 2 out of 5 departed at the scheduled time (5:08 PM & 5:18 PM), with another 2 departing 1 minute ahead of the scheduled time (4:45 PM & 5:08 PM). Only 1 out of the 5 buses observed was delayed by 3 minutes on its departure time. This indicates that despite the perceived lack of reliability concerning the 33 bus route going westbound, the eastbound buses departing from UBC are relatively on time at departure according to the schedule. This conflicts with the survey data we collected, showing a discrepancy between observed reliability and perceived reliability; however it is important to note that there are many factors that can cause delays along the bus route after its departure from the terminus station. Further observation is needed both to understand typical departure behaviour from the UBC Bus Loop as well as schedule reliability along the route in both directions.

Table 3. Participant Observation Periods

Observation Point	January 17th	February 14 th			
Observed bus 33	1 st	2 nd	3 rd	4 th	5 th
Scheduled Translink bus departure time	5:08 PM	4:46 PM	4:56 PM	5:08 PM	5:18 PM
Bus departed	5:07 PM	4:45 PM	4:59 PM	5:08 PM	5:18 PM

C.2. Perception of Service

It is important to understand how transit users' frustrations with the 33 bus route relates to perceptions of service. Eboli and Mazzulla (2012), de Oña et al. (2013), and Nesheli et. al (2016) placed higher ranked certain factors as more influential on the perception of service than others: these more influential factors are journey time, regularity, punctuality, and frequency. Our respondents agreed on frequency, perception of journey time and punctuality (speed and schedule reliability, in our case), but placed comfort over regularity, for which we did not have a category. When asked question 15 from the interview guide, "What conditions would encourage you to continue taking this route or try other routes?", one respondent explained that persistent unreliability of the 33 would influence her decision to take an alternate route. While she could take the 99 bus, the 33 was preferable before sunset for reasons of safety. Interestingly, she had not initially mentioned safety as being a factor in her decision-making process. This discussion served as a reminder of the role of perceptions and how they inform travel behaviour, highlighting perceptions as an integral area of study pertaining to analyzing transit user needs and preferences (Klein, 2017).

According to another study, travel time is a significant motivator behind peoples' transportation mode choice and often wait time is perceived negatively by both transit riders and non-transit riders (Fan, Guthrie, & Levinson, 2016). Our interview and survey results corroborate this, whereby 24 comments from 31 respondents noted frequency as the number one factor when asked what their biggest frustration and suggestion about the 33 bus route. The second biggest frustration factor was regarding wait times and the perceived lack of 33 buses along the 33 bus route. These results can be seen in **Table 4**, which summarizes the number of responses relating to each theme for the secondary intercept survey. The frustrations with frequency were somewhat surprising, as the 4 buses we observed while collecting this data typically came only eleven minutes apart, with no transit users left over after the bus closed its doors to leave. Although there may be more pass-ups along the way, this suggests that there may be some element of perception influencing these riders' responses that there are not enough buses or that they do not come frequently enough. It is equally possible that the respondents are

drawing on their perceptions of transit services from memories of other times or other routes.

It is difficult to collect visual spatial data on perception. Even if we are able to make some observations that can be attributed to perception, it is difficult to know for certain the perceptions that are held without resorting to visual textual methods. That being said, Fayne et al. (2015) and Guo (2011) note that the presentation of transit maps can have influence on passengers' perceived travel times, as physical maps are a visualization tool which can evoke emotional responses which inform transit users choices. Many students check transit times on their mobile devices, which provide up-to-date information for riders, much of which shifts behavioural influences from perception to knowledge.

Table 4. Intercept Survey Results Related to Themes

Frustration	# of Responses/Theme	Suggestion	# of Responses/Theme	Combined Frustration & Suggestion	# of Responses/Theme
None mentioned	7	None mentioned	4	None mentioned	11
Frequency	9	Increase frequency/Add more buses	15	Frequency/more buses/pass-ups	24
Pass Ups	2	Signage	1	Scheduling/reliability/no shows	19
No Shows	4	Shelter	1	Crowdedness	5
Not on schedule/lateness	10	Reliability/timeliness	5	Service change	9
Crowded	5	Have better updates on delays	1	Signage and updates	2
Service Change/Undesirable Schedule	1	Service Change	8	Shelter	1
Route does not get closer to home (and it is best option)	1	Stop blasting the heat	1	Reduce heat	1
TOTALS	39		36		

Note: Service change suggestions ranged from having a skytrain (3), having bigger buses (2), having a faster route (1), having service start earlier in the morning (1), and not having seats face each other (1).

C.3. Quality of Service

Quality of service relates strongly to perceptions of service. In examining the frustrations and suggestions of thirty-one 33 bus route users, twenty four responses highlighted frequency, wait time and number of buses combined as their top issues; nine of these were frustrations, and fifteen were suggestions. To this end, one respondent proposed that TransLink offer additional rapid transit options to and from campus while maintaining the reliability and frequency of the overall system, and another mentioned increasing the number of express buses, reorienting the system to focus on traveling to high traffic nodes, and an overall increase in transit frequency. Another respondent noted preferring other routes after 10 PM because the 33 “only comes every 30 minutes” or more infrequent than other options. As we can see, frequency of the bus can also relate to concerns for safety. Quality of service with regards to safety play an important role for riders as they are accessing transit, but it is as much a factor while riders are on the bus, and a lot of this has to do with the bus driver.

One element which resulted from interviews but not from surveys was the level of safety with regard to the bus driver, and its role in the quality of services. In one interview, the element of safety came up in a roundabout way. At first the respondent was lamenting the over-crowdedness of the bus, and when asked to elaborate she mentioned recently falling on the bus. When pressed further, the respondent explained that the reason she fell was because the bus driver was stopping abruptly and the bus was over-crowded so that she was not able to grab onto something. The respondent connects over-crowdedness to being passed up by buses, saying that she would rather be passed up than be on an over-crowded bus where passengers are standing right next to the driver and presumably, are less safe. However, everybody has different experiences, as another interview respondent noted that one of her reasons for taking this route include the bus drivers – whom she describes as being quite pleasant.

In terms of visual spatial documentation, we observed a lack of available bus shelters; this became a concern which was bolstered by a number of recommendations made by students who advocated for rain shelters at every stop. In **Figure 14**, we can see that there is a bench (albeit quite far from the stop) but there is no shelter in a city that we all know is very rainy. One respondent implied that it would be more fair if all the bus stops had shelters from the rain, instead of just the few bus bays at the new “really nice, new bus loop.” According to Susilo and Cats (2014), stop related service aspects, like the environment, station safety and travel information are the most important attributes correlating with higher rider satisfaction. For a large transit station like the UBC Bus Loop, it comes as a surprise that there are no shelters, and only one bench for all of the stops, which is somewhat out of the way.

Figure 14 - UBC Bus Loop Bay 9 for 33 Bus Route



C.4. Quality of Experience

Quality of experience was a strong indicator of user satisfaction in our evaluation of student ridership along the 33 bus route. During our process of gathering student survey participant data, students highlighted several factors which correlated with the coded data taken from our in-depth surveys. Altogether, the results from these mixed methods highlighted crowdedness, comfort, sitting and standing, and bus etiquette as the most prominent factors that influenced their quality of experience assessment of the 33 bus route. Two questions from the distribution of initial surveys highlighted the significance of several quality of experience factors: **71.9%** of respondents indicated overcrowding and **90.6%** experience delays aboard the 33 bus route; and when asked which factors affect their choice of transit, **54.8%** suggested crowdedness and **67.7%** mentioned comfort. Overall, the main recommendation that students made to help alleviate this issue, was an increase in the number of 33 busses servicing UBC campus. This recommendation was highlighted consistently during survey disseminations and interview processes, and would be a strong topic to explore in relation to AMS SEEDs transit advocacy on behalf of UBC students.

During the in-depth interviews, one respondent touched on crowdedness as it correlated with a specific time of day, and even at a particular location along the 33 bus route. The interviewee highlighted two key elements in her response, regarding timing and analysis of surrounding transportation factors that affected her transit user preferences. The interviewee noted that “The bus is super busy in the morning. It can

take anywhere between 25 to 45 minutes [to commute to UBC] depending on when you go on. When you get the bus between 3 and 5 PM, it takes 45 minutes, versus right now (12:20 PM) around 20-30 minutes.” This interview offered fruitful discussion and conclusions that echoed past recommendations to improve access to route schedules, connectivity of routes and transfer times, and enhancement of bus services to rapidly growing areas in Metro Vancouver (Thomas, 2010).

In future studies, it would be beneficial to seek further understanding of what these concepts mean and in what contexts these factors affect their user transit experiences most strongly in order to gauge a more accurate understanding of how the AMS can advocate for improvements to enhance UBC student ridership experience.

Participation observation data was less effective in contributing to our assessment of student’s quality of experience along the 33 bus route. We observed the bus stop twice, both occurring between 4:30 and 5:30 PM. Importantly, we observed that no students were left behind when boarding the bus. This indicates that several quality of experience factors from the regular surveys such as comfort, the ability to read or study, crowdedness and pass-ups, are occurring elsewhere along the 33 bus route, but do not necessarily affect the riders who board at the UBC bus loop. Future participant observation should occur at several bus stops outside of the UBC bus loop, where additional UBC student ridership is affected.

C.5. How Transit Riders Choose Specific Routes

From both the initial survey results and in-depth interviews, many participants expressed that they sometimes take alternative routes to commute. The two pie charts (**Charts 9 & 10**) below show the difference between how often participants come to campus and how often they take the 33 bus route on average during the week. Out of the 35 survey participants, 75.8% come to campus around 4-5 days per week; however, it is important to note that only 54.3% of survey respondents indicated that they take the 33 to come to campus 4-5 days a week. This indicates that around 21.5% of the survey participants are taking other transit routes to commute to campus on certain days. For example, if a participant come to campus five times a week but only takes the 33 three times a week, we may assume that they are taking alternative routes during the other two times they come to campus.

Chart 9. Frequency of Campus Travel

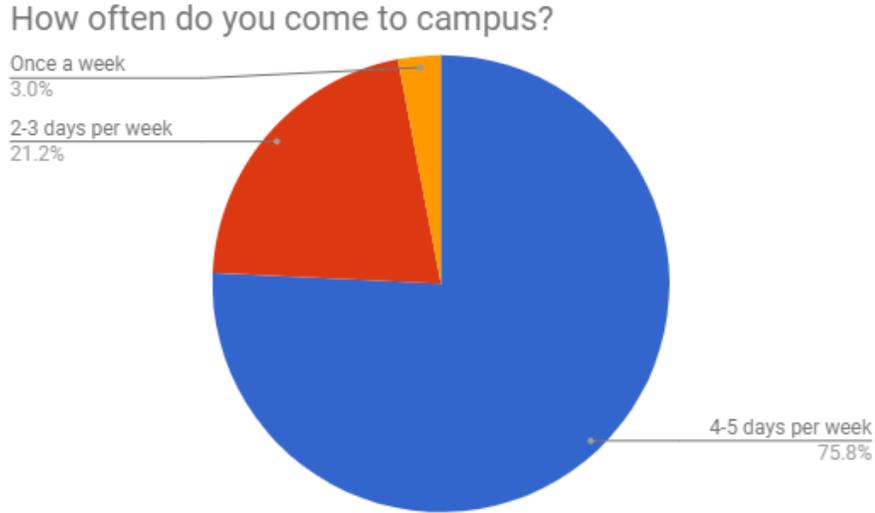
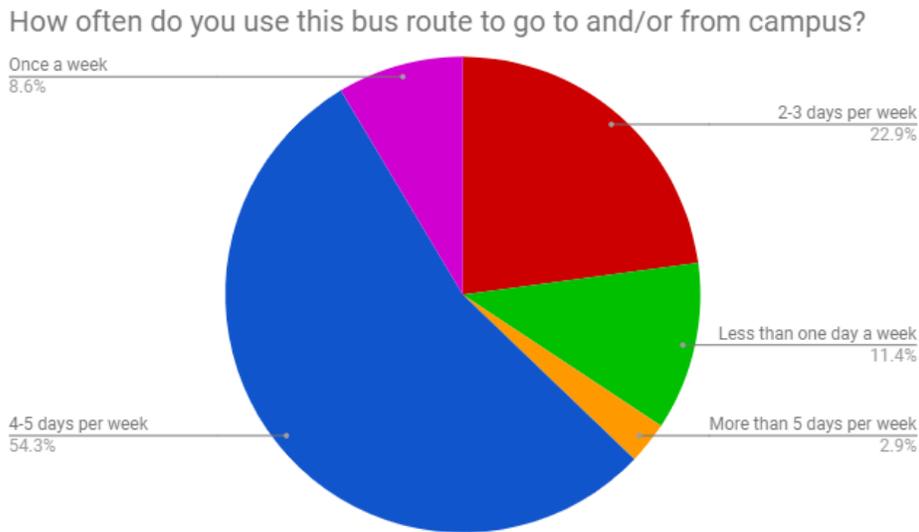


Chart 10. Frequency of Use of Bus Route 33 to Campus



Two questions from the initial survey can be used to analyze what other transit routes participants take to come to campus and why they choose to do so. The first question is “Do you take the same route when you are coming to campus?” Around 17% of the surveyed participants exclusively take the 33 bus route with the other 83% that sometimes take alternative routes during the week. The alternative bus routes mentioned in this

question include the 99 B-line, 25, 41 and 43. One participant also mentioned that they sometimes bike to campus. The most popular alternative route seems to be the 25 since it was mentioned by 8 participants. The 99 B-line was also mentioned by 7 participants. The main reason that participants choose the 25 bus route as an alternative is due to the fact that the 25 and 33 both run along 16th Avenue West of Dunbar Street, and they both stop at King Edward Skytrain station. Participants who take the 25 expressed that they would chose to do so if the 25 came before the 33. For the 99 B-line, speed and frequency are the main reasons for participants to walk up to Broadway and use this alternative route. Two participants would also walk to 41st Avenue to take the 41 or 43, since the 33 runs on 33rd Avenue once it passes Cambie Street. Interviewees also talked about similar bus routes and reasons when it comes to choosing alternative routes. Speed and frequency affect whether some interviewees choose an alternative route such as the 25 or 99. In addition, safety and accessibility are also main determining factors for some interviewees.

The second question that aids to analyzing why people choose alternative routes is “Which of these factors affect your choice of transit?” Speed, frequency, proximity of stops appeared in nearly every survey answer, which is not surprising since they are also the reasons why participants choose alternative routes. Accessibility, schedule reliability, pass-ups due to full bus and crowdedness are the next group of frequently mentioned factors that affects transit choice. Interviewees demonstrated similar sentiments on what factors affect their transit decision. It is important to note that one interviewee has impaired visibility, so they are highly dependent on the bus system since they do not have any other option. When advocating for transit improvements, it is crucial that the experience of dependant riders with special needs are taken into consideration because they usually do not have the freedom of choice.

Visual-Spatial data was also collected through participant observation at the UBC bus loop. Since the 33 bus route terminus is located right beside the 25 terminus, observation was made around whether people in line switched to line up another bus stop instead. This is to help determine if the 25 is a competing route and analyze what are the potential reasons for people to choose the 33 or 25 when leaving from campus. In our 45 minutes of participant observation, a total of 15-17 people switched lines between the 25 and 33. On average, there were around 2-3 people that switched from the 33 to the 25 every time the 25 came first; on the flipside, there were on average 2-3 people that switched from the 25 to the 33 each time the 33 came to the bus stop first. Since the 25 and 33 have many overlapping stops on their routes, we may assume that these people who switched lines had the option to take either the 33 or 25 to their final destination. Additionally, if all line switching happens when a bus comes to the starting bus stop, it indicates that the perception of speed (e.g. getting home faster) helps people determine which bus they want to take.

C.6. Temporal Experience

The temporal nature of transit was an important factor in a few students’ decisions regarding routing and scheduling of their daily commute. Three of the respondents that were interviewed indicated a preference for transiting during specific times of day in response to perceived worsened service quality at other times. One respondent

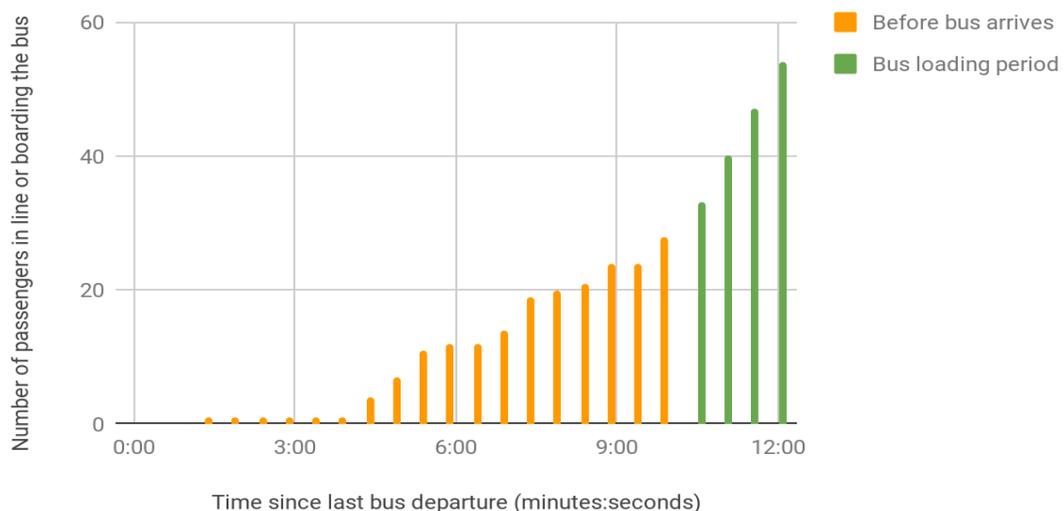
mentioned that the night schedule for the 33 bus route was unfavourable past 10 pm as the frequency of the bus is only every half-hour at this time of day. A similar sentiment was echoed by a second interviewee. This individual said she favoured the 33 and almost always took it during the day but in the evening would instead take the 99 and then walk for an additional 15 minutes due to the infrequent bus service on the route at that time. Safety was also a concern for this student as her street was described as not being sufficiently lit at night.

A third student highlighted timing and analysis of surrounding transportation factors that affected her transit user preferences. The interviewee noted that that the route is popular amongst high school students and is thus very busy during the mornings. The individual's travel time would vary dramatically during the afternoons when the bus was to pass Lord Byng Secondary School between the hours of 3 and 5 PM, with her commute typically extending from 25 minutes to 45 minutes. Similar sentiments to past recommendations were echoed throughout this conversation, including improving access to route schedules, increasing connectivity of routes and transfer times, and focusing on enhancement efforts to bus services for rapidly growing areas in Metro Vancouver.

In relation to visual spatial data, our group devised a simple diagram to showcase the time spent waiting amongst students at the 33 bus route terminus. Beginning from when the last 33 would depart, our group documented the arrival of students in 30 second increments until the bus left once again to gain a sense of when the students were queuing. **Chart 11** below demonstrates our findings. Note that this figure represents only 1 bus departure, as we were uncertain how further observation of this would lead to better data for the AMS without a focus group or survey questions to explain our findings, as described in our methodology section.

Chart 11. Comparison of Wait Times for Bus #33 Passengers

An Example of an Observation Leading to More Questions than Answers: Wait Times for Passengers of 33 Bus on January 17



D. Summary of Findings & Analysis

Our data analysis demonstrates that the mixed method of conducting both surveys and semi-structured interviews, as well as conducting participant observation was effective in expanding the scope of understanding UBC student ridership and corresponding needs and preferences along the bus 33 route. The results of both the survey and the observation data yielded unique insights into the decision-making process of student riders while the in-depth interviews provided much needed context to the user experience. Additional visual-spatial data analysis tool such as GIS mapping can be explored with a larger dataset collected in the future. This report will now conclude with an analysis of identified gaps found in our research, and a set of recommendations to be carried forward in future analysis of UBC student transit needs and preferences.

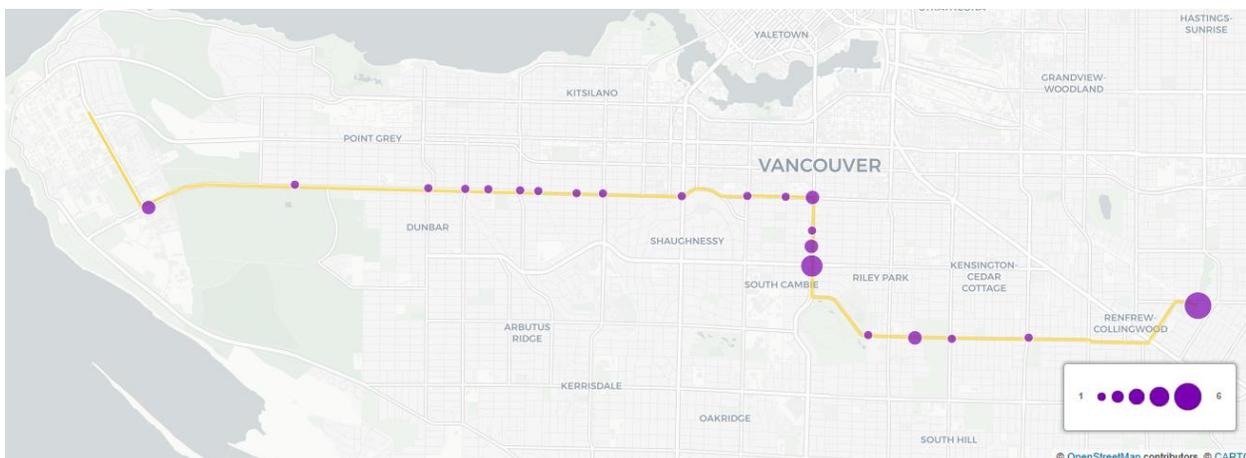
D.1. Identified Gaps in Research

Due to the small sample size of our interviews and surveys, we are unable to establish statistics relating to point of origin of student travelers on the 33 bus route as the margins of error were too great. Conducting additional interviews and surveys into these topics would be of great benefit to both the accuracy and the precision of the information, allowing for a lower overall margin of error and more significant recommendations to be produced.

Future research into the 33 bus route should focus on the following three key areas as to improve upon the recommendations of our study. The first point is in regard to the boarding origins data of individuals. The exact locations of where travelers originated from is unknown, as we only collected the respondents' boarding location for the 33 bus and the first three digits of their postal code. A map is produced showing the boarding locations of the surveyed students (**Figure 15**).

However, this is only based off a small sample size and we cannot make accurate assumptions through this data. Having a larger data set and more accurate spatial information would allow for a more cohesive understanding of where individuals riding the 33 bus route are residing.

Figure 15. *Boarding Locations of Surveyed Students*



The second identified data gap concerns the transfer data of individuals. While we are aware that 20% of people transferred from one transit option to the 33 bus route and we know what mode of transportation this was, we are uncertain as to where and how travelers are transferring. This includes whether these individuals took one or multiple transfers en route to their final destination and the specific transit routes that were employed in their journey. Collecting more data on where and how student transfer would certainly improve the AMS’s advocacy efforts.

Data should also be captured at more bus stops, to determine where and if reported “no-shows” and “pass-ups” are occurring. The sample size of the data gathering must also be increased, to incorporate data collection of a greater number of people, at all different times of day, and over different seasons to truly understand the trends of transit users. Our finding was that the initial survey design with the option of multiple, prompted responses per question (check all that apply format) was not as telling as our secondary survey in which we left it up to respondents to fill in the blanks with their own suggestions. In the initial survey, respondents more readily chose the prescribed responses, often leaving the “other” category blank (as it was at the end of long lists). In our second survey with open-ended questions, respondents still came up with a lot of the same responses from the first survey’s lists, but there was also room for surprises (like, for instance, that some respondents confessed that they had no frustrations or suggestions). Moreover, the kinds of responses garnered from the second survey let us to code the themes of the responses differently as well which, we believe, garnered more telling results (**Charts 11 & 12**).

Chart 11. Initial Survey Responses.

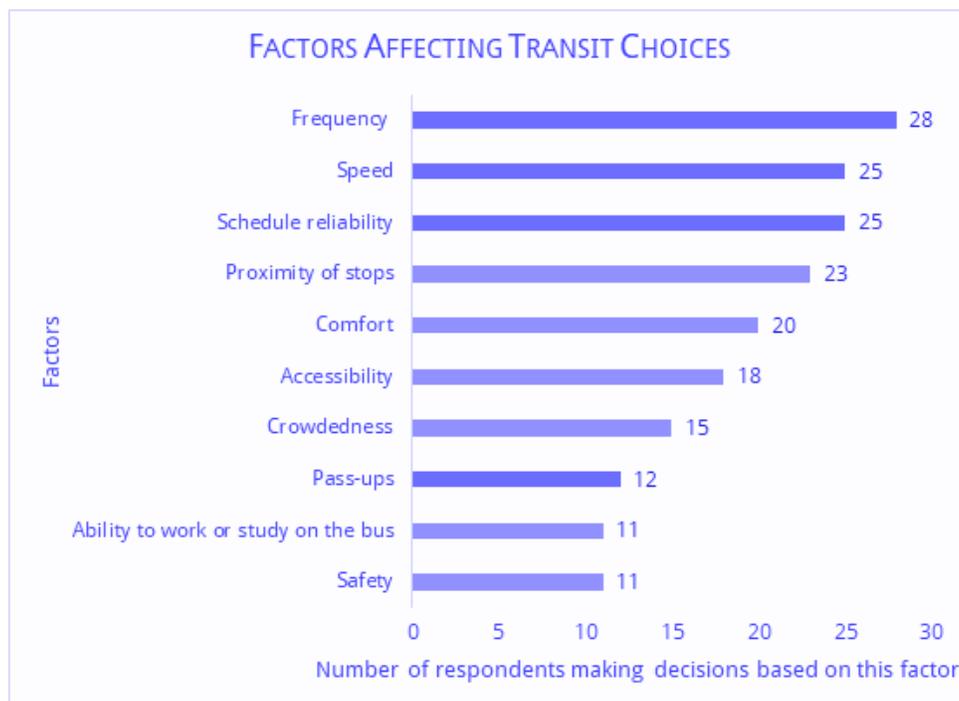
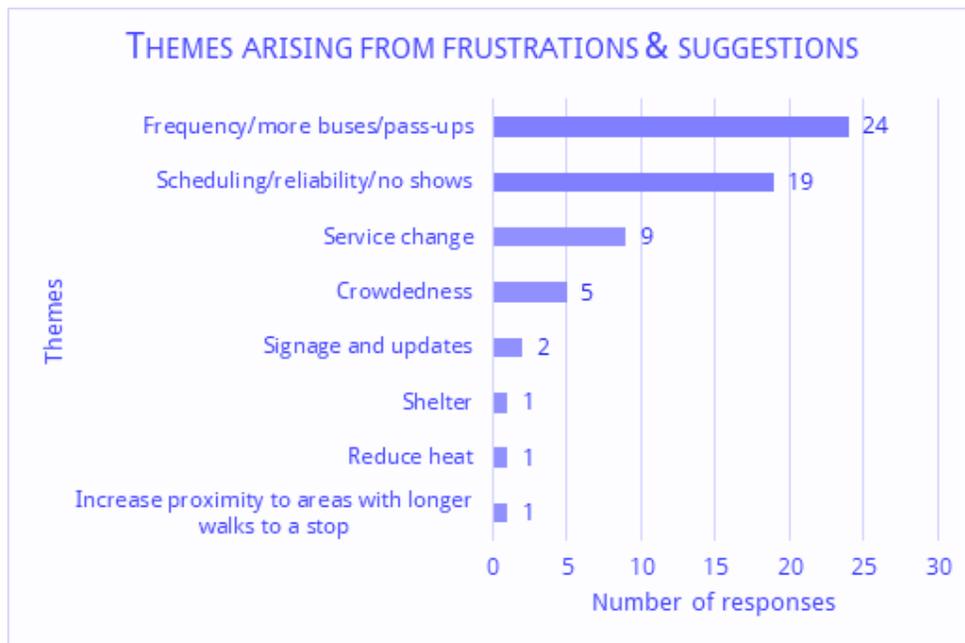


Chart 12 - Second Survey Responses.



The final area of focus for future research is in respect to the distance and time of travel data for individuals. At no point during our surveys or interviews was this data collected. This data could be gathered by asking individuals to approximate their average daily travel time and then an overall average could be calculated based upon this information. It should be noted, however, that approximating the length of travel time can be difficult for commuters given that people tend to either under or overestimate their routes, that the posted times for bus routes are often inaccurate, and that confounding outside variables can dramatically alter travel time.

E. Recommendations

As noted above, based on the data from our observations, interviews, and both surveys, we identified a strong need for more data. As such, our first recommendation would be to collect more data that expands to include non-peak travel times. UBC classes do not necessarily correlate to regular peak hours, and as such focusing only on morning and evening peak hours may cause observers to miss out on capturing important data, particularly that of late-night commuters.

Given the gaps caused by insufficient data we can still be confident in advocating for increased frequency for bus route 33. Frequency was the number one factor affecting transit users as reported in both of our surveys (**Charts 11 & 12**). Increased frequency of bus traffic could alleviate concerns of crowdedness, safety, no-shows and shelters as well. If there were more buses they would likely be less crowded, and as the buses became less crowded and more frequent they would also become more safe. Often as bus drivers are rushing through traffic, they need to stop suddenly; this sudden stopping can cause passengers to lurch forward, and if the bus is particularly crowded there may

passengers may not be able to access a railing to hold onto, so that, as one interviewee reported, they can fall or become injured.

Safety is also a concern for UBC bus riders waiting for the bus for long periods of time late at night, and again, more frequent buses would reduce student wait time at remote bus stops, in the dark, alone or in company. If the frequency could not be increased at night, the bus times could at least correspond to when students in evening classes arrive at the bus stop after their classes end, although frequency has many other benefits. For instance, more frequent buses would alleviate the need for bus shelters at every stop as wait times are significantly reduced.

Lastly, incidences of no-shows and pass-ups would also be significantly reduced given shorter headways. However, as previously mentioned, further data collection on these matters should be the first consideration. As previously reported, we gathered data on the numbers of people getting on bus 33 from the UBC bus loop, each of which, save one, were quite high. However, without capturing direct data on pass-ups, crowdedness, average numbers of passengers at different times of day, and in different seasons (as buses may become busier on rainy, snowy, and cold days than otherwise), we cannot know the degree of accuracy for these reports, or how much these views are actually matters of perception.

V. Route 41 (UBC/Joyce Station)

Michelle Cuomo, Mengying Li, Tadayori Nakao, Rachel Wuttunee

A. Introduction: Route Context

The project focuses on Route 41 (Joyce Station/Crown/UBC), which had the second highest ridership in 2016. Route 41 has 57 stops that connect UBC to Joyce Station along 41st Avenue and SW Marine Drive, servicing the Collingwood, Kerrisdale, Oakridge, and Dunbar neighbourhoods (See **Figure 16**). The bus headways are 4 and 7 minutes during the a.m. and p.m. weekday peak periods, respectively.

Possible transfers onto UBC-41 route may be sourced from the following: another bus route; a rail line (TransLink's Expo Line, SkyTrain); bicycle; walk; private vehicle; shared vehicle; and/or car sharing vehicle. Joyce-Collingwood is a station along TransLink's Expo Line, which provides connections to Burnaby, New Westminster, and Surrey. There is a bus exchange serving 5 routes to UBC, including 41, 43, 26, 27, and 28 located at Joyce-Collingwood Station. The 41 route overlaps with the 43 route which has fewer stops. 2. Oakridge-41st Avenue is a station along SkyTrain, providing connection to Richmond.

Figure 76: Bus Route 41 Joyce Station/Crown/UBC



B. Methodology

The methodology used for evaluating Bus Route 41 was a mixed methods' approach including tools for observation, surveys and interviews (See **Appendix D, E & F**).

B. 1. Observations

Each researcher conducted one set of observations during the evening rush hour (between 4-6 p.m.) at the UBC Exchange, Bay 7. Collectively, researchers observed eight buses from 4:00 p.m. to 6:00 p.m. on January 17th-19th. Each researcher was responsible for conducting 15 minutes of observations following the criteria in **Table 5**. In addition, researchers took photographs of their surroundings at the time of the observations to gather further data (**Figure 17**). However, due to the quality of the photos they have not been included in the final report.

Table 5: Field Sheet of Observation Recording

Observer Name:		Bus Stop Name:	
Weather:	Start Time:	End Time:	
Date:			

	Bus 1: On time? Y / N	Bus 2: On time? Y / N	Bus 3: On time? Y / N
How many people are waiting?			
How many people boarded? (actual number)			
Number of people switching to another bus stop?			
Keep waiting at stop after bus has passed?			
Additional Notes (Bikes? Skateboards? Wheelchair? Walker? Carrying bags?)			

B.2.Surveys

Surveys were conducted between the period of January 24 to February 7, 2018. Collection was done during the weekdays, during morning and evening rush hours of 8-10 a.m. and 4-6 p.m. Twenty (20) surveys were completed, either by hand individually or orally, to participants at UBC Exchange, Bay 7 while they waited for the bus.

Figure 17: Observation and Survey Location



B.3. Interviews

Four interviews were conducted between January 24 to February 7, 2018, one by each member of the research team. Participants were recruited through social media, personal connections, and from the surveys. The criteria for participants to be selected for an interview were that they must be a student at UBC and they had to take the Bus Route 41 as one of their main bus routes to campus. All four participants of our surveys were graduate students and all interviews were conducted in person. Each researcher used a recording device (either a cellphone or computer recorder) in addition to taking notes and transcribing the data.

B.4. Analysis of Data

Collected data was analyzed through both a qualitative and quantitative lens. Observational data that was collected was summarized to reflect the counts of students who boarded the bus or transferred to other buses. The research team developed a set of codes and themes to organize the findings (**Table 6**). The codes were used to analyze qualitative data from the interviews, as well as comments from the surveys. These codes then fit under the themes which make up the subcategories for our findings. Some codes were used under multiple themes as seen in **Table 6**.

Table 6: *Themes and Codes Used to Analyze Interview and Survey Data*

Themes	Codes
Perception of Service	Crowdedness Reliability – Delays, Speed Frequency Convenience
Quality of Service and Facilities	Crowdedness Reliability – Delays, Speed Frequency
Quality of Experience – i.e. safety	Crowdedness Reliability – Delays, Speed Frequency
Temporal Experience – rush hour, late night	Convenience
How People Choose Alternative Routes – safety factors	Proximity Postal Codes
Incentives to Use Transit	Proximity Convenience

C. Findings

C. 1. General Findings

Given observations were done during peak commuting hours, we expected to see a large number of students using the Bus Route 41. As summarized in **Table 7**, two buses were delayed and the other four were on time. Most passengers waited in line to ensure they got on the the bus in time. In terms of bus 2, 3, and 4, the number of people boarding was greater than that of people waiting. One possible reason for this could be that passengers use an online application or website to obtain real-time information on the bus just as it is arriving, thereby reducing their wait time. As for bus 1, 5, 6, and 7, some people left before the bus came; a few of whom switched to another bus stop. This was in part because the 43 Express Bus to Joyce Station came earlier than the Bus Route 41. It appeared that most people who were in the line for the 41 had decided it was the best choice for them before they got to the bus stop or it was their only choice. There were no people who continued to wait after the bus left.

According to our findings, the earlier the bus came in the more passengers boarded. That may indicate that more students finish school before 5 p.m. It is also possible that some buses were not on time. In one of the sets of observations, one bus was very late which resulted in the next bus only having 10 passengers; none of who waited at the bus stop.

The total number of people boarding was 198, with 23 people observed carrying extra bags. There was one person boarding with a skateboard onto Bus Route 3. When the research was conducted in cloudy or rainy weather, less students tended to ride the bus with bikes or skateboards. Given most days are cloudy and/or rainy during the winter months in Vancouver, we should consider the impact of weather on transit users.

Table 7: Observations Results

Bus Number	Number of People Waiting	Number of People Boarding	Number of People Switching to other bus stop	Number of People Keeping Waiting
1	59	55	0	0
2	0	10	0	0
3	11	36	0	0
4	24	31	2	0

5	18	13	1	0
6	15	14	1	0
7	30	29	4	0
8	10	10	0	0

Note: The bus is ranked by the time

C.2. Demographic Data

Demographic data was collected through the survey portion of data collection. Gender of Bus Route 41 participants was collected, as seen in **Chart 13** of those surveyed, where 60% were female, 30% were male and 10% chose not to identify/identify differently. Age of participants was also collected as shown in **Chart 14**. The majority of students surveyed (90%) were under the age of 29 which is to be expected, as the undergraduate population at UBC is larger than that of its graduate population. The largest age group was 20-24 comprising 55% followed by 25-29 comprising 20%.

Chart 13: Self-Identified Gender of Survey Participants

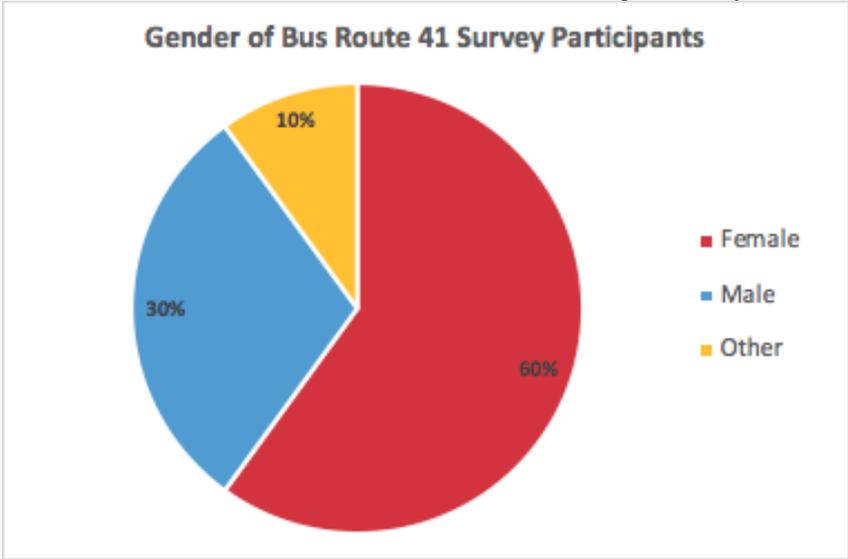
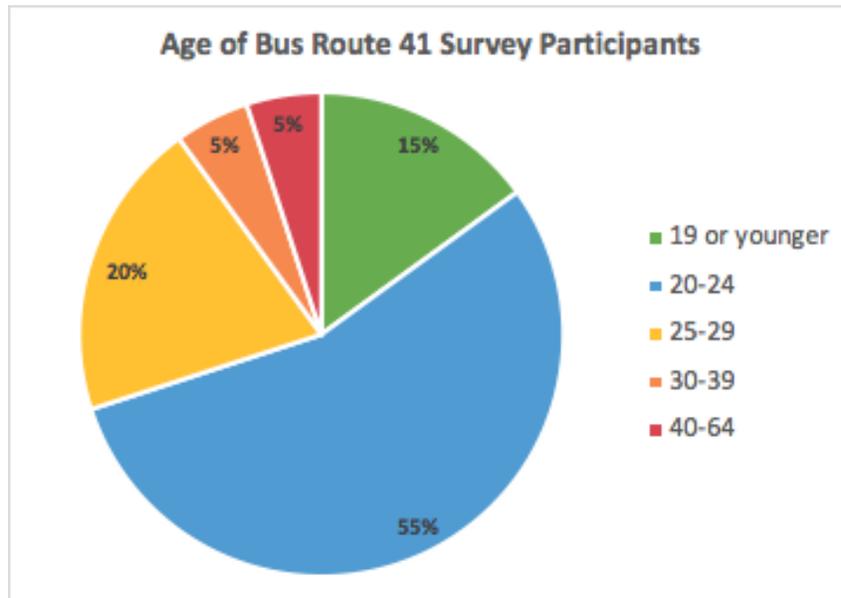


Chart 14: Age of Survey Participants



Our group has categorized the collected data into themes in order to analyze the findings. The themes are: Perception of Service; Quality of Service and Facilities; Quality of Experience; Temporal Experience; How People Choose Alternative Routes; and Incentives to Use Transit. Utilizing coding techniques and theme-based categorizing enabled us to analyze the data to conclude the overall experience of UBC student bus riders. The in-depth interviews combined with the survey results offered an insight into the travel patterns of UBC students.

C.3. Perception of Service

C.3.1. Observations

Luckily it was not raining during the observation process and each person in our group observed the bus stop in 15-minute intervals. We noticed that one of the buses arrived early. This bus was able to accommodate many students who were standing in line, as well as others who saw the bus and ran to catch it. The next bus came on time and had no people standing in line. Many people ran for this bus before it quickly drove away. The nearest shelter is at the 99-bus stop, which is about 1-minute walk and in sight of the 41 stop. It was noticed that some students ran from that area to the 41-bus stop when it pulled up. UBC students' perception of transit service is that they have learned to accommodate to less than appealing circumstances at each stop. It would maximize their experience if there were shelters and benches at each bus stop since we live in a rainy climate.

C.3.2. Surveys

Our team conducted surveys at various times during the rush hour period 4-6 p.m., Monday to Friday. During some of the initial surveys it was raining, and in a lineup of over 10 people only a few of them were carrying umbrellas. Luckily, a couple of the surveyors had umbrellas and were able to cover themselves and the participant, making data collection easier on everyone. Survey participants' perceptions of service is they do not like to be passed up by buses as they are too full and also, they will be standing for the entire trip. They noted that more frequent and bigger buses would be beneficial especially during the busy hours. If these needs are met the potential for more UBC student ridership could be expected.

C.3.3. Interviews

Each person conducted 15-30 minute in-depth one-on-one interviews with UBC students who frequented the Bus Route 41. During the interviews the transit riders expressed concern about being passed up by full capacity buses which could potentially make them late for class or work, especially during the rush hour. During the interviews we asked them if they had any suggestions for improvements. They disclosed that more express buses would be helpful, especially if they are doing homework on the commute.

C.4. Quality of Service and Facilities

C.4.1. Observations

From our observations, it was recorded that there were no facilities located at the UBC Exchange Bus Loop 7; no benches or rain covering. In terms of reliability, during our observations, two buses of six were delayed and the other four were on time. This, however, was only a snapshot in time observing the buses. Only reliability and delay could be observed at the stop. From our survey and interview results, it was clear that delay, reliability, and speed were factors that shaped students' experiences using transit and determined people's decisions to choose transit.

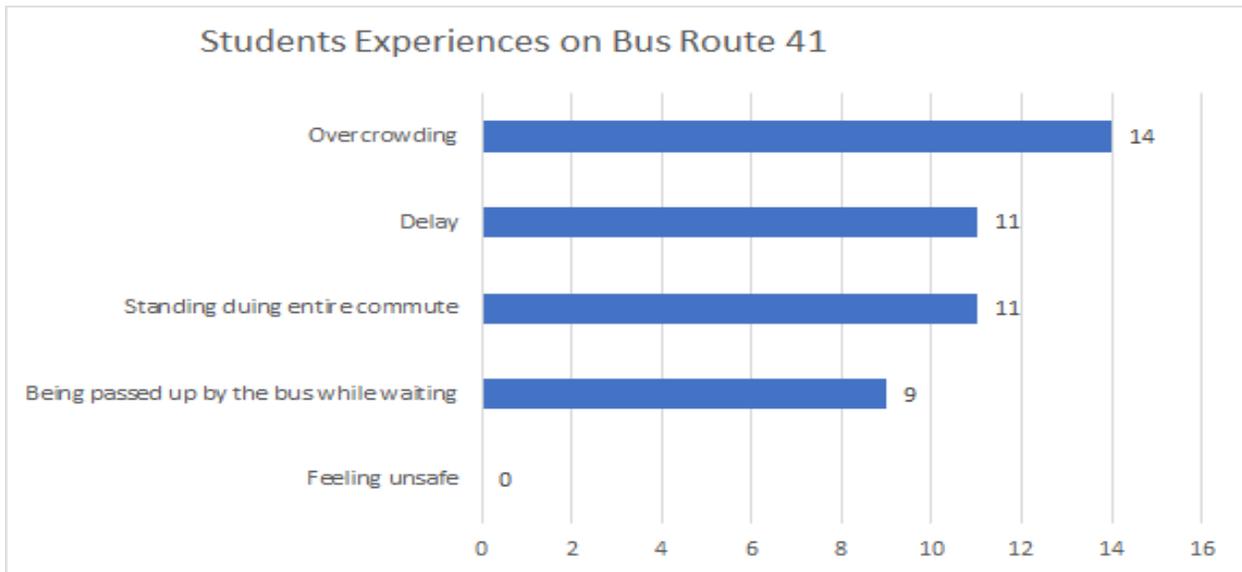
C.4.2. Survey

C.4.2.a. Reliability of Service

Second to the issue of overcrowding (**Chart 15**), respondents of the survey noted that at least once a week they experienced delays on the Bus Route 41. Less frequently, nine of the total respondents experienced being passed up by a bus once a week because it was full. One respondent noted that a way Translink could improve transit service along Bus Route 41 could be by having a better system for knowing in real time when the next bus is coming or if it is delayed. Two people, in their comments, noted that they would like to see larger buses on the Bus Route 41. This aligns with our survey findings of

participants' experiencing overcrowding at least once a week when using the Bus Route 41.

Chart 18: *Survey Responses of Student Experiences on Bus Route 41*



C.4.2.b. Speed

Speed of service was the second most frequent response by survey participants on factors that influence their transit use (**Figure 6**). This was also noted in the suggestion section where four participants noted that they would like to see more express buses along the Bus Route 41 to UBC.

C.4.2.c. Frequency

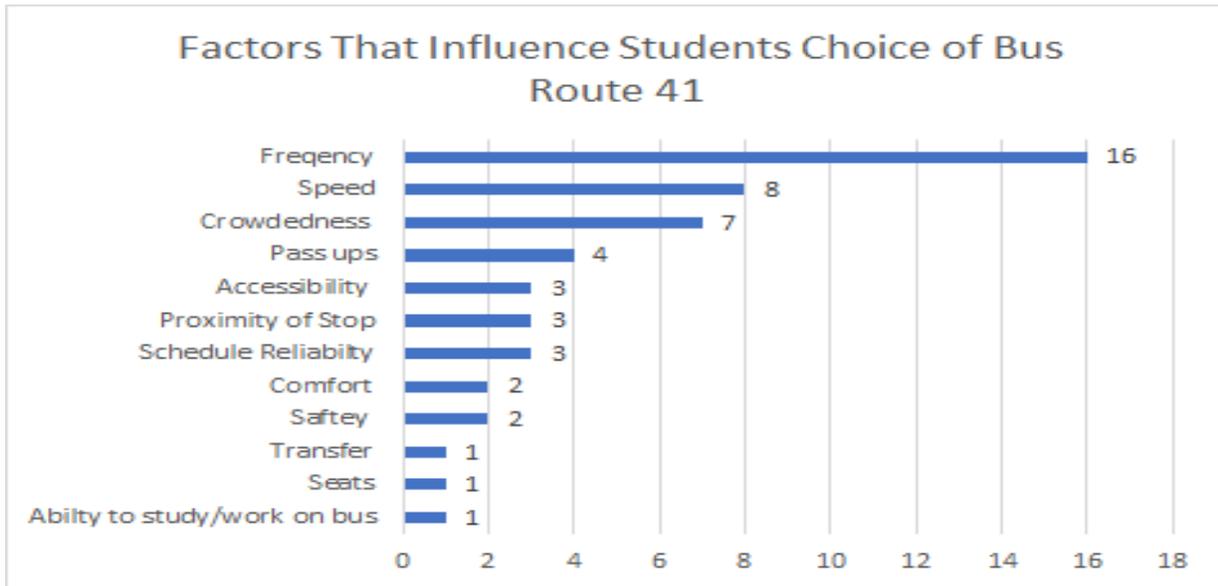
When asked what factors affect a transit users choice of transit, 16 respondents said that frequency of service was important to them. In the suggestions on how their transit service could be improved for their commute, two respondents noted the need for more frequent buses along the Bus Route 41.

C.4.3. Interviews

Frequency was cited as one of the most important factors for students when choosing a bus route (**Chart 16**). When one survey participant was asked what they disliked most about the Bus Route 41 they responded:

“The frequency [of the 41 bus route] is good on weekdays [but] not good on weekends. If I want to go to school on weekends, then I have to wait a long time. If you take the wrong bus on weekend it only stops at Crown and then you have to get off and take the 49 the rest of the way.”

Chart 19: Factors that Influence Students Choice of Using Bus Route 41



This user's experience looks at how the frequency of the route changes based on the time of the week as well as on weekends, when the bus runs less frequently and sometimes, a different route (which makes it difficult for those who live along the Bus Route 41 to get to campus). Another participant noted that they take the Bus Route 41 for convenience:

"I mostly take the 41 for convenience. All the bus routes from my house are a 15-minute walk. I could [take the] 25, 41, or 49. I usually take the 41, but will take the 49 if it comes to my bus stop first."

Findings about why respondents choose to take different routes are explained later in the report.

C.5. Quality of Experience

The quality of experience expresses the degree of satisfaction or dissatisfaction of the riders of Bus Route 41 service.

C.5.1. Observations

The total number of people boarding during our observations was 198 between the eight buses that were observed. It was recorded that 23 people were carrying extra bags. There was one person boarding with a skateboard onto the bus. As the research was conducted in cloudy or rainy weather, less students tend to ride the bus with bikes or skateboards. In the Vancouver during the winter months, most days are cloudy and/or rainy, so we should consider the impact of weather on transit users. One of our observers recorded a visually impaired student using a cane and recorded that schedule information at the stop is in small print and is possibly difficult to read which could affect their quality of experience. The waiting area is fairly wide, but other than, that no observations were

made about how accessible the bus area was for students with limited mobility (i.e. students using walkers or wheelchairs).

C.5.2. Surveys

The survey examined rider experience of participants, the results are in **Chart 15**. According to the survey results, more than half participants pointed out that overcrowding was a big issue for them when riding Bus Route 41, especially during rush hour. As the bus seats were limited, many passengers had to stand for entire commute, particularly participants living near campus. When bus was full, the driver would not stop at bus stops and some students were passed up by the bus while waiting at these stops.

C.5.3. Interviews

According to the interview results, being passed up by the bus is a big issue. One interviewee said that the bus had passed by them several times:

“I find that if I were to walk up one more stop earlier, I would usually get on to the [41]. When the bus passes me up it's usually at my stop or one stop before me, so if I walk to the stop before me, then I would be able to get on the bus easier or always get on the bus, but sometimes I'm lazy it's [the stop I use frequently is] a little bit closer.”

Another interviewee pointed out that they cannot often get a seat on Bus Route 41 as it is a standard sized bus. Another interviewee noted that there was no delays for them at the UBC Bus Loop, but when another student living in Kerrisdale Community went to UBC the bus was delayed sometimes. The same participant stated that they are not satisfied with the bus schedule that is on Google Maps. When they use Google Maps to check the bus schedule, it is often not accurate.

C.6. Temporal Experience

C.6.1. Observations

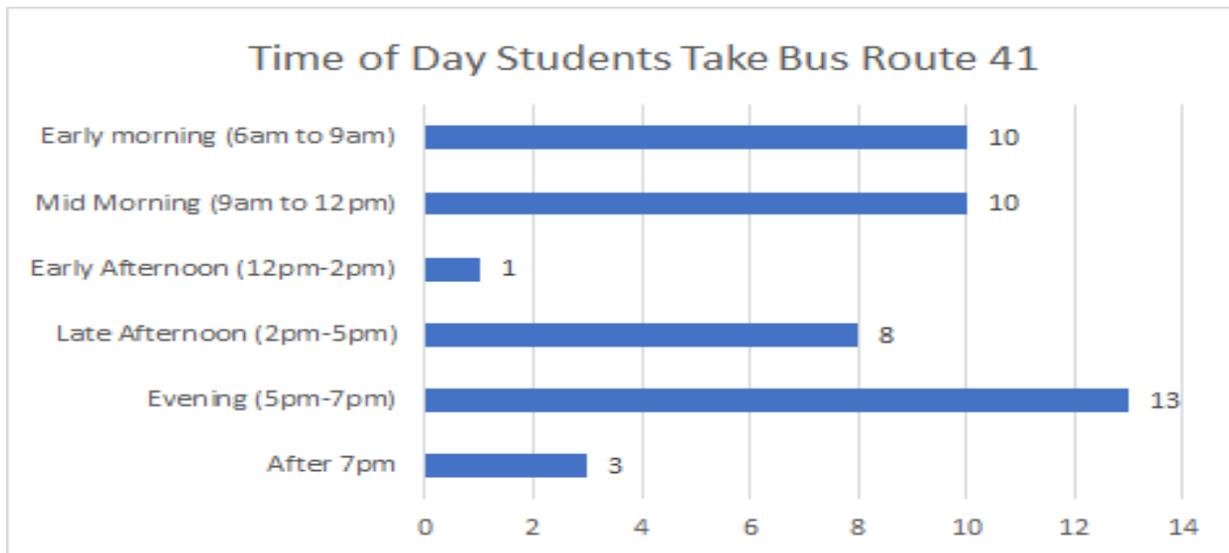
Observations took place during the week, 4:00 p.m. to 6:00 p.m. on January 17th to 19th, during the evening peak hours. It was observed that the earlier the bus was, the more passengers it had boarding. In one of the sets of observations, one bus was very late which resulted in the next bus only having 10 passengers, none of which who waited at the bus stop. Delays of buses can be contributors to overcrowding on Bus Route 41.

C.6.2. Surveys

As depicted in **Chart 17**, about half of the participants take the bus from home to campus between 6:00 a.m. to 9:00 a.m., with the same as during 9:00 a.m. to 12:00 a.m. More than half of students go home by taking the bus from 5:00 p.m. to 7:00 p.m. These three periods are the busiest time for Bus Route 41. Given that many survey and interview participants noted that overcrowding is an issue, it may be helpful to have larger buses

during peak times to accommodate the high volume of riders. Some students still take bus after 7:00 p.m. There could be some campus security phones (Blue Phones) around the bus stops ensuring students' safety.

Chart 110: *Time of Day Students Take Bus Route 41 to and from Campus*



C.6.3. Interviews

Interviewees often took Bus Route 41 to go to campus from 6:00 a.m. to 9:00 a.m.; similar to the results of the survey. The 41 bus runs late everyday, so for students who leave campus late (after 9:00 p.m.), they will take that bus. The night bus is not overcrowded and one interviewee said there is no problem finding a seat.

C.7. How People Choose Alternative Routes

Bus Route 41 shares many stops with the Bus Route 43, both of which along 41st Ave. However, Bus Route 43 is an express route, stopping at fewer stops and allowing for a quicker ride than Bus Route 41 between UBC and Joyce Station. Bus Route 43 is a possible alternative bus route for most 41 bus riders.

C.7.1. Observation

During the observation period, four of the eight buses had passengers switched to other bus stops. Of the 167 people waiting at the stops, only 8 passengers chose to switch to an alternative route. This indicates that most of the passengers who usually use Bus Route 41 have already decided to ride the route before arriving at the bus stop.

C.7.2. Survey

As we have shown in **Figure 7**, “frequency” gathered the most responses (16) among the factors that affect passengers’ choice of transit, followed by, “speed” (8), and “crowdedness” (7). However, according to **Figure 5**, “overcrowding” (14), “delay” (11)

and “speed” (11) are the main experiences passengers have when taking Bus Route 41. “Feeling unsafe,” gathered no responses under user’s experiences. Safety does not seem to be a major factor for passengers during their experience on Bus Route 41. However, “safety” was reported by two respondents (**Figure 6**) as a factor they consider when choosing a bus route. As for frequency, since the 41 bus and 43 bus depart UBC about with the same frequency (about every 10 minutes) the respondents may not compare the 2 buses in considering frequency, but may just consider the absolutely high frequency of the 41 route.

C.7.3. Interviews

What passengers value the most vary from interviewee to interviewee. Two respondents answered, “total travel time,” one answered, “proximity to the bus stop,” and one answered, “distance.” One who valued total travel time the most did not like waiting very long for a bus at the stop, did not want to transfer to another bus, and liked the bus that took shorter time to arrive at UBC. Although one participant lives the same walking distance to Bus Route 25, they choose the 41 to avoid more frequent pass ups:

“I don’t take the 25 because I know that by the time it gets to King Edward and Dunbar, which is where I would catch it, it passes up students even more frequently than the 41. So, I like to take the 41 for that reason”

These comments may be related to frequency, accessibility and schedule reliability, but, “accessibility,” and, “schedule reliability,” did not gather many responses as factors that affect riders’ choice of transit. The two who valued total travel time the most said that they walked between the bus stops and their homes. The all four interviewees actually said they walked between them. This can indicate that the proximity to the bus stop affects the choice of transit, but, “proximity to the bus stop,” did not gather many responses in surveys.

C.8. Incentives to Use Transit

C.8.1. Observations

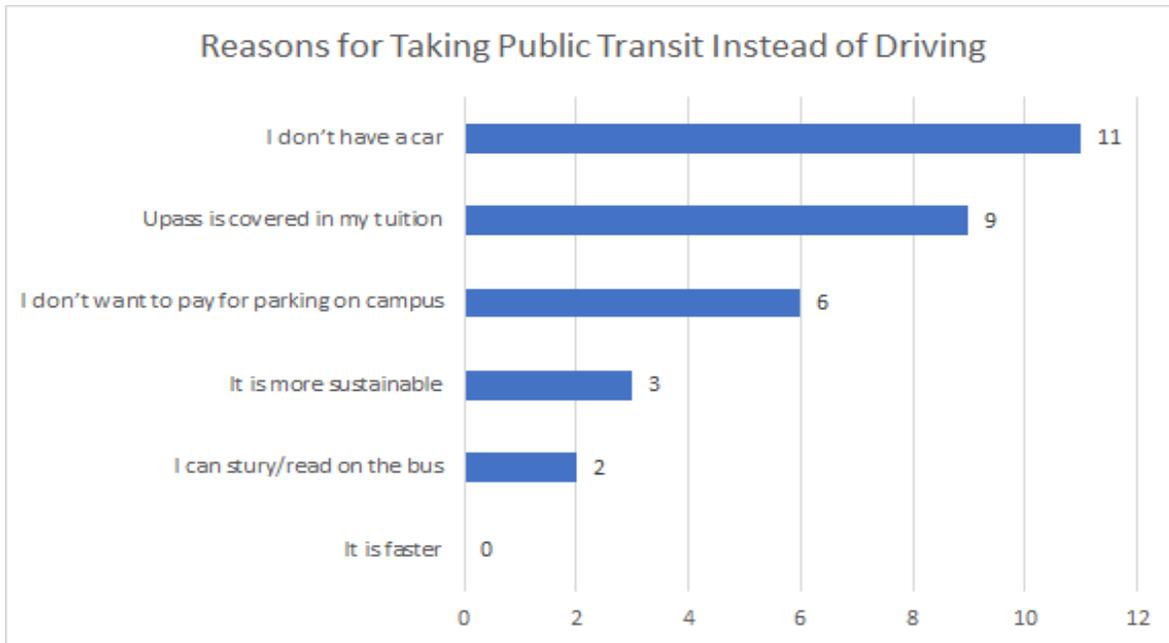
From our observations, 14.5% of the passengers who actually boarded a bus had one or more extra bags plus a backpack or a bag. This may indicate that most passengers have no more than one backpack or a bag in riding a bus, or that most students do not have to carry a big luggage. No one put a bike on the bus and only one passenger rode the bus with a skateboard. Through observation alone, it is hard to gain insight on users’ transit preferences.

C.8.2. Surveys

Passengers using Bus Route 41 seem to mainly have economic reasons for taking public transit. As the **Figure 8** illustrates, the most frequent response for the reasons students take public transit instead of driving is, “I don’t have a car,” (11), followed by,

“UPass is covered in my tuition,” (9), and “I don’t want to pay for parking on campus” (6). On the other hand, responses about sustainability were limited (3).

Chart 111: Reasons Students Take Public Transit Over Driving



C.8.3. Interviews

The result of our interviews coincides with that of our surveys. The all interviewees did not have a car and were enrolled in UPass covered by their tuition. Two interviewees said they did not have a driver license with the other two respondents stating that they are unwilling to drive because parking on campus was expensive. One said that driving cost too much for gas and insurance, in addition to the parking fees.

Another student felt compelled to use transit given the U-Pass was included in the cost of tuition:

“[The UPass]...is included [as part of]..my tuition, so I feel like I should use it. It's fairly convenient, but really it's my only choice.”

When asked why they prefer taking transit, another interviewee stated they preferred transit over learning to drive:

"I hate driving and I have no driver license. [I am] unwilling to learn, I don't know why, I just don't want to. The bus frequency is good, and [it] is good for people who don't have a license to get around Vancouver"

D. Analysis

Rider experience in our study includes the quality of experience, temporal experience and perception of service. Transit service quality is regarded as a mixture of convenience, cabin environment, and ease of use (Morton et al. 2016; Lai & Chen, 2011; and Chou et al., 2014). From our observations, survey, and interviews, student rider experience on Bus Route 41 is generally good. Public transport customers consider the vehicle's physical environment to be an important aspect of service quality (Morton et al. 2016; Lai & Chen, 2011; and Chou et al., 2014). Many respondents of the surveys noted that during peak times, the bus should be one of the larger models to reduce crowdedness. Although not exclusively mentioned by interviewees, the bus stop at UBC is not equipped with benches or bus shelter amenities that could contribute to rider satisfaction.

Delay has been cited as one of the main factors that affect riders transit use decisions (Nesheli et al., 2016). Second to overcrowding, our findings found that delay was experienced by over half of riders who use Bus Route 41, although this did not appear to affect their choice of transit. Trips with low initial wait periods and shorter walks are most popular (Eluru et al. 2012). Most of what was gleaned from the results of the study was that although riders' experience delays it did not affect their route choice, as route choice was mainly chosen based on convenience (short walking distance) or frequency.

Some factors going, "beyond traditional transit quality," shape riders' experiences on buses, such as on-board entertainment (Carreira et al., 2013, p. 241). This was not mentioned by any of the survey respondents or interviewees. However, two people noted in the surveys that they will study or read on the bus. One way of increasing positive user experience could be to equip buses with free wifi.

Overcrowding is another issue for students using Bus Route 41. Overcrowding is an essential factor associated with low travel satisfaction, which in turn creates dissatisfaction by causing systematic delays, higher levels of discomfort, and anxiety, as well as directly influencing users' choices of alternative routes (Tirachini, Hensher, & Rose, 2013). Based on the survey results, more than half participants pointed out that overcrowding was a big issue for them when riding Bus Route 41, especially during rush hours. The interviewees also considered overcrowding as bad riding experience in their trips. Some students also mentioned that as the bus seats were limited, they had to stand for entire commute, particularly those living near campus. Furthermore, when bus was full, the driver would skip stops and passengers waiting at these stops would be passed up by the bus. These two issues can be linked to overcrowding. Therefore, Translink should be encouraged to take action to make the bus less crowded, such as having bus with an extra train or even more frequent service during rush hours.

In choosing alternative routes, frequent users demand more information at bus stops related to waiting times, approaching vehicles, and seat availability (Grotenhuis et al., 2007); trips with low initial wait periods and shorter walks are most popular (Eluru et al. 2012). Reliability, especially in out-of-vehicle times, was found to be the most preferred

value for public transport users (Ceder et al., 2013, p. 121). In the case of Bus Route 41, the factor that influenced users' choice of the route was frequency: frequency shorten waiting time at the bus stop. The context of the interviews for Bus Route 41 uses also implied that users put importance on shorter walks between the bus stop and home. On the other hand, it is argued that multimodal public transport travelers prefer routes with overlapping modes, as they provide more opportunities to reach their destination (Anderson et al., 2017). However, it may not apply to Bus Route 41 users, most of who are its frequent users. According to our observations, few people switched to another bus route at the UBC Bus Loop.

Regarding the incentive to use transit instead of driving a car, there are identified several factors; (1) group service quality; (2) customer satisfaction (Chen, 2016); (3) perceived value -- based on a trade-off of perceived benefits and costs; (4) involvement--the level of interest or importance of a product or services (Lai and Chen, 2011). These factors seem to apply to the result in the surveys of Bus Route 41. Riders not having a car might be explained by, "involvement," and Upass coverage could be explained by, "perceived value." The result of the interviews particularly strengthens these points, as one interviewee showed satisfaction of service level of Bus Route 41 and another underscored the fact of the coverage in Upass which is included in tuition fees (perceived value). In addition to the above four factors, individual's mode of transport influences attitudes toward car and public transit use. To be specific, public transit-bicycle commuters who are considered a distinct commuter group, had more positive attitudes toward public transport use than public transit-only commuters (Heinen & Bohte, 2014). During the observation, there were some students bring their skateboards and bicycles. In the bus, the place for parking bicycles is limited, so the Bus Route 41 can be designed to have more space to store bicycles or skateboards.

E. Recommendations

The compiled qualitative research data is limited, as we only collected data from a small percentage of UBC student transit users. Something that AMS might want to take into consideration is posting a short survey on the UBC U-pass request page. This will increase the qualitative research data and allow for more concise answers with the potential to give more in-depth answers.

The UBC students surveyed/interviewed identified a range of areas for attention in relation to rider experience. Recommendations discussed include:

1. Provision of larger buses on Bus Route 41 during peak hours to limit crowdedness. Many respondents had noted due to overcrowding they had to stand the entire commute, making their trip uncomfortable;
2. Improvement of weekend service along Bus Route 41. Respondents said if they come to campus on the weekend there are longer wait times. If they miss a bus they will have to wait for the next bus;
3. Provision of better real time data of when buses are coming and if they are on time. This will limit the frustration passengers feel in these times of delay;

- Equipping buses with free wifi to improve rider experience. Students may be encouraged by the free wifi to check on and do homework, increasing their positive experience with transit.

Although there are limitations to our study, the findings are beneficial to improving transit riders' user experience. The findings will be transferred into actual transit improvements and changes. Additional study is also needed in many areas, such as the new B-Line Trains. Translink will be launching 4 new high-frequency B-Line bus routes. Service will cover areas in Langley, Pitt Meadows, South Vancouver, and North Shore by end of 2019. These new improvements will impact future directions such studies for AMS.

VI. Route #44 (UBC/Downtown)

Laura Hillis, Jacqueline Hunter, Jordan Konyk, Sarah Labahn, Maureen Solmundson

A. Context of the Problem

Bus route 044 is a popular and high-capacity route that connects UBC to Downtown Vancouver. Though TransLink data indicates high ridership, with 1,439,000 riders in 2016, quantitative data alone provides little understanding of UBC student experiences. Experience-based research reveals some dissatisfaction with this route and its infrastructure, which is valuable for the AMS to better advocate for service changes and improvements.

The 044 is a weekday-only express bus that connects Waterfront Station to UBC. With 14 stops, the route runs along Burrard Street through downtown, before following 4th Avenue and Chancellor Boulevard to UBC (**Figure 18**). The 044 serves the Seabus, both the Canada-line and Expo-line Skytrain, the West Coast Express and several bus connections, as well as the neighborhoods of Downtown, the West End, Kitsilano, and Point Grey. TransLink uses low-emissions diesel and diesel-electric hybrid articulated buses on the 044, which have maximum passenger capacities of around 50 (seated) and 120 (total) (TransLink, 2012).



Figure 18: Route 044

In terms of ridership, the 044 is in the top quartile of TransLink’s bus routes. With an average peak passenger load of 49, and 10% of revenue hours experiencing overcrowding, the 044 is a popular and busy route. The TransLink standard for “overcrowding” on an articulated bus is 75 passengers during peak periods. The 044 experiences elevated Westbound passenger load in the mornings, and elevated Eastbound passenger load in the afternoons, indicating travel predominantly to and from UBC. In response to it’s high ridership, TransLink increased the headways of the 044 from 10 and 15 minutes to 8 and 12 minutes in the morning and evening peak hours, respectively as of September 2017 (**Figure 19**) (TransLink 2016).

The 044 is not the only bus that connects to UBC along 4th Avenue. For much of the route along 4th Avenue, the 044 runs alongside the 084 and the 04 - both of which go to UBC. The 084 is an express bus that links UBC to VCC/Clark Station. The 084 has higher ridership than the 044, with over 2.7 million riders in 2016. Along 4th Avenue, the 084 stops at the same intersections as the 044. At peak times, the 084 runs at 5-6 minute headways. Unlike the weekday only 044, the 084 runs during weekends, evenings and holidays. The 04 is a non-express local serving bus that has more frequent stops along 4th Avenue. It connects UBC and Renfrew St. in East Vancouver through 4th Avenue, Granville St, and Powell St. While the 044 is not the only option for students living along 4th, it is one of the primary routes servicing the West End.

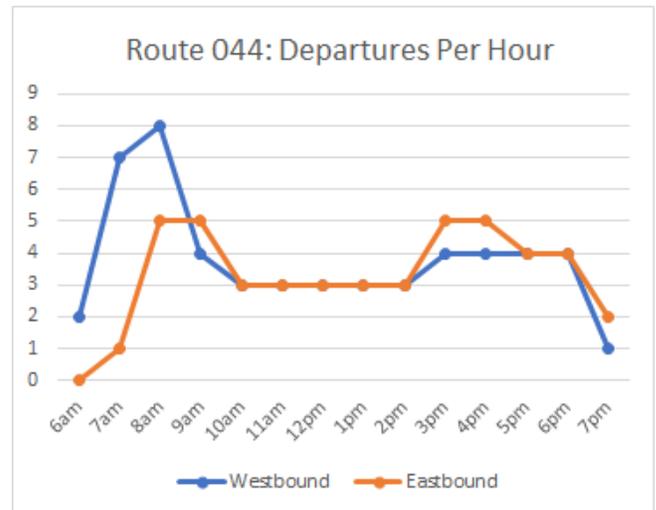


Figure 19: *Departures Per Hour*

An important factor in the context of this research is the location of the UBC stop for Route 044. Because of construction, the 044 stops at Bus Exchange Bay 3, located North of the Main bus loop on campus. It is set to remain here until mid-2019 once construction is completed. The immediate vicinity of the stop features narrow sidewalks and limited infrastructure, providing little shelter or light for students. The temporality of this bus stop provides a unique challenge for recommending actions to improve service and student experience.

B. Methodology

Following a literature review and analysis of existing research results provided by the AMS, primary data was collected using three methods: observation, surveys, and in-depth interviews (See **Appendix D, E & F**). A mixed-methods approach was used to identify travel experience behaviours such as feelings, thought processes, and emotions that may be difficult to grasp through quantitative method alone (Carreira, Patrício, Natal Jorge, Magee, & Van Eikema Hommes, 2013). Observational data provided a contextual

understanding of existing infrastructure, times, and patterns that may influence student travel experience prior to and after taking the bus; surveys provided a wide breadth for student experience on Route 044; interviews provided greater depth into travel experience and a deeper understanding of student travel behaviours while taking the bus. The results gathered from both the visual-spatial and verbal-textual methods identified several variables that influence student travel behaviours which informed the final recommendations.

Observations took place at UBC Bus Exchange 3 in the vicinity surrounding the 044 bus stop. Between January 17th and February 13th 2018, visual-spatial data was recorded a total of 17 times, adding up to over 5 hours of observations. Observations included notes on time of day, weather conditions, bus stop infrastructure, transit-user behaviours, and bus passenger counts of individuals boarding and unboarding the bus during peak hours (7-9am and 4-6pm). Observations were compiled into a spreadsheet and analyzed to identify patterns pertaining to external student experience from a participant-observation point of view. While observations provided a better understanding of the conditions around the bus stop during this time, it was not possible to distinguish between students, faculty, staff and visitors, suggesting that the results yielded from visual-spatial data may not be student-specific. Regardless of this limitation, these observations can provide valuable insights, especially considering infrastructure around this bus stop.

A total of 33 surveys were collected using two methods: intercept and online (see **Appendix G**). All intercept surveys were conducted around peak travel times in order to evaluate the performance of Route 044 when operating at its highest capacity. The surveys gathered both quantitative and qualitative data to gain a better understanding of the age, gender, location, frequency of use, and factors that students experience that may affect their choice of transit. The survey also included a section for general comments and recommendations to improve the user experience on the 044. One limitation for intercept surveys was the time constraint for students to complete the survey prior to boarding the bus. The online surveys were distributed via social media and direct email. Unlike the intercept surveys, there is a possibility that respondents had more opportunity to elaborate on some of the questions, assuming that there was less of a time constraint than those surveyed in person waiting for the bus. This being said, a limitation to the use of online surveys is the inability for participants to ask for clarification if any is needed. Generally speaking, the surveys yielded a broad range of results, however they were not able to distinguish between habitual and sporadic users of the 044. As a result, some responses may be completed by users whose common route is not the 044.

In-depth interviews were used to understand transit user experience and the various factors that influence student ridership. In total, 7 interviews were completed by students who had also previously completed the survey, and recruited either by the researchers personally or by indicating their willingness through the survey. All participants frequently used the 044 to commute to and from campus. One-on-one interviews were conducted

in-person for approximately 15-20 minutes with an opportunity for each interviewee to ask any questions or provide further comments regarding their transit experience.

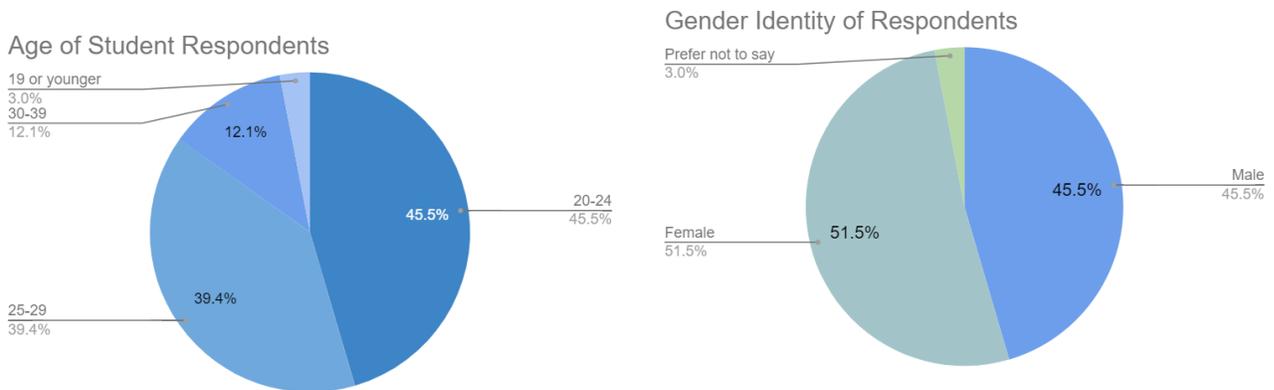
Qualitative data was coded based on the occurrences of the following key terms: crowdedness, comfort, proximity, convenience, frequency, reliability, delays, speed, pass-ups, transfers, and 044 versus 084. These codes were then analysed under the following broader themes: transit incentives, transit choices, quality of service and facilities, quality of experience, and perception of service. The findings and discussion follow in subsequent sections of this report.

C. Findings

C.1. Demographics

The majority of the surveyed students were in the 20-24 year age range (45.5%), with a sizable amount being in the 25-29 age range (39.4%). More than half of the survey participants were female (51.5%), with 45.5% being male, as well as 3% of respondents indicating that they prefer not to say or identify with other genders.

Charts 19 and 20: *Demographic Profile of Respondents, Age and Gender Identity*



C.2. Geographic Data

Figures 20 and 21 illustrate the dispersion of participants' home postal codes and the popularity of stops along Route 044. Figure 4 is a heat map of the first three digits of survey participants' postal codes, with the darkest blue indicating 6 participants, and the lightest blue indicating 1 participant from the postal code area. This clearly shows a high number of survey respondents originating in Kitsilano and, to a lesser degree, the West End, while it also demonstrates that the origins of Route 044 riders extends to North Vancouver, Surrey, and even Langley. To complement this, Figure 5 illustrates the stops that are most frequently used to board and deboard the bus. After UBC, stops in Kitsilano

are most popular, followed by Georgia St, which connects to other bus routes, as well as Waterfront Station, which connects to the Seabus, Canada-line, and Westcoast Express. This supports the findings from the heat map, indicating that people use the 044 as a connector to regional transit options.

Figure 20: *Student Respondents by Postal Code (first 3 digits)*

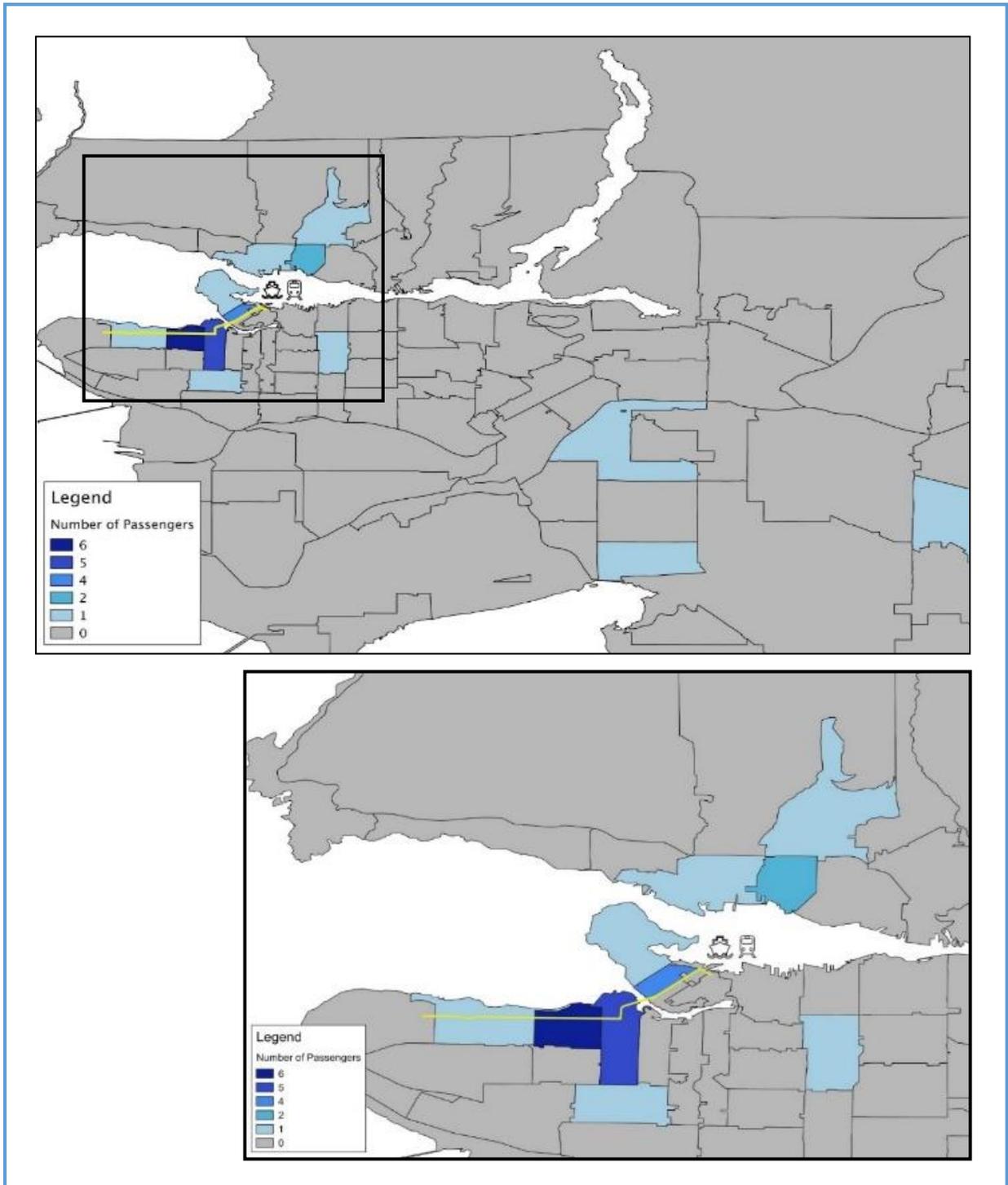
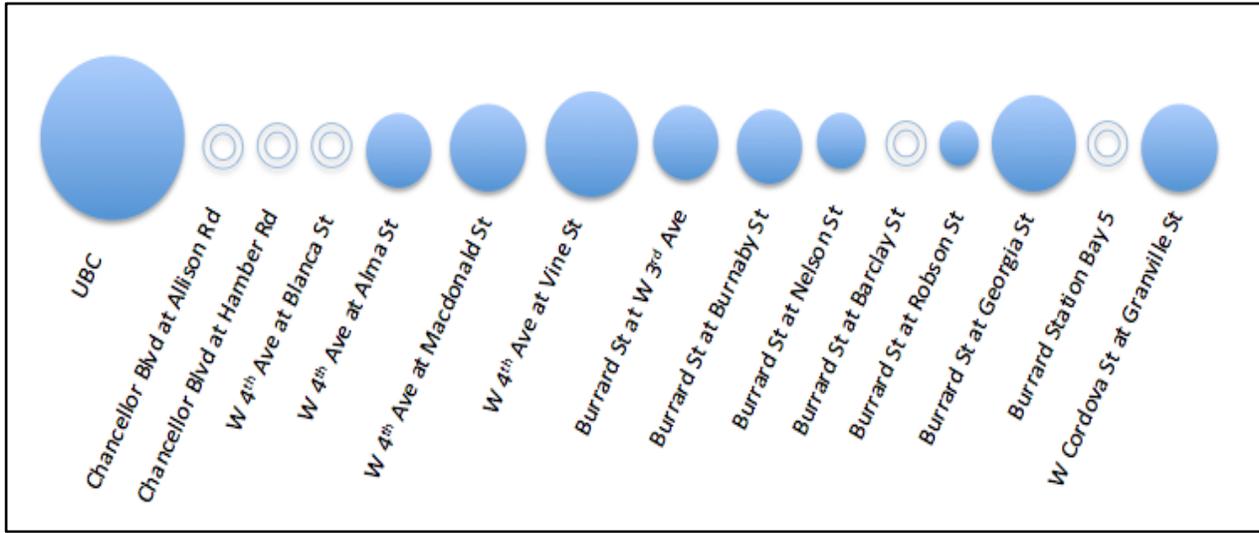


Figure 21: Popularity of Stops



C.3. Factors That Affect Student Choices

Notably, while 53.1% of respondents indicated that they travel to campus 4-5 days a week, only 34.4% indicated that they take the 044 bus route 4-5 days a week. This suggests that some students are not exclusively taking Route 044 to get to and from campus. This could be explained by the lack of Route 044 service on weekends, or it could indicate student dissatisfaction with the route, prompting them to take other routes or modes of transit. Many factors may have an effect on student satisfaction with transit experience, so our study aimed to understand which factors are most important.

In the 2017 UBC Transportation Survey, commuters were asked what would increase their likelihood of travelling to campus by public transit more often: “about six-in-ten mentioned shorter travel times (60%) and less overcrowding on buses (58%). Over half (52%) also mentioned increased frequency of service” (2017 UBC Transportation Survey, 19). These findings are consistent with the results yielded from the verbal-textual data that was collected for Route 044. Below is a summary of the factors that influence students’ decision to take public transit, according to surveys and interviews.

Charts 21 and 22 illustrate the range of issues that were identified as key concerns in the surveys and interviews. Although the themes remained the same, the results varied slightly with each method. For instance, in the survey results, the most popular characteristics described were crowdedness (52 occurrences), comfort (45 occurrences), speed (44 occurrences), and frequency (39 occurrences). However, for the interview participants, the most frequently cited characteristics were the comparison between the 044 and 084 (26 occurrences), followed by frequency (18 occurrences), as well as pass-ups, reliability, and crowdedness (14 occurrences each). The difference in the results demonstrates that each method yields a distinct response, depending on the

circumstances. While surveys capture more information but perhaps fewer nuances, in-depth interviews allow for more consideration and elaboration. These results will be discussed more thoroughly below.

Chart 21: *Transit Behaviour and Characteristics Described During Surveys*

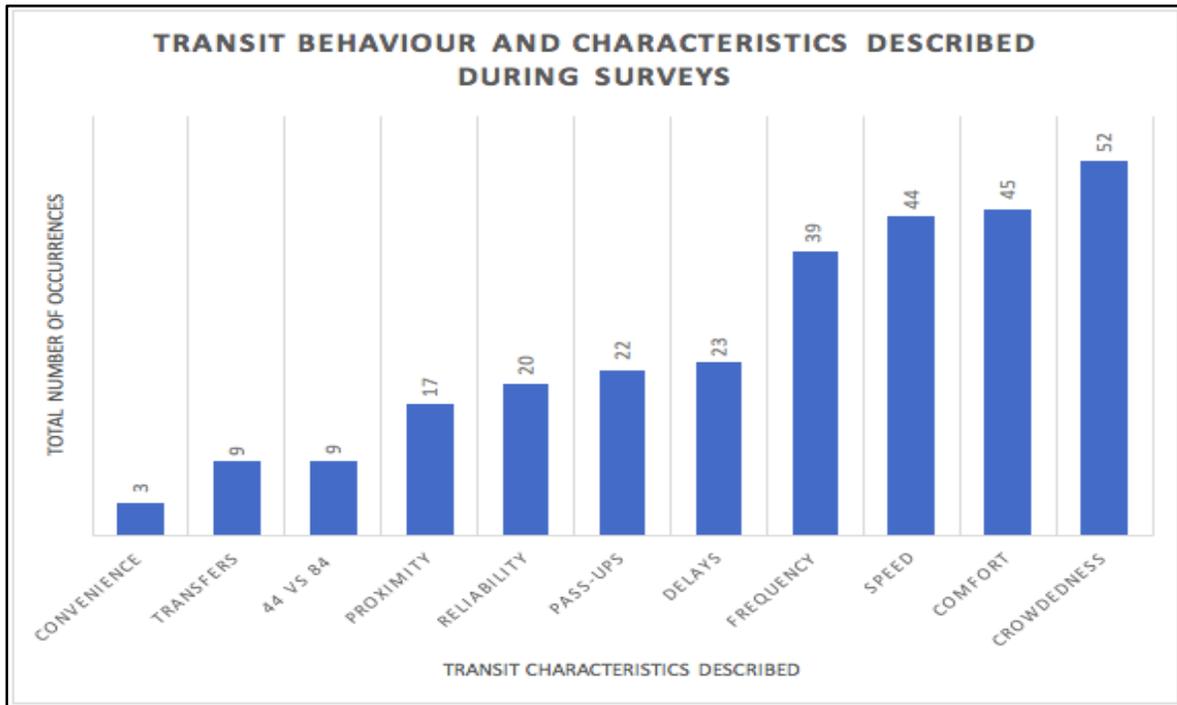
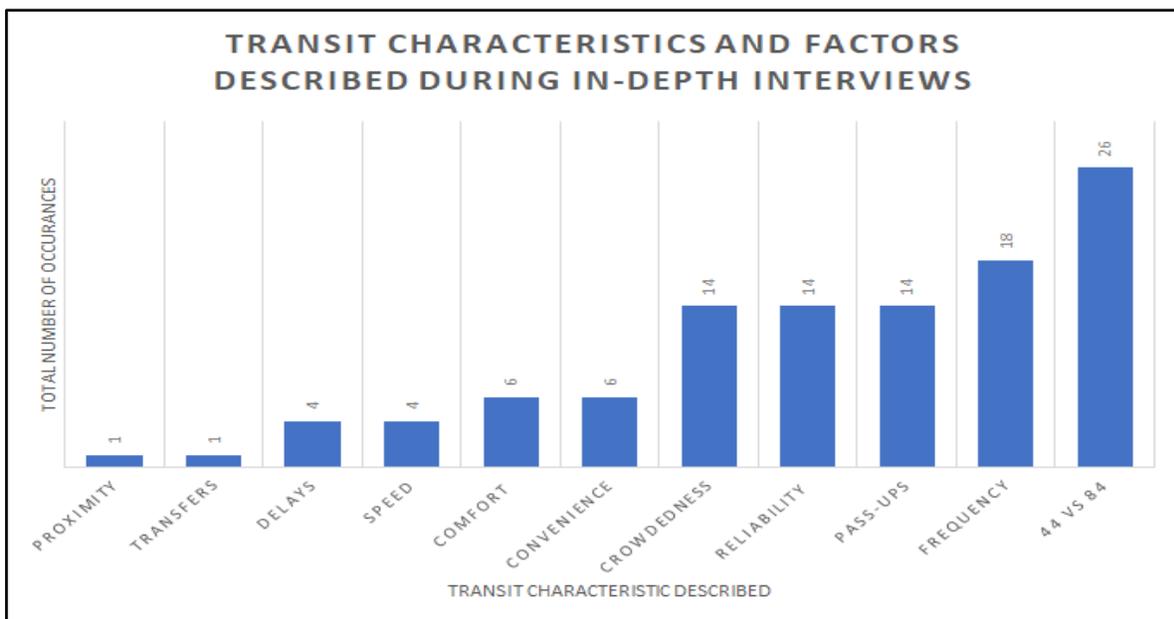


Chart 22: *Transit Behaviour and Characteristics Described During In-Depth Interviews*



D. Analysis

Based on the results yielded from both visual-spatial and verbal-textual research methods, various themes emerged including: transit incentives, quality of experience, quality of service and facilities, and perception of service.

D.1. Transit Incentives: Understanding Why Students Choose Public Transit

Researchers have found that public transit use can increase with interventions and incentives, such as free bus tickets, which can change the habits, attitudes, and travel modes of users (Bamberg et al. 2003; Fujii & Kitamura 2003). The cost of a parking pass at UBC starts at \$358.00 per semester or \$96.50 per month, while the U-Pass costs students \$41.00 per month. The relative affordability of public transit provides an incentive for UBC students to choose transit over driving. To support this, 57.1% of survey respondents listed that they use public transit because the student U-Pass is included in annual tuition fees. Moreover, 60.7% of respondents expressed that they did not want to pay for parking on campus.

“Coverage for the Compass card definitely encourages me to use the bus.”

A slightly smaller proportion of surveyed students (42.9%) also indicated that they use public transit for sustainability reasons, with two interviewees expressing the importance of public transit as a way to travel sustainably and economically. For example, an interview participant said they value public transit because “I don’t have to pay for parking, plus it’s better for the environment.”

Although transit incentives such as the UPass, cost of parking, and environmental benefit affect student decisions, these incentives were not identified as the most important issue to respondents. In fact, the quality of service and quality of experience were mentioned more frequently, suggesting that if the quality of service or experience is negatively perceived, students may opt to choose another route or mode of transport. For example, one interviewee expressed the importance of reliability over the cost of parking, stating that “if I know I have to be [on campus] by a certain time, to TA a midterm for example, I will often choose to drive because I want to ensure that I won’t be late.” This emphasizes the importance of advocating for improved quality of experience and quality of service to ensure that students continue to take transit over less sustainable modes of transport like driving.

D.2. Quality of Experience

According to Carreira et al., experience factors are defined as “customer perceptions of all aspects of a product or service that contribute to the customer experience” (2013:234). These experience factors were the most prominent themes that appeared throughout all methods of data collection, including comfort, reliability, cleanliness, ability to study, and more. When these factors are positively experienced, the overall experience is often viewed as being satisfactory and encourages customers to use the service more

on future occasions. Conversely, when these factors are experienced negatively, they can drastically influence an individual's transit behaviours.

The majority of the surveyed students deemed speed (93.8%) and frequency (87.5%) to be the most important factors that impact their transit decision making process. These findings may indicate that students are choosing Route 044 because it is both an articulated and an express bus, meaning it performs at a higher capacity and along an expedited route between Downtown and UBC (TransLink 2014B). In fact, one surveyed UBC student wrote that the 044 bus is the “most accessible and fastest route from Downtown Vancouver.”

Participants in our interviews and surveys also expressed frustration with delays and reliability. One interviewee stated that “reliability is the most important” to ensure that they arrive to their classes or other obligations on time. More than two-thirds of survey respondents (71.3%) indicated that they experience delays at least once a week. Throughout the interviews, reliability was a recurring theme, because students are required to be somewhere by a certain time, especially for those who use the 044 as a connecting route from the Waterfront Skytrain station or SeaBus.

“Crowdedness is really annoying”

The survey findings indicated that a large majority of respondents perceived ‘crowdedness’ to be a common problem on Route 044. Several interview respondents mentioned that the 044 is crowded as it begins downtown at Waterfront Station, connecting at Burrard Station, passing the hospital, and continuing along 4th where there is a high percentage of student riders. Some stated that they “get passed often” while others specified being passed-up especially in the morning peak hours.

Similarly, each interview participant mentioned, at least once, frequency, reliability, and crowdedness as key factors that influence their decision to take the 044. Crowdedness also drives comfort as it can affect one’s ability to get a seat on the bus, as well as one’s ability study or read during a transit ride. As such, comfort came up as the second most coded term in all of the survey responses, right behind crowdedness. For instance, interview participants expressed many common sentiments regarding crowdedness and comfort: “the buses are too crowded,” “[the bus] can get overcrowded fast and it has passed me often in peak times,” “if you don’t get to the bus stop before a certain time (as in before the half hour of the hour) you won’t get on the bus.”

D.3. Quality of Service and Facilities

Although responses regarding the quality of services and facilities was not as common overall, external facilities surrounding bus stops can influence student experience before and after taking transit. The photo illustrates a long line, without shelter, in good weather conditions. (Figure 21)



Figure 21. Long Line-Up for Bus 044

With regards to quality of service and facilities, what stood out most in observations was the lack of bus shelters. The UBC bus stop for route 044 only has one small shelter with one bench. When there are line-ups for the bus, which occurs often

during peak hours, students and passengers have to line up to board the bus without shelter or protection from weather conditions. Whalen et al. (2013) demonstrated that good-quality shelters at transit stops improve travel and physical comfort, thereby increasing the probability that students will take transit. In a city where it rains often, a covered waiting area would help make the passenger experience more dry and enjoyable.

Another observation made was the lack of real-time bus information at the UBC Bus Exchange Bay 3. While there is a Route 044 schedule posted at the stop, it does not communicate delays in real time, nor is it exceptionally user-friendly or noticeable for new users of Route 044. Considering the number of participants that emphasized the importance of frequency and reliability, the use of real-time transit data would help reduce perceived wait times while increasing customer satisfaction and safety (Watkins et al., 2011).

D.4. Perception of Service

Perception of service refers to the discrepancy between what people feel they experience and what actually occurs. Throughout our interview, survey, and observational data, discrepancies arose regarding crowdedness and delays. One survey respondent noted that “when I first started taking the 044, I thought the frequency had been increased but it doesn’t seem like it has in reality. This is frustrating when the buses are clearly at and over capacity during peak hours.” However, TransLink did in fact increase headways for the 044 in September 2017 from 10 and 15 minute to 8 and 12 minute intervals during peak hours (TransLink 2016). While crowdedness was one of the most frequently coded

complaints in the surveys and interviews, our observational data found that only 2 of 17 observed buses were officially “crowded” according to TransLink’s official crowding guideline of 75 people during peak periods (TransLink 2014A). This reveals that individuals may have a different perception of crowdedness -- perhaps classifying a bus without available seats as crowded. Similarly, while more than two-thirds of survey respondents (71.3%) indicated that they experience delays at least once a week, only two out of 17 observed buses were delayed by more than 5 minutes. These two instances occurred during peak hours, between 4:30 – 5:15 PM.

Researchers Nesheli et al. (2016) found that delay time can greatly impact an individual’s decision to use transit. One negative experience can colour a user’s opinion of a particular bus route and can outweigh average or positive experiences on that same route. As noted, installing real-time digital bus times at UBC bus stops would help to resolve misconceptions about delays, and improve student perception of reliability. Improving stop related service with travel information and waiting times might increase user satisfaction, as well as attract new transit users.

D.5. Comparing 044 and 084

A common observation throughout this research was the comparison of service between the 044 and the 084. A significant portion of the 044 route overlaps with both the 04 and the 084 along West 4th Avenue (as previously described). Although these three routes are slightly different, a large portion of all three routes is along West 4th Avenue to UBC. The comparison between express routes 044 and 084 was mentioned over 26 times during the interviews, particularly in relation to quality of experience, quality of service, and perception of service. When students have more options, small experiences and observations can make a large difference in the satisfaction of student experience.

The following quotations from interview respondents exemplify this comparison:

- *“I prefer to take the 084 over the 044 because it runs more frequently both going to and coming home from campus.”*
- *“The 84 is much more frequent than the 44.”*
- *“If I had to eliminate the 084 bus route or the 044 bus route, I would eliminate the 44 because it’s less frequent. But it’s good that it comes because it supplements the 084.”*

Because a large proportion of respondents live in the Kitsilano neighbourhood, these users likely have the choice between the 084 and the 044 when commuting to and from school. This makes the 044 and the 084 supplementary routes and allows students living within proximity to West 4th Ave to have greater choice in the route that they take to campus. However, for those living downtown or those who are required to travel downtown to connect to another service, their choices are much more limited. The 044 is

thus still very necessary for the many UBC students who live in or have to travel through Downtown as part of their commute to school.

E. Conclusions and Recommendations

Throughout this report, we have attempted to understand the patterns, experiences, and preferences of students taking Route 044 when commuting to and from UBC campus to help support AMS advocacy in the future.

E.1. Study Limitations

Although this study successfully captured information to understand the experiences of students taking Route 044, there are a few notable limitations to the research. These limitations include a small number of respondents as a result of the 8 week time constraint for the research project. Because of this, a focus group was not possible, although this method would have helped highlight the degree to which different factors and experiences are ranked among students. For this reason, any recommendations should be sent out for further feedback to ensure feasibility of proposed actions. A limitation of the survey design is that it asked respondents to list the factors that influenced their use of transit, instead of ranking them. A ranking or scalar response would have perhaps led to a clearer picture of the more significant factors that are influencing user experience. Additionally, this research was unable to capture the difference between frequent and infrequent users of the 044. The data also does not differentiate the various reasons why students are choosing to take the 044 or not, which could be a wide range of reasons including academic, professional, personal, and domestic responsibilities. Further research would benefit from this distinction.

E.2. Recommendations

There are several reasons that students either choose or refuse to take Route 044. These include transit incentives like cost and sustainability; quality of experience such as comfort, crowdedness, frequency, and reliability; and quality of service such as infrastructure bus stops. Because transit choices are complex, each one of these factors influences a student's decision to use public transit differently. Based on the information presented throughout this report, there are five notable recommendations taken from literature-based analysis and directly from participant suggestions. As the researchers are students and users of the 044 themselves, some recommendations are also derived from personal experience.

1. **Increase frequency:** Frequency was the second most important factor that affects survey participants' choice of transit. By increasing frequency, some of the issues that were identified regarding reliability, delays, pass-ups, comfort, and crowdedness may be mitigated.
2. **Expand route to include weekend service:** Survey results revealed a discrepancy between the number of times students take the 044 to and from

campus and the number of times they come to campus each week. There could be a number of explanations for this, including participants' occasional preference for another route, or changes in their destinations due to work or social commitments. Though this requires further research, one reason for this discrepancy could be the lack of weekend service for Route 044. Initiating weekend service, even if as infrequently as twice an hour, may help students reach campus outside of the regular school week. Further research is encouraged to understand and gauge the interest of expanding the service to include weekends.

3. **Improve infrastructure near the bus stop:** While the temporality of the bus stop at UBC Bus Exchange 3 provides a financial barrier to improving the surrounding infrastructure, it is recommended that the following infrastructure be considered when Route 044 changes to a permanent stop:
 - a. **Include a drop-off only stop:** from observational data, there are slight delays during morning peak hours as there is a large number of students deboarding the 084 (which stops at UBC Bus Exchange 2) and as a result, the 044 may experience delays waiting for these students to clear the road and drop off students at Bus Exchange 3. Dropping students off at a stop that does not conflict with other deboarding passengers may mitigate this delay.
 - b. **Rain shelter:** the lack of shelter around the bus stop can lead to student discomfort in harsh weather conditions like rain and snow, which are common in Vancouver. The shelter should consider where students form a line while waiting for the bus and ensure coverage in this area.
 - c. **Lighting:** Although safety was not a frequently cited concern, improving lighting near the bus stop can provide a greater sense of comfort for students, especially at night. Lighting would also be beneficial to students with mobility or sight differences.
 - d. **Live and up-to-date digital bus information.** This recommendation comes directly from a survey respondent's suggestion, which emphasized the need for real-time bus information "outside of SkyTrain stations, major bus hubs, and on campus, so that students are more aware of when the bus arrives without having to take out phones to check the schedule." This would decrease misconceptions about bus schedules and improve student perceptions of bus reliability.

Using a mixed methods analysis, this research has examined the travel patterns and experience of UBC students on Route 044 (UBC/Downtown). The recommendations listed above will help inform AMS advocacy, as well as improve the transit service and overall experience of frequent and infrequent students users of the 044 bus route. These conclusions also aim to increase the percentage of UBC students who choose public

transportation over less sustainable travel modes like driving and carpooling. These recommendations align with AMS transportation and sustainability goals and should be thought of within the broader context of the research findings of all seven study groups involved in this project.

VII. Route #49 (UBC/Metrotown)

Sean Bailey, Desiree Givens, Cody Kenny, Robbie Knott, Halina Rachelson & Lily Raphael

A. Context

This study will evaluate the travel patterns of students who travel to UBC daily, specifically for the 49 (Metrotown-UBC) bus route, one of the six major bus routes connecting the UBC Point Grey campus to the rest of the region. Information gained includes the length of commute, transit choices, interface between other modes of transportation with the 49 bus route and reasons governing students' choice of taking the 49.

The 49 bus runs from Metrotown Station to UBC through 67 stops and is twenty two kilometers in length. It serves four neighborhoods: Metrotown, Victoria-Fraserview, Oakridge, and Dunbar. Unique to the 49 bus is that it bypasses Westbrook Village, unlike the 43 and 41 which run a similar route making it a more direct route to the city. It has a few stops along SE Marine Drive, providing the opportunity for some individuals who park along Marine Drive to take the bus the remaining distance to the UBC bus loop.

In addition to traveling to UBC, this bus line is also popular for individuals commuting into the city for work and for other students attending Langara College, making it especially crowded during peak hours. Further, the 49 is experiencing increased popularity as it has experienced a 4% increase in ridership over the previous five years.

As the goal of public transportation planners and advocates is to ensure that the local transportation meets the needs of the populations they are servicing (Shay et al 2016), this research is significant in that it will capture the experience of student ridership on the 49 route in order to inform how AMS can advocate for improved public transit to and from campus on behalf of the UBC student population.

Figure 22. Map Route of Bus #49



B. Methods for Data Collection and Analysis

We engaged in **participatory observation** to gather data regarding the general characteristics of the 49 bus route. (See **Appendix D**). To gain an understanding of the typical volume of ridership during peak hours, we counted how many riders were getting off the bus arriving to UBC in the morning, and getting on the bus to leave campus in the evening. This was done for a total of 15 minutes in both the morning and afternoon, with 5-minute intervals or a total of 3 buses. Additionally, we rode the bus to gain an understanding of the experience en route and collected observational data at certain stops regarding what passengers were doing and how their mood appeared to be when they were waiting for the bus. We also photographed these moments of observation to capture a better sense of student’s perceptions of public transit.

After gaining initial observational data, we began to conduct **surveys** and **individual interviews**. (See **Appendix E & F**). In total, 44 students responded to our survey. The criteria for selecting students were as follows:

- Passengers needed to be UBC students
- Passengers needed to be regular riders of the 49 bus route

The means by which survey data was collected included the following:

- 2 online surveys
- 20 individuals were given the survey to fill out while waiting for the 49 bus to arrive
- 22 individuals were questioned by student surveyors while waiting for the 49 bus to arrive
- 10 individuals were provided an intercept survey of three-questions

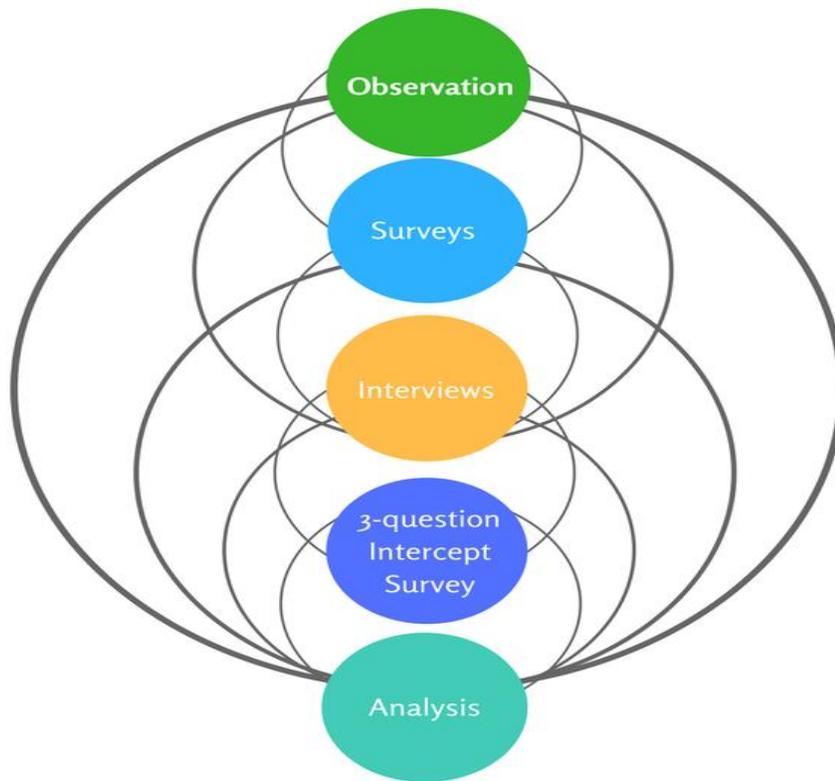
Limitations and challenges arose for some of the surveying methods. It was challenging to read some of the handwriting for surveys filled out by participants, and due to the lengthiness of the survey, we acknowledge that participants may not have been reading the questions carefully. When surveying and recording individuals' answers, participants were often notably anxious about making sure they did not miss their bus, and were only able to provide one-word answers. In both intercept scenarios, survey participants were waiting for the bus, which comes roughly every 5 minutes during peak hours. As students were responding they were clearly feeling rushed to complete the survey in order to board the arriving bus. In such a setting, their responses may not be as carefully considered as they would have been had they not been in a hurry.

From the survey respondents, we conducted seven (7) **in-depth interviews** to gain further insight about individual student riders' experiences. Two interviews were conducted by phone and five were done in person. The interviews lasted approximately twenty minutes. We either recorded and then transcribed the interviews or took notes while the interviewee was speaking. The interviewees were given gift cards to the AMS Nest as a gesture of appreciation for their time.

To verify the stories related to us by the interviewees, we went out again to gather more **observational data**, replicating some of our participants' travel patterns to further understand what they experience on a regular basis when transiting to and from campus. A brief follow-up **three-question intercept survey** was also administered in the hopes of providing clarity to our previous qualitative data.

The interviews and survey data were coded according to certain words and concepts that were brought up repeatedly, such as "convenience", "crowdedness", and "speed". The coding included information, such as positive and negative insight, relating to each topic. Following this organization, the findings were then sorted according to themes which guide the format of the Findings portion of this report.

Figure 23. *Iterative Research Process*



As visualized in **Figure 23**, the research process we used was iterative in nature with the individual research tools informing one another. Each step in the research process served to reinforce certain findings from previous methods or identify gaps in the research design, which inspired deeper investigation through a different method and led to more a detailed analysis.

C. Findings by Method

C.1. Observational Data

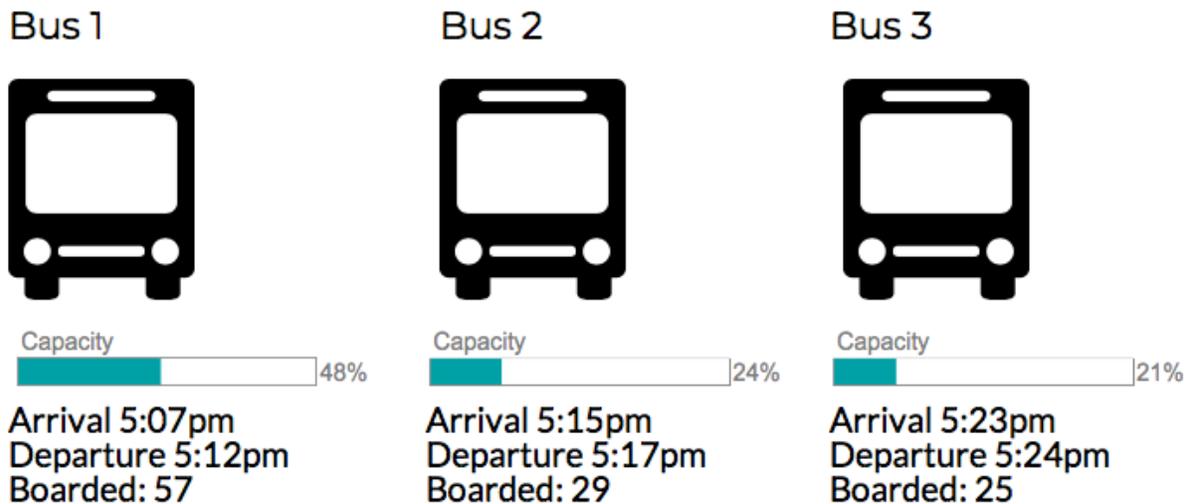
Our data collection began with observations about 49 pick-up and drop-off at UBC. At different times of the day, we counted how many passengers were either boarding or de-boarding the bus. From these observations, we noticed that peak hours were significant time windows for 49 bus ridership and that the buses came very frequently. Between the hours of 7:00 am and 9:00 am, the bus comes once every 4 - 7 minutes, with the most frequency occurring around 8:00 am. The afternoon peak hours have the same frequency with a bus departing once every 4 - 7 minutes, and with the most frequency occurring at 5:00 pm.

We made observations on three separate occasions. First, we observed people as they boarded the afternoon bus from campus. Second, we observed the arrival of the bus to campus in the morning. Finally, we went out one more time to conduct additional observational data collection at a mid-route location. Our results have been sorted by the time of day and location we conducted our research.

C.1.2. Afternoon Peak Hours - Departing from UBC

First, we counted the number of people boarding the bus between 5:00 - 5:30 pm. As the infographic below shows (**Figure 24**), even during peak afternoon hours, the 49 bus does not leave campus already at full capacity (120 people). However, collecting data at other stops on campus may have shown otherwise.

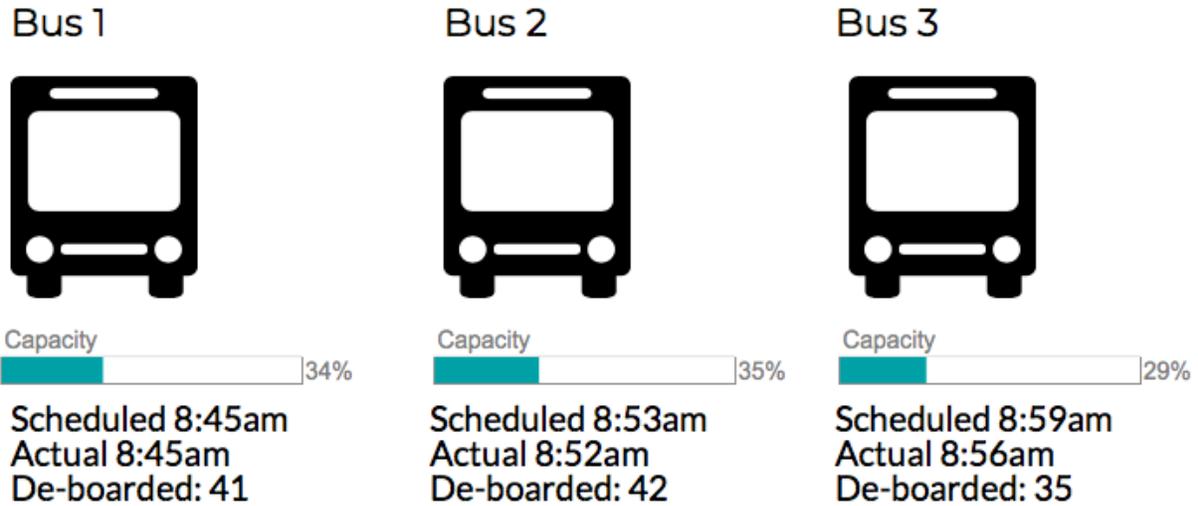
Figure 124. *Afternoon bus departures from UBC*



C.1.3. Morning Peak Hours - Arriving to UBC

Similar to our afternoon results, the buses arriving to campus in the morning were not nearly as crowded as we were expecting. (See **Figure 25**). Again, counting the number of people de-boarding at other stops on campus would have been useful. What this data does tell us, however, is that the 49 is frequent, with one arriving every 5 minutes (on average). It also shows its reliability, in that the bus arrives within 3 minutes of its scheduled arrival time.

Figure 25: Morning Bus Arrivals to UBC

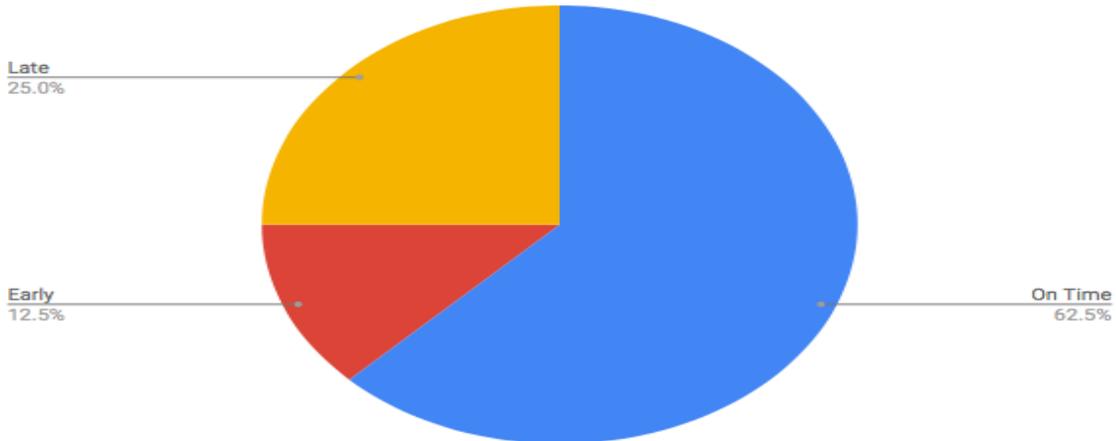


C.1.4. Morning Peak Hours - 49th Avenue and Main Street

After conducting surveys and interviews, our group went out once more to collect observational data in order to validate the claims that students were making about being passed up towards the middle of the route. Between 9:00 am and 10:00 am, we observed 9 UBC-bound buses at the 49th Ave. and Main St. stop. (See **Chart 22**). Although we did not witness any students being passed up, we did note that every bus was near full-capacity. The bus that arrived at 9:09 am had the full-capacity sign turned on, but still picked up students at this stop (7 people de-boarded, 2 people boarded).

Chart 22: Timeliness of UBC-Bound 49 bus, Morning

Timeliness of UBC-Bound #49 Morning Bus - Mid-Route



In terms of the timeliness and frequency of the 49, we observed that the bus was on-time more than 60% of the time. However, overlapping occurred a couple times within the hour, where two buses would come one right after the other due to one running behind schedule and/or the other one running ahead of schedule. **Table 8** below illustrates this.

Table 8: *Scheduled Time vs. Actual Time of 49 at 49th and Main St.*

Scheduled	Actual
9:05	9:09
9:11	9:10
9:17	9:15
9:23	9:23
9:30	9:29
9:36	9:30
9:42	9:45
9:48	9:51

Red shows where there is overlapping

One limitation of the observation method was that we were unable to distinguish between students and other riders of the bus route. Initially we thought that a backpack would be a useful indicator in telling whether or not an individual was a UBC student. However, we learned that this accessory is not a guaranteed way of determining whether or not a rider is a student, as many other people traveling to UBC, such as professors or staff members, may also use backpacks. Additionally, with such a large number of individuals arriving to campus in the morning, it was difficult to filter out those who were not wearing backpacks. Therefore, to capture the significance of the 49 bus, we ultimately counted the total number of people de-boarding, which we can presume were mostly students.

C.2. Survey Findings

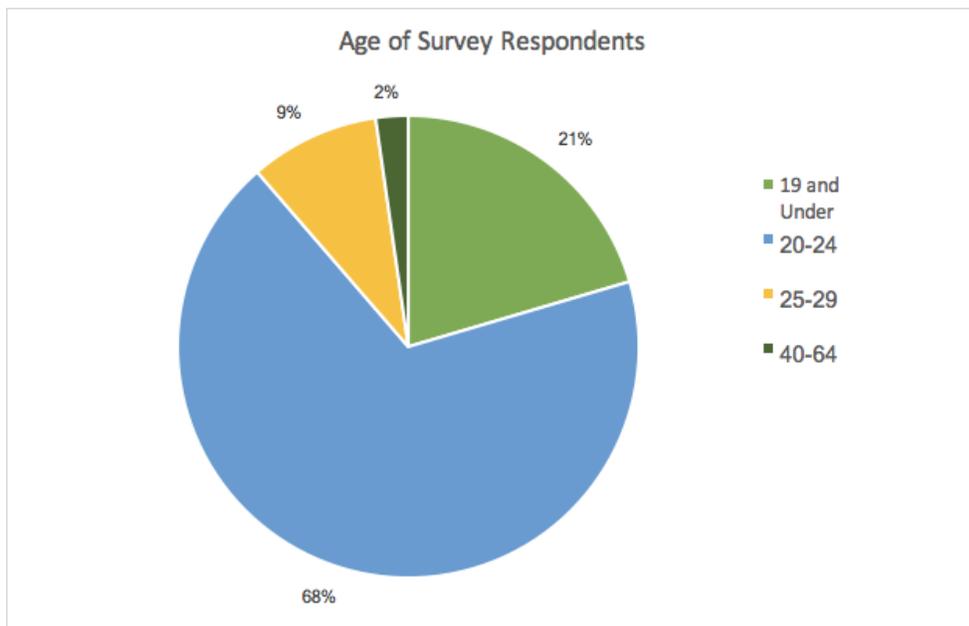
In this section, key findings from the survey are presented. First, general survey respondent characteristics will be represented, followed by respondents' experience taking the 49 and transit choices and values.

C.2.1. General Survey Respondent Characteristics

The following information was collected to help further understand the riders and their travel characteristics. We gathered data from the surveys on age, how often the riders came to campus, how often the riders used the 49 route, what time of day they used it, and what area they lived in.

C.2.1.a. Age

Chart 23: Age of Survey Respondents (n= 44; 100% response rate).

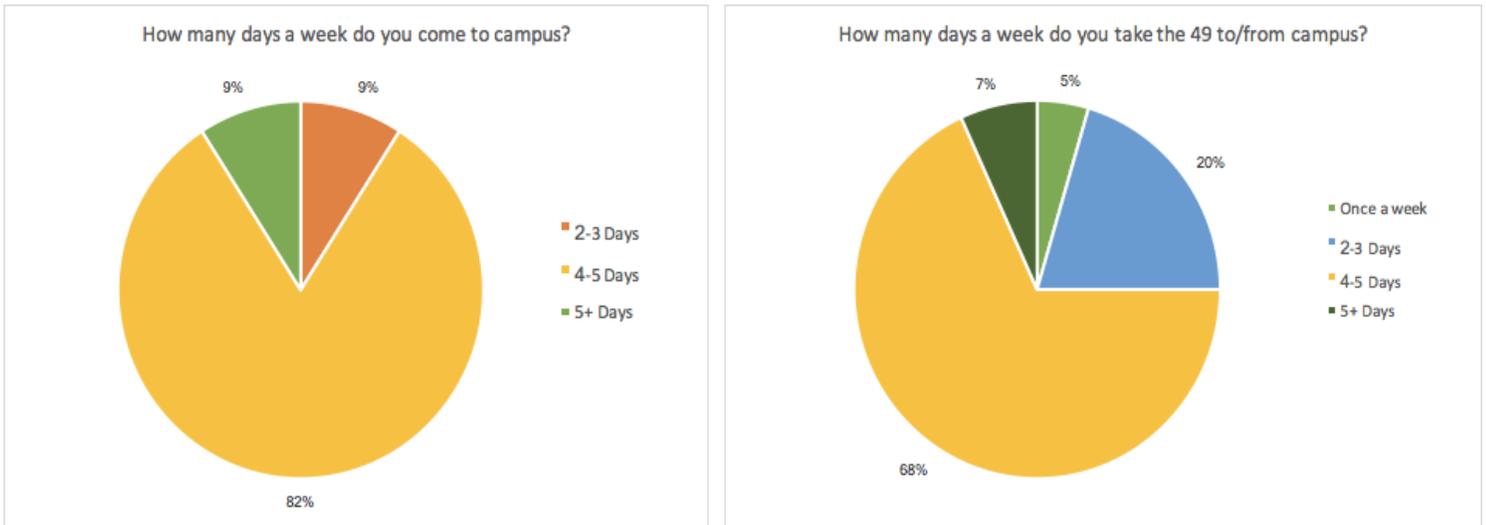


As seen in **Chart 23**, the vast majority (68%) of the respondents (n=44) were between the ages of 20-24, with the second highest age range being 19 and under.

C.2.1.b. Frequency of Commuting to Campus and Taking the 49

The following pie charts in **Chart 24** illustrate the frequency at which survey respondents come to campus and take the 49, respectively. This relationship sheds light on the dependency of riders on the 49 bus route. The majority of respondents came to campus four to five times a day, suggesting that they are mostly full-time students. When looking at each individual survey respondent, we deduced from these two questions that 82% of respondents took the 49 bus route every time they went to campus.

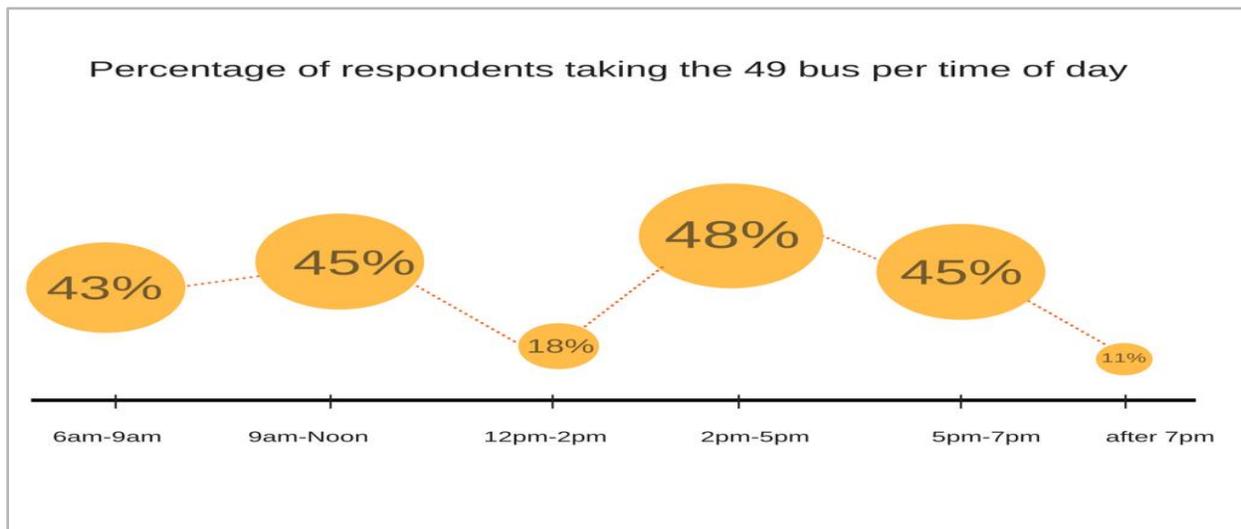
Chart 24: Frequency of respondents' travel to campus on 49 bus (n=44)



C.2.1.c. Time of Day

Respondents were asked to select the times of day that they typically come to campus, which may vary from day-to-day due to the irregular nature of student scheduling. As shown in Figure 8, the majority of students take the bus in the later afternoon and during peak hours. Further, by examining individual surveys, it was discovered that most respondents were likely to have stayed on campus for the majority of the day.

Figure 26: Percentage of Respondents Taking Bus 49 by Time of Day

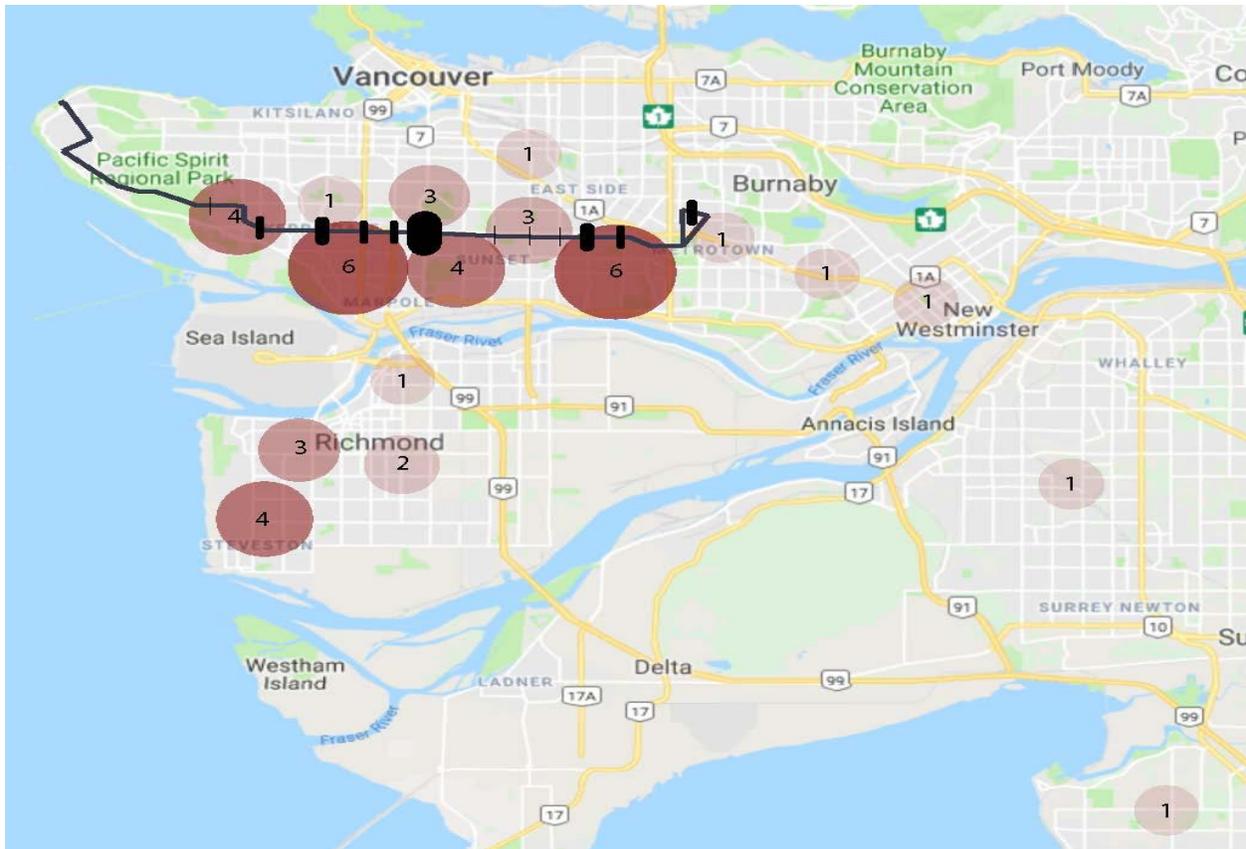


C.2.1.d. Postal Code, Bus Stops and Transfers

Respondents were asked for the first three digits of their postal code and the bus stop at which they board the 49. Sixty-five percent of the students we surveyed live within

Vancouver, with the remainder living in cities such as Burnaby, New Westminster, Richmond, Surrey, and White Rock. As shown in **Figure 27**, the majority of respondents live in the neighbourhoods of South Fraserview, Sunset, Marpole, and Kerrisdale-Dunbar. The Langara 49th Skytrain Station is the most popular transfer node for respondents. A considerable amount of students are transiting to campus from Richmond, accounting for 21% of our results.

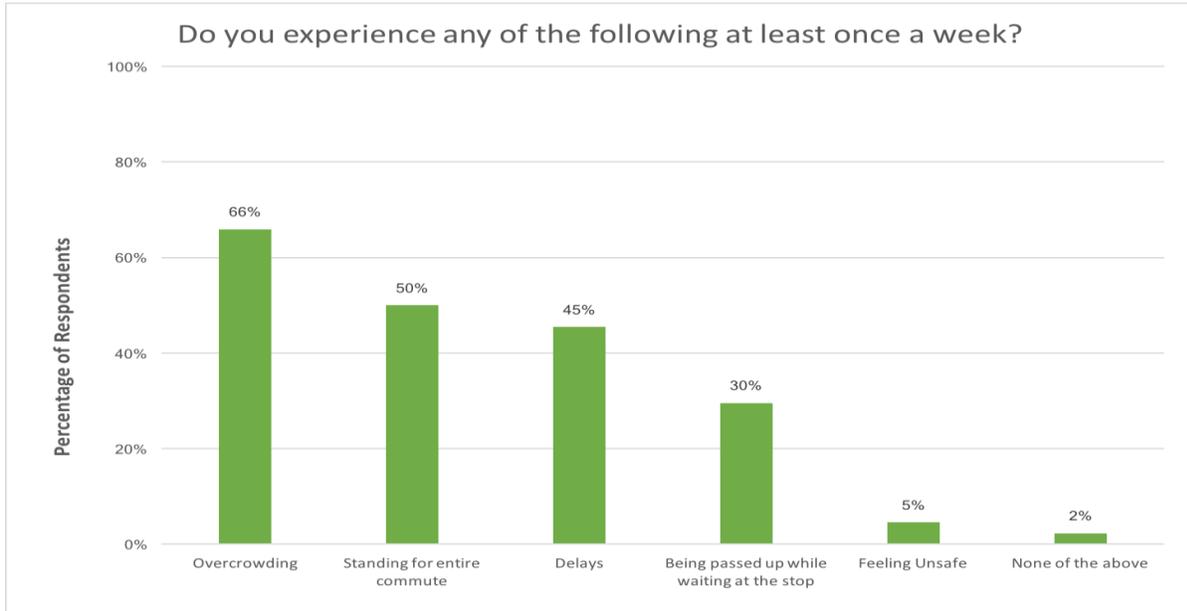
Figure 27: Heat Map of Number of 49 Bus Users' Zip Codes & Transfer Location



C.2.2. Bus 49 User Experience, Values and Student Transit Choices

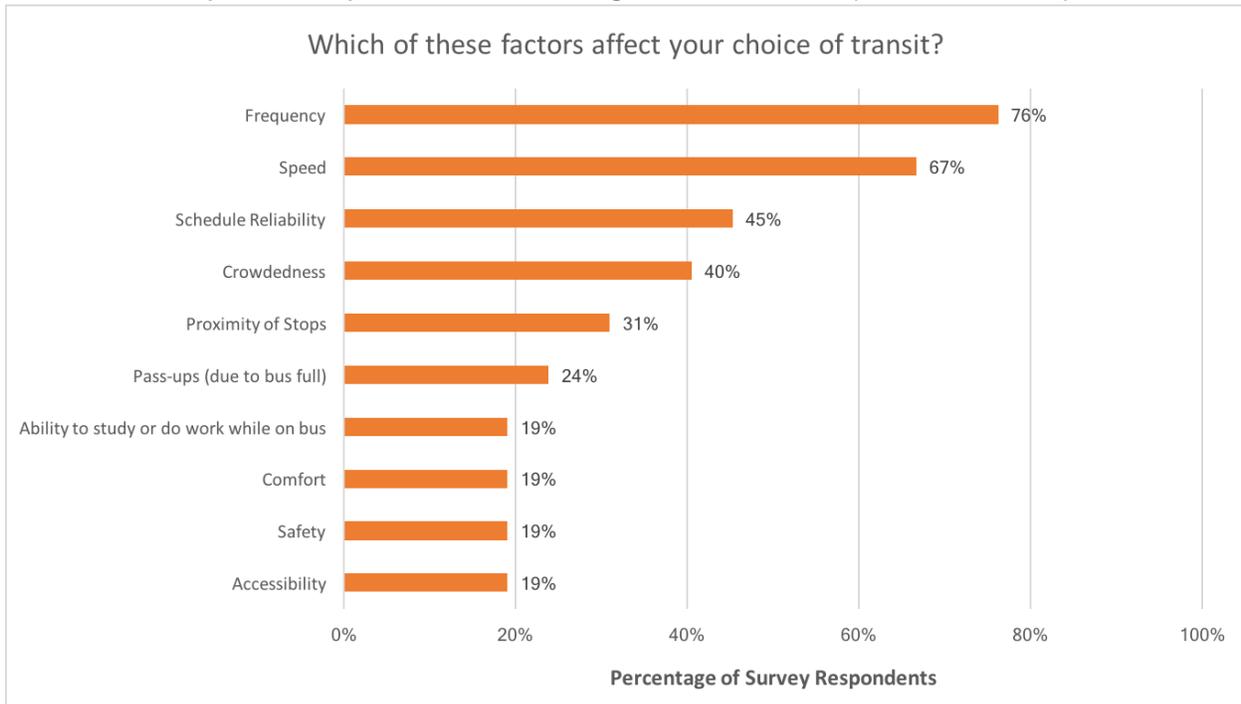
The survey went on to capture respondents' experience riding the 49 and what factors lead them to choose this transit route. **Chart 25** shows that overcrowding, standing for the entire commute, and delays were common experiences for respondents when riding the 49, whereas the feeling of being unsafe was significantly less common.

Chart 25: Respondents Reporting on Experience Taking Bus 49 (n= 40 out of 44)



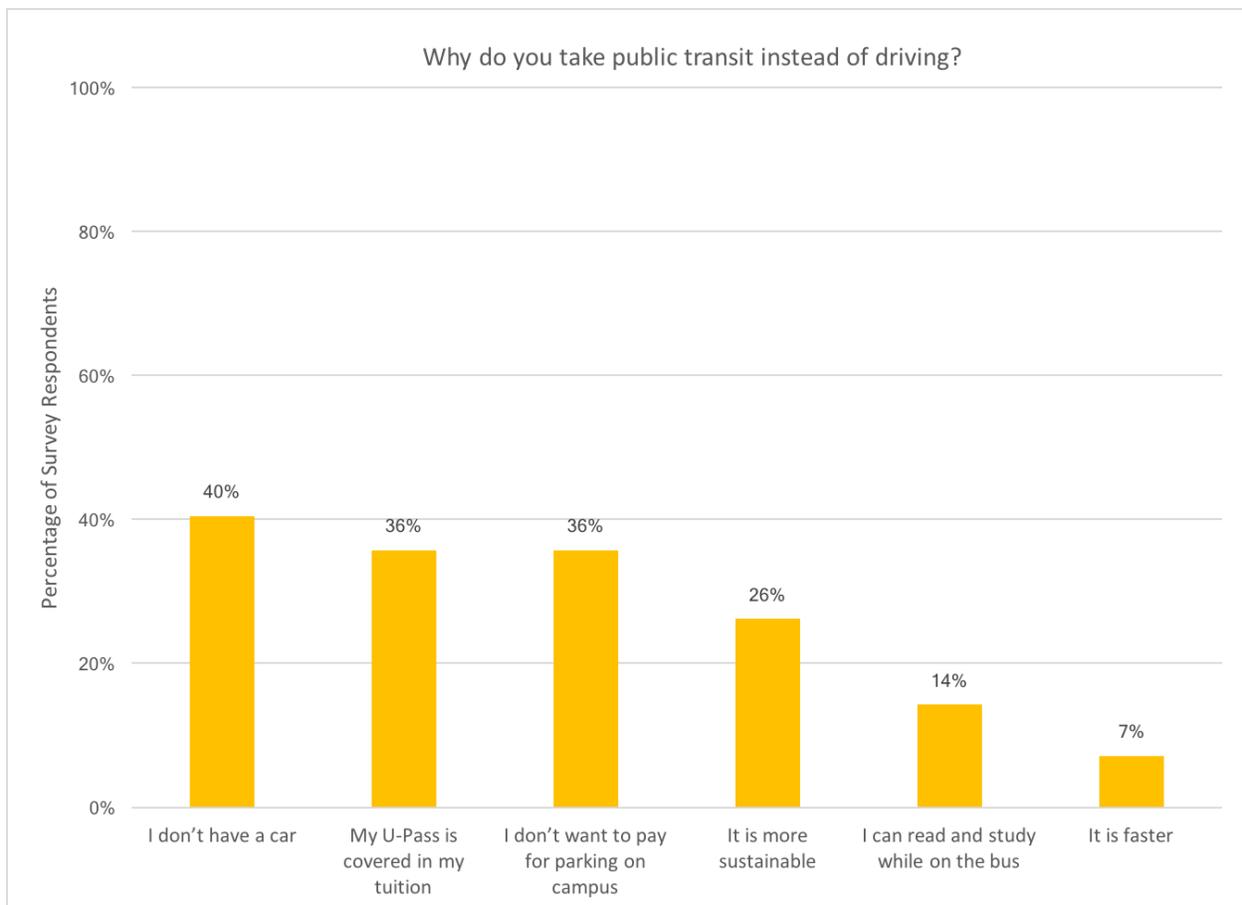
Frequency, speed and schedule reliability were the top three selected factors (**Chart 26**) that affect respondents' choice of transit. Crowdedness, proximity of stops, and ability to study or do work were less commonly reported on. Other factors mentioned included the ability to get to campus on time and cost (presumably compared to other forms of transportation).

Chart 26: Respondents per Factor Affecting Transit Choice (n=42 out of 44).



In addition to asking questions related specifically to the 49 route, the survey also aimed to capture values affecting students' choice of transit over driving to campus. Figure 11 shows that 40% of respondents reported that they do not have a car, while 36% of respondents selected that the U-Pass is covered in student tuition and that they do not want to pay for parking on campus. Sustainability, the ability to read while on the bus and speed were lesser factors. Other values that arose included not having a license or the ability to drive, the high cost of gas, and, from a cost-benefit perspective, the convenience of the bus compared to paying for parking.

Chart 27. Survey Respondents per Values Influencing Transit Choice (n= 42 out of 44)



C.2.2.a. Interviews

Following our initial survey, certain respondents participated in an in-depth one-to-one interview session with members of the research team. The findings revealed many wide-ranging perspectives and experiences when taking the 49. This method served to deepen our understanding of trends that appeared in the survey and formulate a thematic structure to our analysis. In this section findings from the interview are organized

according to these broader topics that later evolved into themes for our analytical framework.

Speaking to the themes of **crowdedness** and **convenience** of the 49, different patterns can be observed. DI1 observed: “It is very slow, and frustrating in the morning because I will get there really early, and will have to wait in the morning. Sometimes the bus will pass by 3 times because it is too crowded, so I just prefer not to take it at that time” (DI1). (See **Figure 28**). The student added, “I take the 43 instead of the 49... It is easier to take the 3 and then the 41/43. It feels like I am more likely to get on the bus” (DI1). Another student did not prefer this option because she gets on the 49 fairly early in its route. This student mentioned that the “43 is not really frequent” and has observed that for every 43 that comes, three 49 buses will come.

Another student mentioned that the bus can be crowded during peak hours returning home as well, responding that at the Thunderbird Blvd. bus stop, “everyone just crowds and it goes from being okay to super squishy, but I’m already usually sitting down” (HI2). Comfort and crowdedness are closely related, showing how crowdedness can impact user satisfaction. However, when taking the 49 at the beginning of its route, students find it quite convenient. One student claimed “she can sleep on the bus” (HI1) when taking it

home. Another student claimed that taking the 49 home rather than to UBC is more appealing, not only because the 480 comes less frequently but also because “[she] prefers to get on buses when they start their route so [she] can also guarantee a seat.”

Some students elaborated on **speed** and **efficiency** of the 49 bus route. LI1 said that what he likes least is how much the bus stops. Especially during peak hours, it feels like the bus stops every block and that it takes a lot longer than it needs to. When asked why speed is important, HI1 responded: “so I don’t waste my time.”

Despite the many woes mentioned by 49 users, taking transit is still preferred over taking the car for UBC-bound commutes, due to the prohibitive cost of parking or other

restrictions like not having a driver’s license. Two interviewees mentioned the former as a reason for not driving to and from school, whereas other respondents said, “if parking



Figure 138: Quotes from Select Interviewees

were free I would definitely drive because it would mean a 20-minute drive rather than an hour-long commute [to/from campus” (LI1). Another student added: “I decided to just take the bus because it is convenient and I don’t want to pay for parking.”

C.2.2.b. Three-Question Intercept Survey

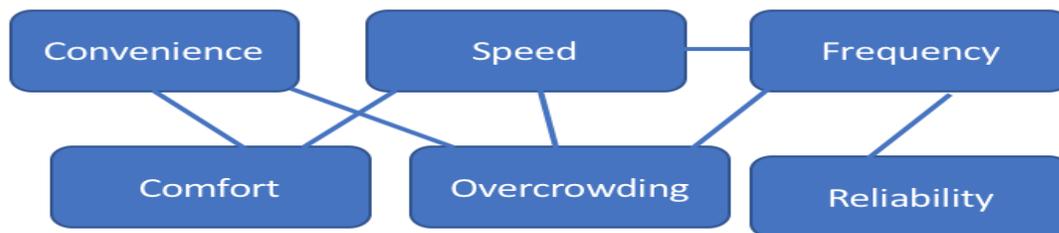
A follow-up intercept survey was administered to 10 students in order to clarify perceptions by asking their satisfaction on a 1-5 likert scale (1-very dissatisfied 2-dissatisfied 3-neutral 4-satisfied 5- very satisfied). This intercept survey captured a snapshot which demonstrated an **80% overall satisfaction** with the 49 route service, 20% neutral response, with no negative sentiments voiced. Even with the extremely small student sample captured in this intercept survey and the lack of accompanying qualitative data on the participants, it can be suggested that most students are satisfied with this particular bus route.

A final open-ended question regarding what students would change to better serve their needs elicited a range of responses which aligned with our main themes of **frequency, reliability and crowdedness**. This corroborates our previous findings and strengthens our understanding of student perceptions when asked directly how satisfied they are with the bus route. Interestingly, two responses had not yet been explored which were extending the 49 line further east of Metrotown and providing a Langara express bus to mitigate student congestion transiting between the two universities.

D. Analysis

The analysis of qualitative and quantitative data collected is organized thematically and supported with pertinent literature in relation to our findings. A number of considerations raised by the students interviewed shared similarities which highlights the importance of exploring these themes to recommend improvements to service quality. Separating factors like convenience, comfort, speed and frequency is difficult as they are closely intertwined (see Figure 6) and influence one another. However, some factors were explicitly mentioned as being valued more by students, both generally referring to transit choices and perceptions of quality of service. This interconnectivity of themes is explored further.

Figure 29. Interconnected Themes Relating to Student Transit Experience



D. 1. Frequency

Survey results demonstrate that frequency was a key factor influencing why students take transit, confirmed by 76% of respondents (see **Chart 26**). Our observations also compliment this, in that the 49 left campus every 5 minutes. During our interviews, frequency did not come across a significant factor, however, it was mentioned that the 49 bus comes fairly frequently, driving up student commuter satisfaction with the route. Interviewees suggested having more frequent 49 buses in night time hours. In addition, frequency was mentioned more in relation to other buses sharing a similar route to the 49. One student mentioned the “43 is not really frequent” and has observed that for every 43 that comes, three 49 buses will come. These findings are consistent with multiple pieces of literature as Bordagaray et al. (2013), Eboli and Mazzulla (2012), de Oña et al. (2013), and Nesheli et. al (2016) all placed higher rankings on the perception of journey time, regularity, punctuality, and frequency. This also highlights the importance that frequency plays when determining transit route choice.

D.2. Speed

In this study, 67% of respondents reported that speed was an influencing factor for choosing to take transit (see **Chart 26**). Two survey respondents suggested more buses or fewer stops, perhaps even through the provision of express buses, which relates to frequency and speed. With regards to the 49, interviewees corroborated the survey results, providing a wealth of feedback which could be applicable for the AMS when making improvements to this specific route. One interviewee responded “My time is valuable to me,” which highlights how speed is an important factor guided by personal values and needs. One interviewee said what he likes least is how much the bus stops, particularly during peak hours, which slows down the perceived length of commute. Another interviewee highlighted that “express buses are great,” and having one come from or go to Richmond would eliminate the need to take a Skytrain and transfer to a UBC-bound bus, showing that speed and convenience are also intertwined.

D.3. Reliability

Though reliability was not mentioned as much in interviews, 45% of respondents reported schedule reliability as an influencing factor for transit decision-making. Based on our observations, the bus appeared to leave and arrive as indicated in the schedule. However, in our survey on student experiences with taking the 49, delays was the third most reported phenomenon experienced (45%; see **Chart 26**), which is a factor of schedule reliability. A few interviewees reported that pass-ups have occurred in their experiences taking the 49, particularly in the morning commute, which also influences schedule reliability. Literature relevant to this theme found that “service reliability” and “waiting time” have a combined weight of 51.4% in the overall evaluation of the service (Dell’Olio et al. (2010). Perceptions of transit reliability will have an impact on ridership and positive evaluations of transit.

D.4. Crowdedness

Though crowdedness came in fourth place, with 40% of respondents reporting that it affects transit choices, the interviewees elaborated on this factor extensively, connecting it to issues of convenience, comfort, and reliability as well. In addition, overcrowding was the most reported phenomenon experience (66%; see **Chart 26**) for 49 student users as seen from survey results. An interviewee said, “it is very slow and frustrating in the morning because I will get [to the bus stop] really early and will have to wait in the morning. Sometimes the bus will pass by 3 times because it is too crowded, so I just prefer not to take it at that time.” This quote shows the high degree to which crowdedness can influence one’s commuting decisions and travel satisfaction. The aforementioned quote is confirmed by other interviewees who say “I take the 43 instead of the 49 in the morning because the 49 is crowded and slow in the morning and the corner where I would get picked up often gets passed up because the bus is full, and is picking up students at Cambie (Langara Skytrain Station).” In fact, this student decided to take an entirely different, seemingly circuitous route to avoid overcrowding and enhance her daily commute. Another interviewee hypothesized that this crowdedness on the 49 arises because “there are several schools on the 49 as well as two skytrain stations” which influences its popularity. Referring back to survey results, this is perhaps why students tend to take the bus more in afternoon hours and avoid it during the morning.

D.5. Cost-Savings

The issue of cost-savings is multifaceted and difficult to separate from a host of other considerations (transportation alternatives, scheduling, vehicle ownership and housing location) but is important to include in our analysis. When asked why students take public transit instead of driving, 36% responded that it was because U-pass is covered in their tuition with another 36% stating that they don’t want to pay for parking (see **Chart 27**). It can be inferred that the incorporation of the U-Pass into the student fees combined with the high cost of paid parking on campus act as successful “switching barriers” (Williams et al 2011) to discourage the use of SOV transportation to campus. However, such factors may not be sufficient to continue to discourage SOV use. Given the lengthy trip to and from campus for most students in this sample (ranging from 1 to 2 hours), the convenience of driving and arriving to campus in a third of the time is still enticing. UBC and TransLink may want to collaborate further to ensure that the service quality (Fu et al., 2016) is enhanced to maintain and increase student ridership.

D.6. Student Perceptions of Transit Experience

Even with our findings showing that students enjoy the frequency and comfort of the 49, it’s interesting to consider the implications of negative transit perceptions, even if the occurrence of factors such as overcrowding and delays are occasional. In relation to current literature, Guiver (2007) found that negative experiences have a disproportionate impact on users perception of bus travel, which may subsequently overshadow the many average or positive transit experiences commuters have on a daily basis. While it is clear that overcrowding has a negative effect on transit experience, Nesheli et al. (2016) found

that delay time had the greatest impact on a traveler's decision to use transit, emphasizing the importance of improving on-time performance and reducing wait time.

The commonalities of both positive and negative transit experience found in our survey results corroborate the conclusion made in multiple literature sources and can be utilized to inform decision-making, mitigate frustrations and optimize student perceptions in the hope of increasing ridership. To provide another measure of student perceptions, the intercept survey demonstrated an overall satisfaction with the 49 which should be considered in tandem with the rest of our findings.

E. Conclusions & Recommendations

Combining the verbal-textual and visual-spatial data obtained from multiple observations, surveys, interviews and a follow-up intercept survey offers an indication of UBC student travel patterns and perceptions specifically for bus route #49. Throughout this qualitative and quantitative data collection, there were diverse attitudes regarding public transit, with certain collective themes arising. These themes of Speed, Frequency, Reliability and Crowdedness can be considered essential factors in student ridership and form their perceptions of public transit. In addition, concerns about parking costs, sustainability, and comfort and convenience were key themes that influence the decision to take transit more generally.

An important next step in the continuation of research would be to further explore these themes through an iterative process. There are multiple confounding variables that need to be taken into consideration when analyzing this data, such as number of research participants in relation to student population, seasonal variations in travel patterns and potential weaknesses in survey design and delivery (considering significant time constraints set upon coursework). When we compile all working groups data we are provided with a comprehensive snapshot of student data which can be used to assist AMS and provide recommendations and improvements to transit services.

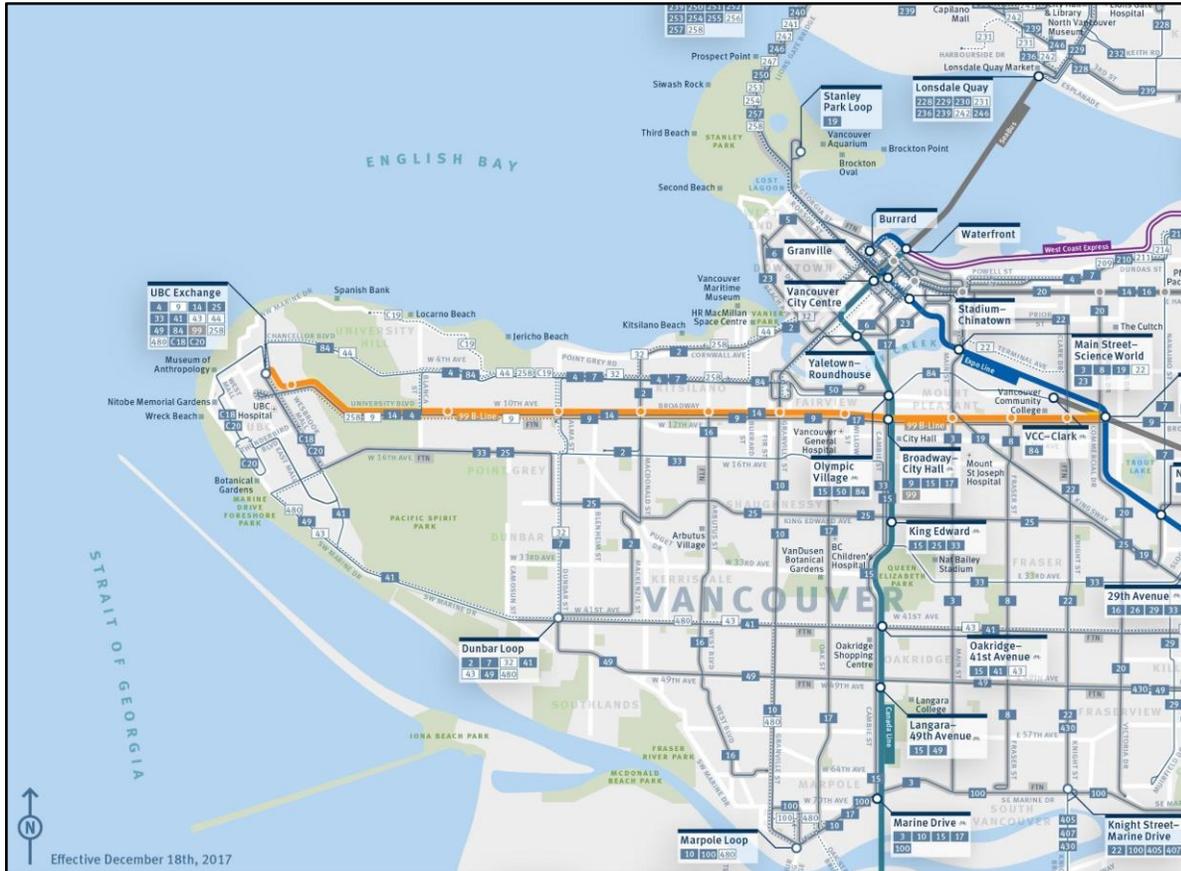
These Recommendations are synthesized from feedback from student respondents and our own observations after analyzing the data. To improve upon frequency, speed, reliability, and crowdedness to ensure service quality, we propose the following recommendations for AMS:

1. Provide more express buses (i.e., additional Richmond-UBC express bus routes, additional 43 express buses) to relieve stress on the 49
2. Optimize bus experience through seamless transfers
3. Improve scheduling (buses running later into the evening)
4. Explore creative options for alternative features to the 49 route, such as:
 - a. Have buses that start later on their westbound route, especially in morning hours (instead of Metrotown- UBC, offer Langara/49th- UBC route)
 - b. Express 49 to Langara/49th
 - c. Partnership with Langara College for an express student line

VIII. Route 99 B-Line (UBC/Broadway-Commercial Station)

Simon Liem, Emily Huang, Nidah Dara, Pascal Volker, José Wong

Figure 30. 99 B-Line Route Map



Source: http://infomaps.TransLink.ca/System_Maps/139/V-Jan%202018.pdf

A. Introduction

The 99 B-Line, the express bus that runs from Commercial-Broadway Station, is one of 14 bus routes that connect UBC to the surrounding region. It is operated by TransLink, Metro Vancouver's transit authority, and it is Vancouver's most used and most overcrowded transportation route. The 99 B-Line route sees more than 17 million annual boardings and is overcrowded 33% of the time (TransLink, 2017). Riders on the 99 B-Line are more than double any other routes (Zeidler, 2015), and some have even called the 99 B-Line North America's' busiest bus route with Commercial-Broadway as the most utilized transit station in the region (City of Vancouver, 2012).

As TransLink ridership continues to increase (total trips increased 4.5% in 2016), overcrowding on key routes, such as the 99 B-Line, will present pressing service challenges for the system. The AMS, in accordance with the 2014 UBC Transportation Plan, hopes to have 66% of all trips to be made to UBC by cycling, walking, or public transportation by 2040 (Campus + Community Planning, 2017). Our research is informed by the desire to meet this goal and to improve transit service for UBC students overall.

Our goal is to provide a broad characterization of the 99 B-Line relation with UBC students that includes objective and subjective data. Additionally, this recovered information will provide powerful insights of why other TransLink bus routes are not being chosen by students to commute to and from UBC, which may help alleviate pressure on the already overcrowded 99 B-Line. To improve the student experience and further encourage transportation uptake, the AMS, through its SEEDS project, requires new, updated, quantitative and qualitative data to better advocate for developments that will benefit UBC students, which we aim to provide here.

B. Methodology

Our information was recovered from two types of source: i) Verbal-Textual, and ii) Visual-Spatial. These two methods contribute to a broad understanding of the 99 B-Line experience and assist in triangulating the results of each approach. This also permitted us to give a context and verify the opinions given by our research subjects. In this sense, we were able to distinguish a random opinion, from a recurrent one and also to understand the real meaning of words expressed by non-expert subjects.

For the verbal-textual method we utilized two research tools, surveys and a round of semi-structured interviews. For the visual-spatial analysis, we conducted two participatory observation sessions using the photovoice method.

B.1. Survey

A total of 33 surveys were conducted between January 30 and February 6, 2018. The survey questions were prepared and designed in coordination with other research groups. They were initially directed to students that were waiting for the 99 B-Line buses in the UBC Bus Loop. Nevertheless, for this specific route, recruiting and surveying participants at bus stops was challenging due to the high frequency of the 99 B-Line buses that arrived every three minutes, while the survey was designed to be completed in five minutes. To face this inconvenience, students were also contacted in other locations of the Point Grey campus and through an online survey where 20 participants were contacted through facebook and by referrals from friends. Before conducting the surveys, all the participants were informed of the nature of the research. The complete survey data is available in **Appendix H**.

It is important to acknowledge the limitations of the conducted surveys, in regards to its representativeness. The online survey was targeted to people from similar social circles, which may explain the predominance of the 20-24 years old segment (18 out of 33) and the high number of V6* and V5* postal addresses noted in the surveys (25 out of 33). The frequent headway of the 99 B-Line also led to three of the surveys to be incomplete, as the participants wanted to board the bus before it departed. This is a

limitation of the small number of in-the-field survey of UBC students due to this inconvenience. This may also mean the sample is not the most representative of all sub-groups present at UBC (i.e.: multi-modal, commuting students outside of the catchment areas of the 99 B-Lines). A broader range and number of participants would be required to constitute a more representative sample, which could be gathered systematically with collaboration of the AMS. We believe this would improve the accuracy and representation of the results.

B.2. Interview

We recruited five UBC students, who were regular 99 B-Line riders, to do short, semi-structured interviews with the interview instrument created in class. The interview questions were designed, discussed and approved in class. Each interview had a duration between 10 and 15 minutes. Participants were asked to speak about their experiences using -and attitudes about- the 99B-Line. Two students were male, and three students were female. Their ages ranged from 19 to 39 years old. The participants were either recruited from respondents to the survey, or were acquaintances of the interviewers.

Because the selection method and relatively small size of the subject group, the representativeness of the sample is limited. While we cannot make robust generalizations about 99 B-Line ridership or service quality from these interviews, several themes consistently arose in the interviews and correlate with results from our survey instrument, which may offer insights for advocacy for UBC students may be improved.

B.3. Visual-Spatial Data Analysis

For our study's visual-spatial data analysis, we conducted two participant-observation analysis during peak hours. In addition, photovoice was adopted as well, a tool for participatory research, which has been used in different research contexts for "participatory needs assessment" (Wang & Burris, 1997, p. 385) with the goal to "identify, represent, and enhance their community" (Wang & Burris, 1997, p. 369). For our purpose, as students in the UBC community, we used photovoice to document and analyze students' use of the UBC Bus Loop during rush hour. The photovoice, along with the survey and interview results, has been translated into graphs, maps and a 3D - Model. The researchers decided to user a 3D - Model because "combining ethnographic data and GIS methods helps researchers see both 'context' and 'content' in a spatial dimension. This alternative way of representing data may identify issues that would not be apparent otherwise" Skinner et al (2005, p. 230). Therefore with these photos and 3D - Model the researchers hope to highlight and visually show the experience of students who take the 99 B-Line. In turn, this could be a method of advocacy to influence change in policy and design of the route's service and supporting infrastructure.

A participant observation protocol was developed as well to gather information at the UBC bus loop on student riders of the 99 B-Line. As all researchers are UBC students, we are in the position of having a "culturally understandable identity" as defined by Johnson, Avenarius, and Weatherford (2006, p.114) within the university context. While this does put us in the position of fully immersing ourselves in the activity we are observing, because of the dynamic nature of our subject—several thousands of students in commute—this identity will mostly inform our own conclusions about our observations

rather than the interactions we will be having with our subjects. For example, during the observation we describe below, the most amount of time we could spend with any student was three minutes before they boarded and left the bus loop. The relationship-building described by Johnson et al. (2006) plays some importance as we are able to identify ourselves as students, but the fostering of trust, which is a longer-term process, will not typically factor into this stage of our research.

Observations took place between 5:00 pm and 5:15 pm with the departure of five buses, which is within the rush hour time frame. We were recording information on various criterias for quantitative data and qualitative observations at the site. This protocol was adapted from the protocol devised in class. We removed the arrival and switching bus route criteria due to the dynamic nature and high turnover of people and busses at the stop. This allowed us to observe behaviours and pursue a headcount that showed a consistent number of commuters waiting in line.

During the observation, five short and informal interviews were also conducted with students waiting in line in order to collect more detailed data on their commuting experience. The questions were:

- Are you a student?
- What's your destination?
- Do you have to transfer?
- Do you always take the 99 B-Line?
- Are there other options?
- What's most important to you during your trip?

This method of having an observation protocol allows the data collection to be focused so that we as researchers can better understand students' commuter behaviours on the 99 B-Line route. Our initial data collection analysis was able to inform us on key themes that will be further discussed below.

C. Findings and Data Analysis

Using the above methods, our group collected mixed qualitative and quantitative data, and present out analyses below, organized by method of data collection used.

C.1. Survey Results and Analysis

Our survey results were organized and analyzed around the following themes:

C.1.1. Reliability

A common theme in most of the survey results is reliability, understood as time spent waiting for the bus (Carrel, Halvorsen, & Walker, 2013). Although only one of the participants explicitly used the word, the importance that they give to reduced waiting times achieved by the high frequency of the bus is evident in the collected data: as evident in graph 1, 29 of the 33 participants placed frequency as one factor that affect their choice of travel. One of the participants also expressed this relation between reliability and frequency by saying that “[this route is the] most frequent and therefore, the most reliable”.

Nevertheless, Graph 1 also shows that only 14 of the participants stated schedule reliability as a factor, which may appear counterintuitive with the stated importance of reliability. This finding, however, may be explained by the fact that the high frequency of the 99 B-Line minimizes the relevance of punctuality as off-schedule buses may mean no more than 1.5 minutes of waiting time. As a result, this highlights that users of this bus route still perceive the bus to be reliable as the frequency masks the schedule punctuality.

C.1.2. Quality and Perception of Experience

This theme was the most mentioned in the surveys. Issues of standing in the bus, sense of security, crowdedness, and cost were included as seen in Graph 1. In this sense, quality of experience was mentioned 61 times, crowdedness was mentioned 35 times, and cost was mentioned 24 times. These results are aligned with what is described in the study by Carreira, Patrício, Natal Jorge, Magee and Van Eikema Hommes (2013, p. 233). Carreira et al. explained the importance of a “holistic” approach to traveler experience and the sensory, emotional, and subjective elements that influence the quality and perception of the travel experience. Cost is also an important factor that affects perception of experience, since passengers expect a trade-off between what they are paying and the service that is provided as explained by Lai and Chen (2011). As seen in the literature, this holistic perspective over user perception and desire is a growing theme in the discipline and must be considered relevant for future improvement of transit systems.

C.1.3. Quality of Service

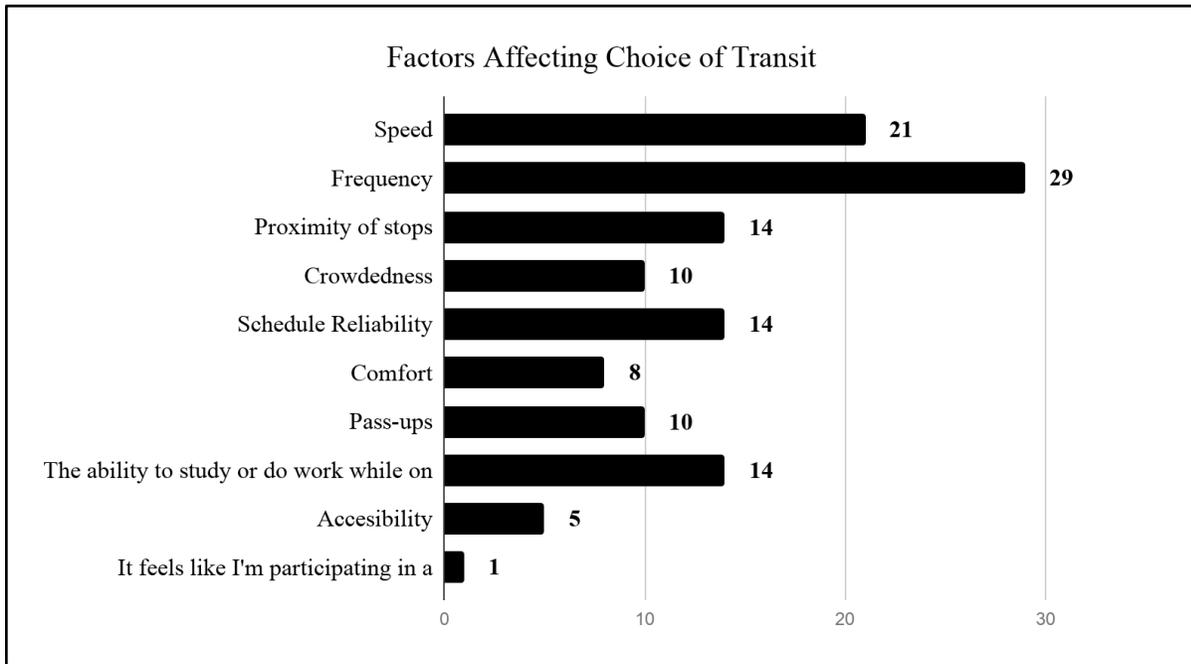
The quality of service theme includes frequency, proximity, and cost as relevant factors. This theme was highlighted 70 times, with frequency being indicated 31 times by survey participants. Indeed, this reveals that students value high frequency as a characteristic of the 99-B Line’s quality of service.. As dell’Olio, Ibeas and Cecin (2011), describe, the quality of service theme permits us to distinguish the “variables most valued by users for a desired quality of service” and “the results can help in the design of a greater range of measures to improve the service” (p. 227). In this sense, the survey results allow us to identify frequency as the most important variable if TransLink aims to keep a high quality of service.

The importance of observing user perception in the quality of service is relevant to acknowledge users’ desires in public transport, as well as for public transport to move beyond the limited rationalized perspective of stipulated contract conditions, as currently conceived. The recognition of this approach provides transit operators with the tools to remove any barriers to improvement by adjusting the provision of service to the expectations of passengers, while not depending on contract modifications.

The results found in the surveys consistently show frequency as a crucial factor that affects participants’ route choice. This characteristic, along with the shorter time of commuting due to the fewer number of stops compared to non-express routes, appear to compensate the crowdedness associated with the popularity of the 99 B-Line route.

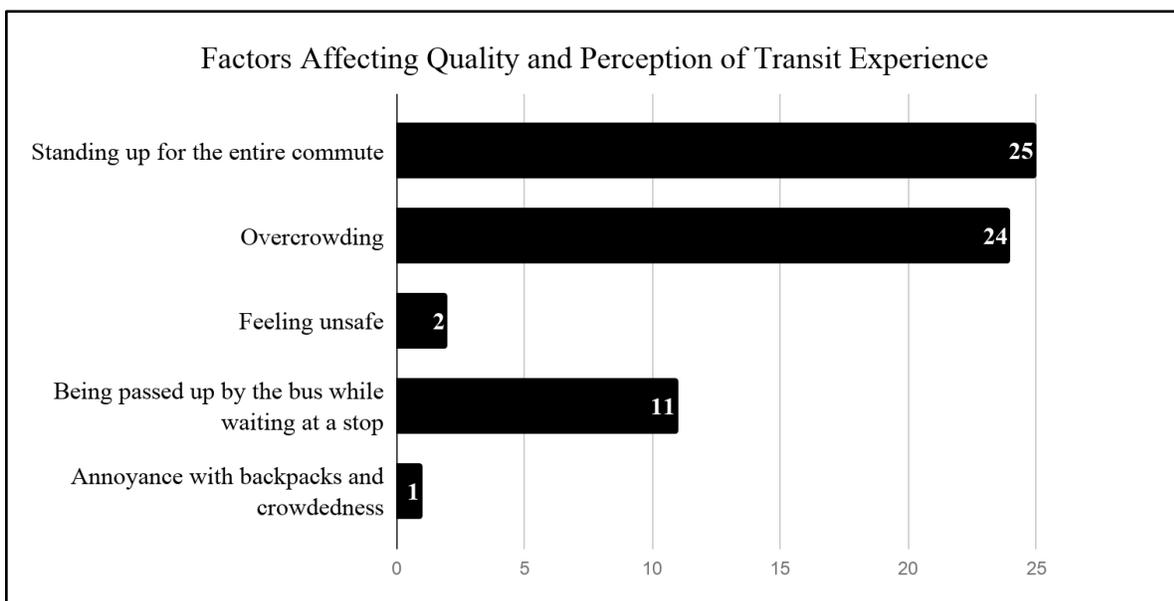
Nevertheless, comfort and other factors as cost savings in relation to car usership are important for the participants’ perception of quality transit experience. Thus, improvements in these areas are important for dis-incentivizing car usership.

Chart 28. Factors Affecting Choice of Transit



The above graph (**Chart 28**) shows the other factors that affect the survey participants' choice of transit. As mentioned previously, 29 out of the 33 participants stated "Frequency" as one of the main factors that affects choice of travel. The graph shows that "crowdedness" and "reliability" were not a factor that affected the participants' choice of transit, however **Chart 29** below shows that it is "crowdedness" is one of the main factors that affects the quality and perception of the transit experience.

Chart 29. Factors Affecting Quality and Perception of Transit Experience



The above Graph (**Chart 29**) shows the factors that affect the survey participants' quality and perception of Transit Experience. As mentioned previously, four out of five one-on-one interviewees said overcrowding was the only thing they disliked about the 99 B-Line. Survey participants stated that "standing up for the entire commute" and "crowdedness" were 2 factors that affected the quality and perception of transit. However, it is important to note that as seen in **Chart 28** due to the frequency of the 99 B-Line, participants were willing to sit or stand in a crowded bus.

C.2. Interview Results and Analysis

As with our survey results, we organized and coded our interview results according to similar themes, discussed as follows:

C.2.1. Reliability

Five interviews were conducted with findings showing that the 99-B Line reliability was the most discussed topic for the participants. The topic of reliability highlighted the frequency and short headway of the 99 B-Line, allowing the participants to be less rigid about when they leave their house. This is reflected in the studies by dell'Olio et al. (2010), Bordagaray dell'Olio, Ibeas and Cecín (2013), Eboli and Mazzulla (2012) and de Oña, Eboli and Mazzulla, (2013) that found service reliability, frequency and regularity are significant factors in transit users' evaluation of service. During the interview, one student mentioned that he does not "have to plan with too much anticipation when I leave home". This is echoed by another student who said she will "catch the next one in three minutes. It is not the end of the world, so you kind of just leave whenever." The frequency is important for "being able to get to class on time" as one student said, or at least not being significantly late if they miss or get passed up by the 99 B-Line. An example was that taking another bus route such as the 9, 14, or 44 would result in having a long headway, up to around thirty minutes for each bus. One student mentioned that if she missed the bus on another route, she will have to wait another thirty minutes for the next one, which means being very late for class. This negative experience of infrequency and the high-risk of being late for class is discussed in the literature where a negative transit experience has a disproportionate impact on users' experience and of a bus route (Guiver, 2007). As a result, the reliability factor of the 99 B-Line can also be seen as a positive factor that result in users' going out of their way to take the 99 B-Line over other less reliable and frequent bus routes.

On the other hand, another student spoke of how if other buses, such as the 84 buses were always there then she would consider other bus routes. However, even if, according to the student, TransLink "sped it up... [she] don't trust it to go on so [she] always end[s] up on the 99." As a result, interview participants put reliability as a significant reason to why they choose the 99 B-Line. Our analysis of the interview shows that all five participants said that frequency and reliability the primary factors for why they continue to take this route, even though it is less comfortable. If they were to take another route, the frequency of the alternate bus route would need to be increased. However, as of right now, the 99 B-Line is their primary choice, while one student said it is their only option.

C.2.2. Quality and Perception of Experience

The second most mentioned subject related to transit was crowdedness on the 99 B-Line, with one student saying she avoided another route because of it being often too full. While one student indicated that the only thing she disliked about the route was the volume of people, her experience was not completely negative, saying “It feels like I’m participating in some kind of community of people as well. I like to people watch on the bus. It’s kind of fun [laughs].” Crowdedness, in some respects, appears to be a feature of the 99 B-Line that is either tolerated or, with respect to the student quoted above, of interest to riders.

The topic was discussed in all of the interviews, and it only had a minimal effect on how students choose their transit routes. One student said, “I want there to be less people, so I don’t go during rush hours,” while all of the other students indicated that crowdedness was not as important as the good qualities of the 99 B-Line. Another student said specifically that she could select other routes that were “a much more comfortable ride,” but the benefits of the 99 B-Line outweighed discomfort. Another student said, “If I’m late, I prefer to take buses even if they’re crowded, as there are much less [six] stops to campus.” These findings are contrasted to the study done by Chowdhury and Ceder (2006) that indicates overcrowding affect users in a negative manner, thus resulting in a decreased likelihood of returning to the bus route. Likewise, Tirachini, Hensher and Rose (2013) found that overcrowding can also create dissatisfaction by causing systematic delays, higher levels of discomfort, and anxiety, as well as directly influencing users’ choices of alternative routes.

The convenience and speed of the 99 B-Line were other factors that led students to choose the 99 B-Line over other options. Only one student owns a car, but four out of five interviewees believed that driving was either too costly or too inconvenient of a method for commuting. A student said, “I don’t have a car and even if I did, it would take me longer to find parking or even rent a room with a garage or parking space.” There were generally negative associations among the interviewees with regards to the logistics of owning a car, specifically to do with parking. Our analysis of the interviews suggests that 99 B-Line riders see the route as a most practical choice for commuting.

C.2.3. Quality of Service

According to our analysis, the 99 B-Line quality of service is the third most important factor that students valued. The feature of speed was primarily highlighted as a highlight of the quality of the route, in that students can rely on its frequency and fewer stops. This was mentioned by three out of five students we interviewed who liked the infrequent bus stops. Although the 99 B-Line is often crowded, one student found that the fewer bus stops outweighed the negative experience of crowdedness. While most students liked this aspect for its speed to campus, one student said “I get car sick, so less stops is smoother for me,” reflecting her feeling of wellness as part of the quality of service. Additionally, one student said that the 99 B-Line “covers a very important part of the city,” which perhaps also highlights the busy areas of this route as students frequent this area often. For example, two out of our five interviewees live on or are within walking distance of this bus route, while one student who lives on campus said that he takes the 99 B-Line if he is going to Main Street or Fraser Street to see friends. This is also discussed in

studies that shorter walks are most popular as well (Eluru et al., 2012). This analysis shows that the quality of service does not just consist of bus frequency and speed, but also whether the bus successfully covers a high demand area and is in short walking distance for transit users.

Upon asking the interview participants what could improve their travel experience to and from the UBC campus, two out of three participants' suggestions elude to the quality of service topic of having more bus services with one student including the need for "more express buses, but not from downtown". Additionally, one student suggested having Wifi on the 99 B-Line. This suggestion in addition to the experience of car sickness perhaps reflects that the quality of service lies not only within functional factors such as speed, frequency of stops or proximity to the route but also the psychological factors of wellness, health and the ability to be connected online. Furthermore, Lai and Chen (2011) and Eboli and Mazzulla (2012) state the physical cleanliness of the bus and environment is an important determination of the quality of service as well. This is reflected in a student's comment that there is "sometimes garbage on the bus" and the "cleanliness of the bus will make it more pleasant to be there."

The reliability of the 99 B-Line is the most important feature of the route from our interview findings, often with regards to how it outweighed other factors that students disliked. In similar fashion to the survey analysis and result, we believe this finding to be significant as it demonstrates that students are more concerned with reliability rather than comfort. This suggests that improving UBC student rider satisfaction could be best done through increasing the reliability of other routes that tend to be less crowded, which would alleviate stress on the 99 B-Line. All suggestions for improvements to the 99 B-Line were mostly to do with with this subject, namely offering other reliable options or making the 99 B-Line less crowded by increasing the number of them.

C.3. Visual-Spatial Results and Analysis

As we expected, the 99 B-Line at this time is well used. Classes end at 50 minutes past the hour, and buses leave every two to four minutes with approximately 75 to 80 people in line at each boarding time. Most people were alone and were listening to music or focused on their phones. Roughly half of the people waiting were wearing backpacks. On the other hand, those who had someone with them were usually engaged in conversation. While the lineups were long, they moved quickly because of the high frequency of the departures. Additionally, the long lineups were separated into three lines since the 99 B-Line has three boarding doors, in which the lineups were mostly under a long overhead covering. As indicated from our survey and interview findings, one student from our informal interview also said that frequency and reliability is the most important to her during a trip.

It was also interesting to observe that around ten to fifteen students for each boarding did not board even though the bus was not at capacity. Our informal interviews indicated that students preferred to wait for the next bus in order to get a seat. The five 99 B-Lines boardings we observed left the bus loop with an average of 70 passengers—58% of the bus capacity (Coast Mountain Bus Company, 2016).

Observation also shows that only one bus out of five had a bike. This could possibly be due to poor weather, which may have reduced cycling commuters that day. No passengers boarded the bus with a skateboard or stroller. Moreover, the number of people who board the 99 B-Line is very uneven, with most people boarding at the back (50%), then middle (36%) and the least at the front door (14%). Notably, passengers who boarded the buses through the front door had a disability or were elderly.

C.3.1. Participant-Observation - Informal Interviews

From our informal interviews, three students usually or always take the 14 or 4 bus route going to UBC, with one taking the 25 bus route. Although we did not ask them the reason, the importance of having a seat on the bus could suggest that the 99 B-Line on the westbound route is too crowded during the morning.

Four of the five students interviewed were transferring to another bus route or mode after the 99 B-Line. Of those, one student was being picked up by car at the Commercial-Broadway Station. The student who was not transferring from the bus skipped one boarding of the bus to take a 99 B-Line that went to Boundary Road to disembark at the Rupert Street stop. His other option was to transfer at Commercial-Broadway Station to the Skytrain, which he preferred to avoid.

Since the boarding time of each bus was around two to four minutes, some people having noticed that all seats were taken would return to the line to wait for the next bus. Many of the students said having a seat on the bus is most important to them throughout the trip, with one emphasizing the ability to study while seated. One student said bus frequency and reliability was important as well. Several students take the 14, 4, or 25 coming to UBC with others taking the 99 B-Line both ways.

C.3.2 Physical Environment

The physical environment of the UBC 99 B-Line bus station was not discussed in the surveys and only one student suggested more cleanliness of the buses and bus stations in her interview. Figure 1 is a photo that we took of the bus station which shows that the area is covered by a large overhead structure that runs horizontal to the bus. Figure 2 show that the line-up follows the horizontal overhead structure, with other people standing under the covering even when they are not in line. As a result, people waiting in line are covered by the rain or other weather conditions. As seen in figure 3, the physical environment is also highly lighted which could suggest feeling more safe, although safety as a deciding factor for transit choice was only indicated by two survey participants. This is contrasted to other stations at the UBC bus loop that lack adequate covering and lighting. This is reflected in the study by Lai and Chen (2011) and Eboli and Mazzulla (2012) who state the physical cleanliness of the bus and environment is an important determination of the quality of service as well.

The importance of reliability and the availability of seating suggests that the eastbound 99 B-Line would be preferable for many students, even when routes such as the 4, 14, or 25 may drop them off closer to their home destination. Moreover, figure 4 shows that students were willing to wait for the next bus to get a seat on the bus. However, more information is needed on what factors influence the different choice of a UBC-bound and

home-bound bus routes. Furthermore, the reliability and validity of our findings are limited by a number of factors associated with the short period of observation; including the small sample of interviews, and the inability to confirm which riders are UBC students by just observing. To minimize this lack of reliability, survey methods could be applied to confirm our general observations and determine the ratio of UBC students to non-student riders, which will be determined through the first question of a survey.

Figure 31: *Large overhead structure running horizontal to 99Bline Bus*



Figure 32: *Shelter for People Boarding 99BLine*



When it's raining, people boarding the bus typically form lines that extend beneath the shelter at the bus loop. On the evening on the observation, it was raining lightly and mild (7 C). The shelter offers cover for students who are often looking at their phones or reviewing paper material. All of the student researchers generally follow this behaviour when it is raining. As represented in the graphic model (**Figure 32**), riders utilize the overhead shelter during rainy weather when the lines are long.

Figure 33: *UBC 99 B-Line Bus Station Horizontal Overhead Covering and Well Lighted Physical Environment during Night Time*



Figure 34. *How 99BLine Riders Relate to Infrastructure at Bus Stops*



Many riders did not board the bus when there was still standing room available. Most appeared to be waiting for the opportunity to get a seat and some were waiting for the Boundary Road B-line, which has an extended route that goes past Commercial Drive. One student rider would do this only during peak hours when bus departures were frequent. The graphic model (**Figure 34**) represents students waiting between bus departures.

D. Conclusions and Recommendations

In all aspects of our analysis, reliability was one of the most prominent themes. In the verbal-textual analysis of the survey and interview results, the short headways allowed students to be flexible in their scheduling. Reliability was explicitly cited as compensating for a lack of comfort on the route, which was the most cited negative aspect of the 99 B-Line. This aspect was highlighted by the fact that students who had alternate, and more comfortable, routes preferred the 99 B-Line because of its perceived reliability.

Conversely, during our visual-spatial analysis at the UBC Bus Loop, we observed that students did not board departing busses that had standing room, deciding to wait for the next bus because they preferred to have a seat. We believe that because students knew that the short headways would have little effect on their transit time, they would sacrifice approximately three minutes in order to obtain a seat. This behaviour relies on the reliability of the 99 B-Line's departure schedule.

Overall our results indicate that student satisfaction with the 99 B-Line is relatively high. Areas of focus for advocacy could be directed at the most mentioned negative feature of the 99 B-Line, which is comfort. Students often recommended increasing busses, which could apply to both the 99 B-Line and busses that are close to that route. Students who had the option of choosing other routes would do so when it was convenient. If the reliability of those alternate routes were increased, they would become more attractive due to their higher comfort level. This would likely have the effect of alleviating stress on the 99 B-Line, thereby reducing overcrowding and pass-ups. In discussions amongst the authors, we also believe that bus injections—empty busses sent to stops with frequent pass-ups—could help address the issues that were most important to the students.

We also found that there was support for the extension of the Millennium Line through the Broadway corridor, which would replace the 99 B-Line. While we found important information about student preferences for public transit, there are several limitations to our methods. Selection of survey respondents was a mix of on-the-ground surveying and online soliciting, and interview participants were recruited with a semi-snowball sampling method. This makes generalizing about student attitudes unreliable. Notably, our selection criteria excluded students who do not regularly ride the 99 B-Line. This means that students who have the option of taking this route but choose not to are not represented in these results.

IX. Why Students Drive to School: Single-Occupancy Vehicle (SOV) Use at UBC

*Matthew Callow, Geneva Lloyd, Katrina May,
Naomi W. Reichstein and Kelsey Yamasaki*

A. Introduction and Methodology

As part of a larger study sponsored by the AMS of UBC examining the experiences of students taking public transit to campus, our group has conducted research on the motivations of those who commute in SOVs instead. In this portion of the study, we have employed two research instruments:

1. A brief (5-min.) **intercept survey** conducted at campus parkades, with questions on location of residence, commute time, travel mode choice and frequency, and reasons for driving; and
2. A **semi-structured one-on-one interview** (approximately 30 min.) eliciting similar information to the intercept survey but delving into greater detail on respondents' answers.

Our findings showed that by far the most salient reason for driving was commuting time. Other main reasons for driving were comfort, flexibility, health, distance and safety. Various factors, however, underlay these main reasons. In this report, we discuss our methodology, findings, analysis and conclusions.

A.1. Context of the problem

The objective of the larger study sponsored by the AMS is to collect and analyze data about how commuters travel to UBC via 6 major bus routes. It is pertinent to include data on SOV commuters as well, to find out why some students choose not to take transit in the first place. This information will help inform the AMS in advocating for specific modifications to capacity-constrained transit routes and for enhancements to sustainable alternatives such as biking, walking or carpooling. It will also assist the AMS in encouraging SOV users to adopt such alternatives.

A.2. Methods for data collection and analysis

We recruited a total of 45 UBC undergraduate and graduate students to participate. Of these, 26 were female, 19 male. Research data results appear in **Appendix J & K**.

A.2.1. Intercept survey

We administered the intercept survey to a total of 35 of the respondents. Each researcher held two intercept sessions. We conducted 6 sessions at UBC's Fraser River Parkade, 4 at the West Parkade. We conducted these samplings during the morning rush hour from 7:00 to 9:00 AM and during the afternoon/evening rush from 4:00 to 6:00 PM. We had overwhelmingly more success in recruiting respondents for intercept surveys during the evening when students were returning to their vehicles, as opposed to rushing to get to class on time in the morning. Beyond the respondents, some drivers were willing to participate but ineligible because they were not students.

Figure 35. *The Fraser River Parkade Location*

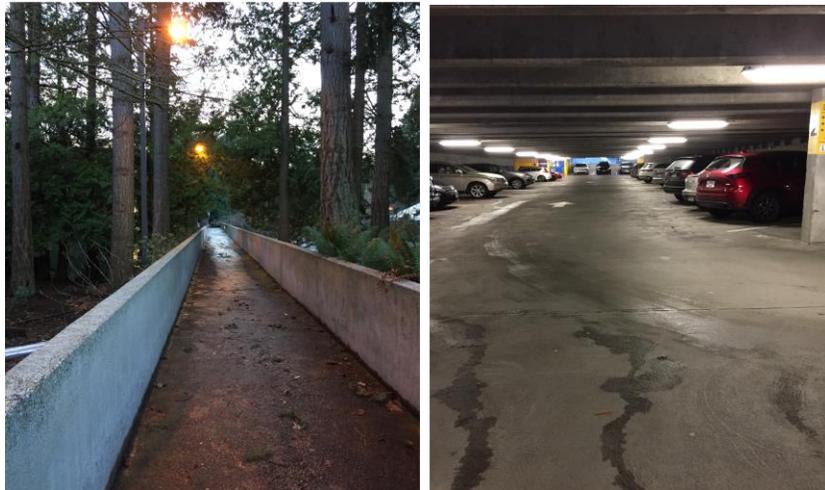
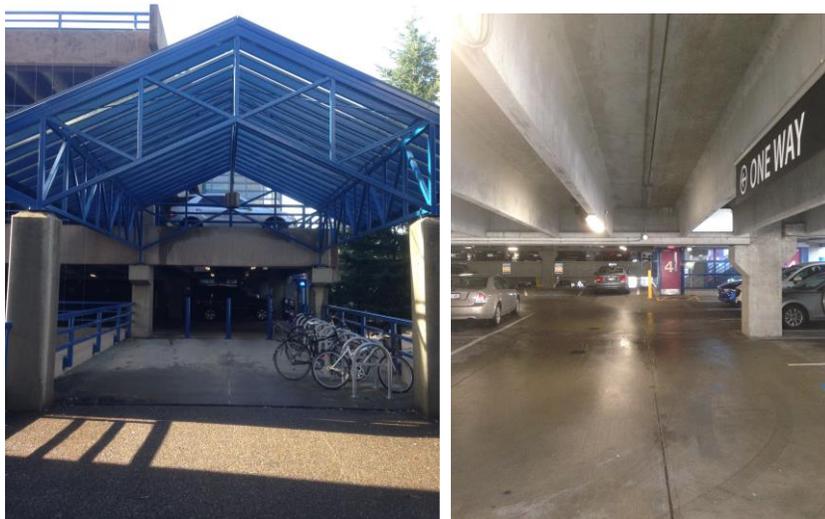


Figure 36. *The West Parkade*



A.2.2. Semi-structured interview

Of the total respondents, 10 engaged in semi-structured one-on-one interviews. Of these, we recruited the majority by word of mouth and interviewed them over the phone

with verbal consent. The questions asked during the interview were similar to the intercept survey questions but allowed us to gain more detail from respondents (see **Appendix J**).

A.2.3. Respondent incentives

As an incentive for participation, AMS provided gift cards to offer as honoraria. Because of limitations on the number of cards available, we used them selectively to thank some of those who agreed to do semi-structured interviews.

A.2.4. Themes for coding

After conducting the interviews, we gathered and coded respondents' answers to organize and analyze our data. In establishing codes, we clustered our responses into themes (**bold**) and subthemes according to the following hierarchy (See **Table 9**):

Table 9: Coding themes and subthemes - SOV

Time	Comfort	Flexibility	Health	Distance	Safety
Childcare pickup/dropoff	Crowdedness		Injury	Walking to bus stop	Weather
Distance	Perceptions of transit		Motion sickness	Walking to class from bus loop	Road conditions
Infrequency	Weather/time of year				
Multiple stops					
Reliability					
Scheduling					

Within this hierarchy, it is important to note that a given variable (e.g., weather) can function as a subtheme for more than one main theme. The reason for this is that the same variable may contribute to different motivations for different people. Moreover, a variable that is a subtheme for one person may be the main theme for someone else; for example, for some, travel distance in itself is a principal reason (theme), whereas for others, it is a subtheme insofar as it lengthens the *time* of travel.

In coding, we applied an interpretive lens, distilling what we believed the respondents' intentions to have been rather than relying solely upon their words, since people often use words in different ways. This procedure helped us sort out which reasons constituted themes versus those which were subthemes for individual respondents. For example,

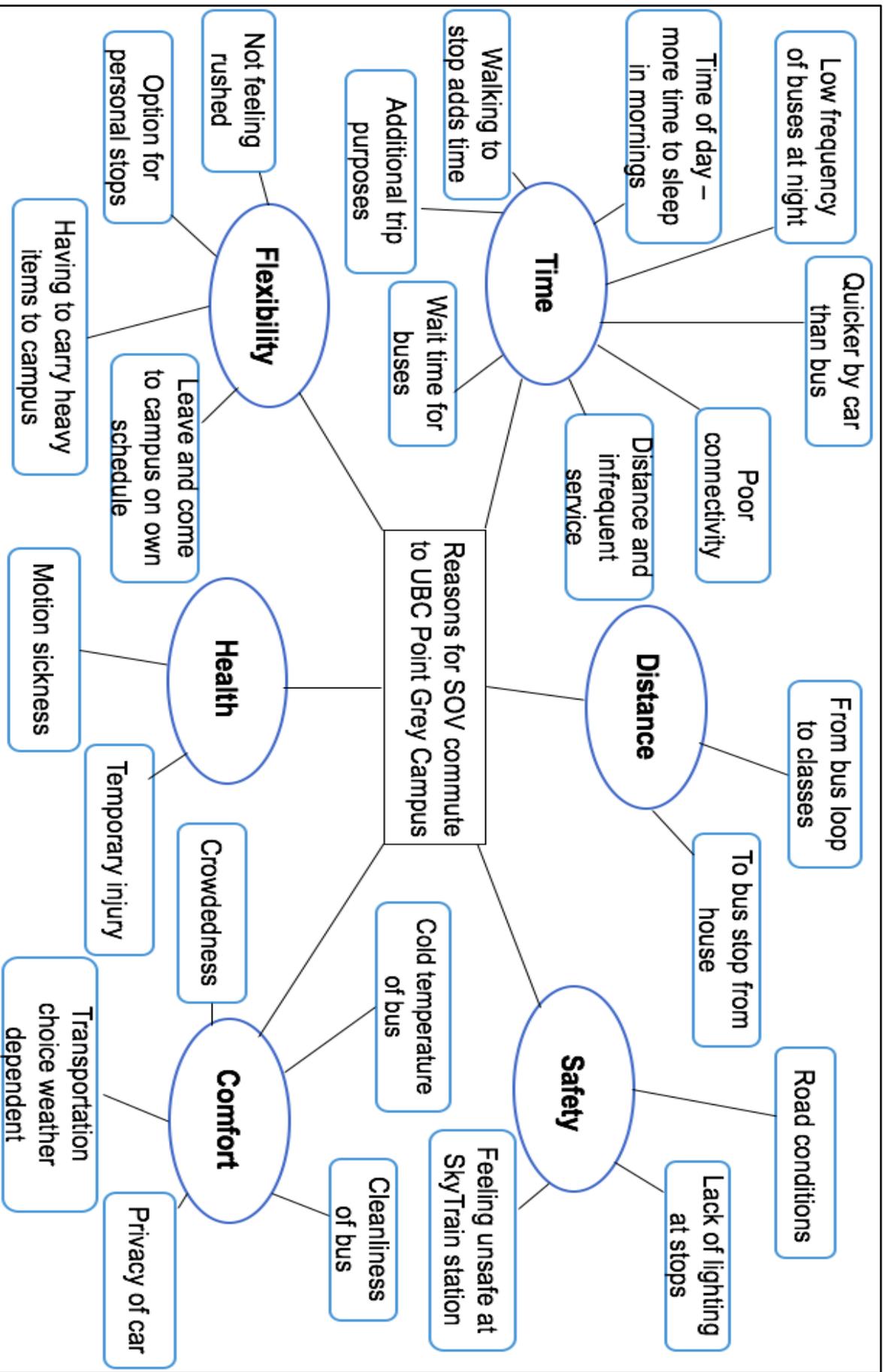


Figure 34. Thematic web

when people cited “distance” as a reason for driving, they often mentioned travel times, illustrating that their main high-level reason was time; thus we have coded those responses under “time.” Another example is that when respondents cited the walk from bus stops to their classes or homes, some meant the inconvenience of the walk itself (coded as “distance”), whereas, others meant the time *added by* the walk (coded as “time”). **Figure 34** illustrates the web of interrelated reasons, with main themes shown elliptically and subthemes in rectangles:

B. Findings

We found that the intercept surveys and interviews elicited similar responses as to the themes and subthemes behind driving to campus. Our reason for using different methodologies was to capture a range of off-the-cuff as well as in-depth responses. The interviews allowed more time to prompt respondents with regard to their answers, resulting in more considered, thorough and multi-dimensional responses that often included subthemes. Because the themes and subthemes we heard were consistent across the two methods (intercept and interview), we have pooled the responses collectively below. So as not to bias responses toward socially encouraged low-footprint travel, we avoided framing questions in environmental terms (Hopkins, 2015, p. 154). Upon pre-testing the survey questions, we found that some respondents hesitated to provide their reasons for driving and that we needed to adjust the language used to approach respondents. It was helpful to express to students that we were making no value judgements on the use of SOVs rather than transit and that we were merely collecting data to inform the AMS’s overall transit improvement advocacy. This seemed to make respondents more relaxed and comfortable, yielding candid responses such as: “I love driving. It’s my favourite thing to do. I put my music on; I’m warm and comfortable. I can drive my friends.”

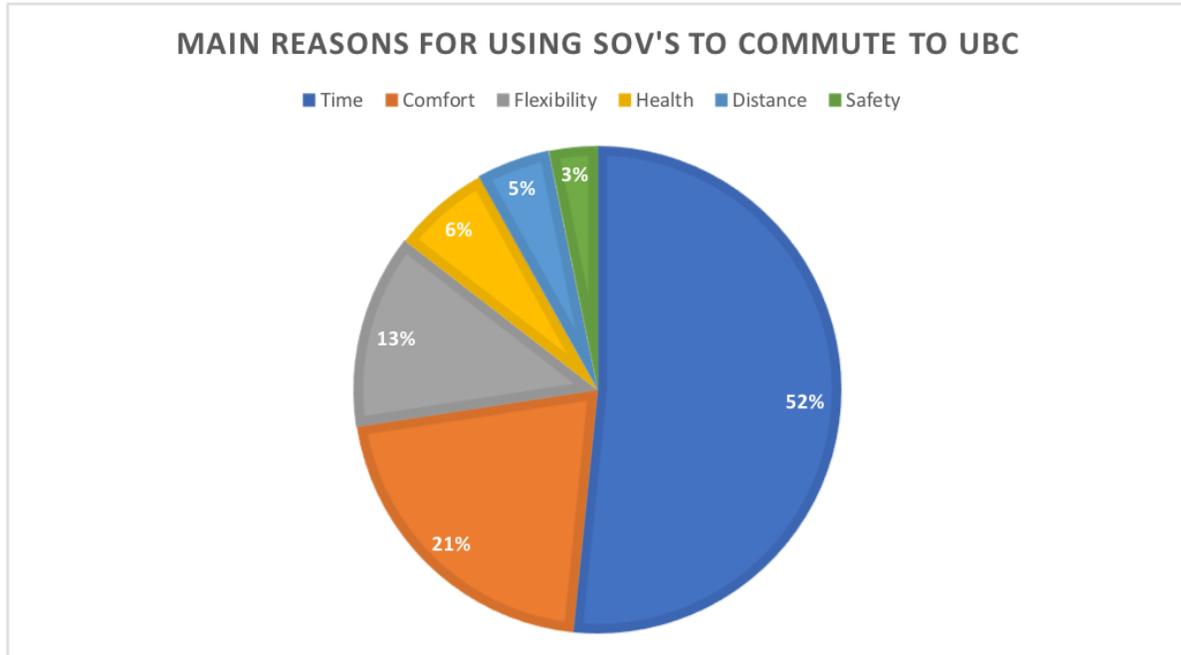
The following table displays the tallies of main reasons stated by respondents, demonstrating clearly that time was the most salient:

Table 10: Primary Reasons for using SOV to Commute to UBC

Reason	Number of responses
Time	32
Comfort	13
Flexibility	8
Health	4
Distance	3
Safety	2

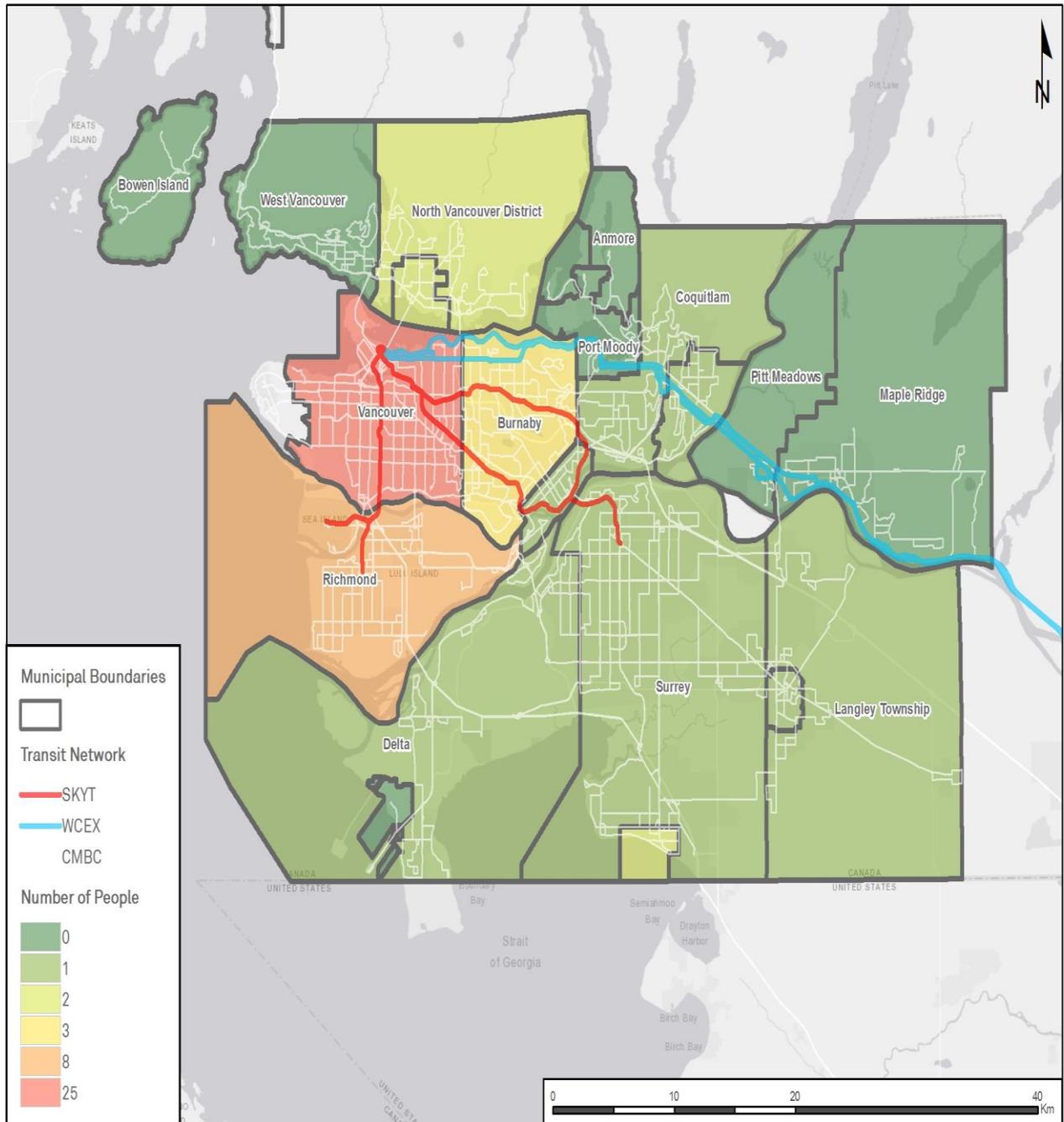
We also show these tallies as percentages in a pie chart (See **Chart 30**)

Chart 30. Main Reasons for SOV Use



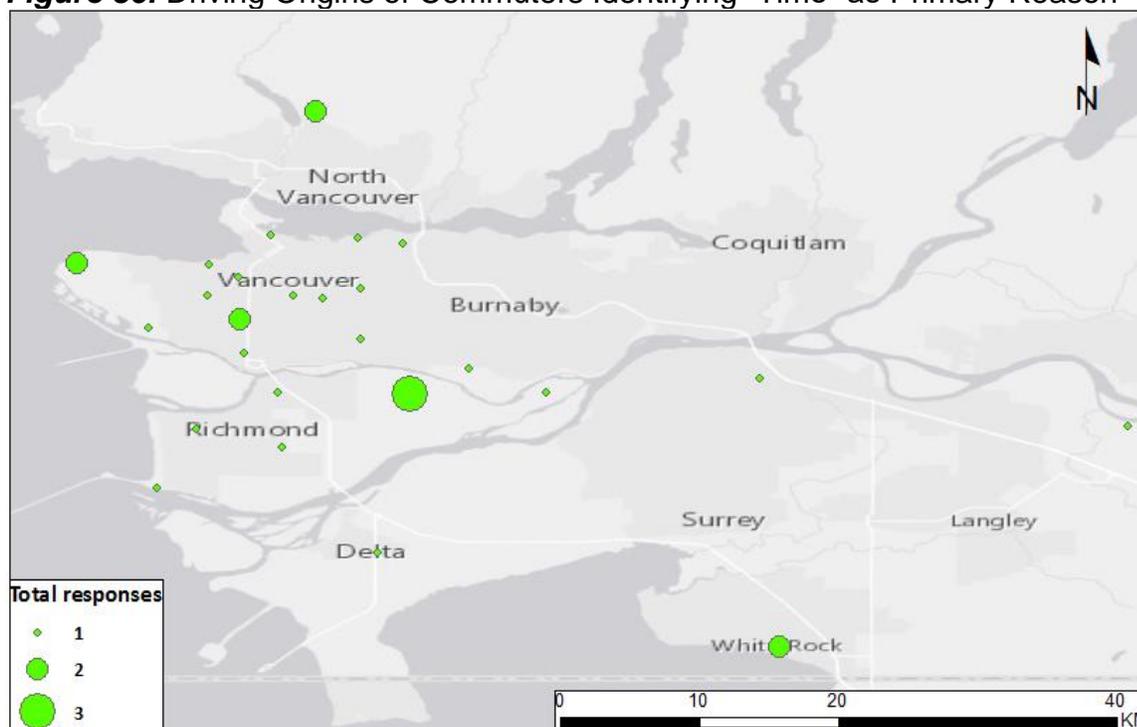
The map below (**Figure 35**) identifies how many SOV users originate from which municipality within Metro Vancouver. We used a heat map, where warmer colours are associated with more people to visually convey where drivers are coming from (such as red for the City of Vancouver with 25 respondents and dark green for municipalities from which no students originate). We overlaid both the rapid transit system and the bus network in the map to identify which areas of the region have more access to transit and thus may be more easily connected to UBC campus than others. Our experimentation with using GIS to represent data is consistent with the literature on how displaying both content and context in a spatial dimension allows identification of issues that would not otherwise be apparent (Knigge and Cope, 2008). Iterative use of GIS elevated our team's level of analysis and revealed that, interestingly, over half the respondents (56%) lived within the City of Vancouver ("Vancouver") (based on the first three digits of postal codes). This fact surprised us, as we had expected the majority to be driving from outside of Vancouver. This suggests the possibility that even within Vancouver, there are areas where transit to UBC may not be very accessible or convenient and therefore students opt to drive instead.

Figure 35: Number of SOV Commuters from each Metro Vancouver Municipality



As a way of illustrating the most commonly cited primary reason, the map below indicates roughly where those who identified “time” are commuting from. This is another example of our iterative use of GIS, with larger circles denoting larger numbers of respondents:

Figure 36: Driving Origins of Commuters Identifying “Time” as Primary Reason



C. Analysis

The above findings were organized, coded and analyzed using the themes noted in Figure 34.

C.1. Time and distance

Findings from surveys and interviews reinforced the message that travel time was the prevailing theme governing the decision to drive. For 28 out of 45 respondents (62%), a one-way transit trip would take over 60 minutes, while 15 (one-third of all respondents) reported that a one-way trip would take at least 1.5 hours. For many respondents, multiple reasons shaped the decision to drive (see **Table 10**).

Significantly, for 1 respondent staying in Musqueam, distance per se was less a factor than the fact that bus stops were located at a far walking distance from the house, causing a 1.5-hour commute in each direction. This shows that while there was a strong correlation between time and distance, the two were not exactly the same. For many, both distance and transfers mattered; one respondent said, “I live in Richmond, and to get to campus I would have to drive to the River Rock Casino, park my car, and then take a one-hour bus trip.” Another said, “Make [transit] faster and more convenient. If the Canada Line ran all the way to UBC, I would take that.”

Some SOV users who also took transit occasionally indicated that longer days on campus or poor weather conditions were factors in their decision to drive on a given day.

Classes in the early morning or in the evening were another reason, as respondents preferred having slightly more time to sleep in in the morning or get home earlier at night. Time to walk to the bus stop and from the UBC bus loop to classes was also a motivator. One intercept respondent said, “After a long day, I just want to get home in peace.”

C.2. Other Factors

While our questions revealed that time was the most powerful reason for people, students also cited factors such as discomfort from bus overcrowding, safety on the SkyTrain at night, need to drop off and pick up children at school and daycare on the way, health effects of motion sickness on busses particularly with heat turned high or heat emitted by other passengers’ bodies, physical injury, increased access to the use of a family car, flexibility to drive elsewhere in the city, and infrequency or unreliability of busses.

For example, we found that the comfort of a car or the comfort to come and go as class schedules permitted were sometimes covered in respondents’ initial answer of “convenience.” The perceived lack of convenience correlates with evidence in the literature that travel time on the bus is viewed as more onerous than time spent on other modes (Eluru, Chakour, and El-geneidy, 2012; Anderson, Nielsen, and Prato, 2017). Another respondent stated time as the main factor for driving but expressed a dislike for public transit by saying, “I don’t care for people sneezing in your face.”

This response is consistent with existing literature on the theory of planned behaviour as it pertains to travel. The respondents’ negative attitude aligns with findings that passengers’ attitudes of transit experience are a significant predictor of travel mode choice (Şimşekoğlu, Nordfjærn, and Rundmo, 2015; Nordfjærn, Şimşekoğlu, and Rundmo, 2014). Two (2) respondents mentioned the discomforts of proximity to other passengers and exposure to body heat or coughing on an overcrowded bus. This is consistent with observations in the literature that customers’ perceptions of travel hinge not only on cognitive assessments but also on “sensorial and emotional components” (Carreira, Patrício, Natal Jorge, Magee and Van Eikema Hommes, 2013, p. 233). Responses were also consistent with evidence in the literature that factors such as transfers and overcrowding are particularly negative deterrents for riders, with “seamless transfers” having the most impact on willingness to use public transit (Chowdhury and Ceder, 2016).

Reflecting on how time burdens from multiple transit connections are aggravated by and intersect with health factors, one participant commented, “[M]otion sickness makes my timing change because of being sick, so I have to take longer. If I feel sick, then I have to jump off the bus and catch the next one maybe.” This participant also alluded to the impact of lacking washrooms on transit, particularly on long commutes: “[F]rom being a mother, sometimes it’s an hour and forty minutes’ commute, and if I am drinking water or tea, I have to use the washroom. But I have to buy something [at a restaurant] in order to use the washroom. The SkyTrains really should have washrooms, because that’s part of the reason I don’t want to take transit.” This feedback points to the gendered aspect of

what Shay et al. (2016) have called transportation disadvantage, by which transportation barriers can complicate access to destinations necessary for employment, education and more.

Research by Muggenburg, Busch-Geertsema and Lanzendorf (2015) on mobility biographies has drawn attention to the way in which “key events” from people’s lives, namely important changes such as moving, starting a family, finishing university and/or making a transition into the workplace can affect decisions regarding transportation mode. This is consistent with certain comments from some of our respondents that they switched from using transit to driving when they moved to or stayed in places in Vancouver where they felt less safe with transit and associated connections, especially at night (e.g., SkyTrain), or where they had to walk too far to access a bus stop. These students had moved to or were staying in places that did not offer fast or easy connections to get to UBC. In one of those cases, a respondent also reported having moved from a small town to Vancouver and feeling unsafe on SkyTrain at night in the big city.

Our findings show that 23 out of 45 respondents (51%) currently carpool to campus or have carpooled in the past. In one interview in particular, the respondent expressed a desire for a mobile application that would allow commuters from one area to connect with others from a nearby area to coordinate a carpooling schedule. The respondent expressed this interest further: “A carpooling app would be great ... not only would I be able to meet new people, but the commute would be more enjoyable, and I wouldn’t have to drive every single day!” Compared to SOV use, carpooling would reduce energy consumption and greenhouse gas emissions to a level equivalent to an express bus service, but at a lower cost (Dorinson et al., quoted in Tahmasseby, Kattan, and Barbour, 2016, p. 242).

While a carpooling initiative could be an attractive alternative transportation mode, more research would be needed as to what type of carpooling app would best meet the needs of drivers and ride-seekers. A successful carpooling app would need a safe, reliable platform where drivers and ride-seekers could confirm pickup and drop-off points and meeting times. Moreover, the transaction should be set up so that users perceive it not as a commercial business action but rather as the provision of incentives such as gas, CO₂ credits or coupons that could be electronically added to the driver’s account (Tahmasseby et al., p. 243). Potential barriers to overcome might include reliability of service, expectations of driver behaviour and vehicle type, flexibility of trip times and safety concerns regarding “stranger danger” (Tahmasseby et al., p. 242).

C.3. Switching to SOV

Our research illuminated the reasons that some respondents switched from transit to SOVs. During an interview, one revealed that she had switched out of frustration after a negative experience taking transit. In one case, the bus had not arrived at its scheduled time, and after waiting 15 minutes, she had returned home for her vehicle. This rationale is consistent with the literature focused on the relation of psychological phenomena to transportation choices. Research on car users’ predicted satisfaction with transit shows

that people underestimate future satisfaction because they recall a specific negative experience rather than considering the broader context or other, more positive experiences (Pedersen, Kristensson, and Friman, 2012). This phenomenon, referred to as the “focusing illusion,” causes an ongoing negative attitude towards transit and a positive one towards automobile use (Pedersen et al., 2012). For this respondent, one critical negative event, the lateness of the bus, caused an inaccurate prediction about future satisfaction and may also influence her to remember the event as having been worse than she originally felt it to have been.

While we have noticed very few qualitative differences in the answers from the intercept survey versus the interview, the interview format allowed teasing out the various factors that contributed to the overall theme of time burden. For example, when asked why she did not wish to take busses and especially the (faster) SkyTrain at night, one interviewee said, “Safety concerns, just especially living in a bigger city. Where I lived before, safety wasn’t so much of a concern because it was a small town, but here there’s more opportunity for criminal activity and more opportunity for big and dangerous situations.”

The interview format gave respondents time to reflect on what they wished to see from TransLink, for example: “I think incentives like wifi would be beneficial because then you could do your homework on the way to school or read on the way to school, and also more safety features such as more lighting, and perhaps they could also heat the shelters and make taking the bus more enjoyable. ... I think it would be nice ... to better inform people about schedules and routes. I actually had quite a difficult time trying to plan my route from my house to UBC.”

D. Recommendations

In the surveys and interviews, respondents identified a number of potential ways to minimize SOV use to campus. On the basis of what we heard, we recommend:

- Increasing the number of express busses from distant locations
- Increasing the number of busses on routes to campus
- Increasing the reliability of busses
- Reducing the number of transfers needed to get to UBC (better connectivity)
- Developing a mobile app for carpooling
- Free student parking at SkyTrain stations to encourage Park and Ride
- Washrooms at SkyTrain stations
- Having SkyTrain connect to the UBC bus loop
- Not having to load Compass Cards every month, given that students have already paid for the entire semester
- More affordable housing options on or near campus to reduce the need to live farther away from campus and depend on SOVs
- More careful (less jerky) bus driving, to help prevent motion sickness

For example, delving deeper into the recommendation for a mobile carpooling app, the app should be a social-network based platform, where drivers and ride-seekers could connect to the webpage via their social media accounts (e.g., Facebook, Google+). This way, both drivers and ride-seekers would be able to base their decision on offering or accepting a ride using their judgement on the perceived trustworthiness of peoples' profiles. Research indicates that for drivers, a ride-seeker's profile is a determining factor in their decision to accept a carpool request (Tahmasseby et al., 2016, p. 251). Similarly, ride-seekers are more willing to accept a ride offer from drivers whom they judge to have a "desirable" social media profile (Tahmasseby et al., p. 251). It is also important for the application to have a platform for drivers and ride-seekers to provide feedback about their carpooling experience. An example of this would be a "crowdsourced user review system" where experiences with carpooling trips could be shared amongst members (Tahmasseby et al., p. 252).

The mobile app should be supplemented with initiatives to promote sustainability and environmental awareness among students on campus. For the app to be successful and maintain usership, carpooling as an alternative mode of transportation to the SOV would need to be marketed through environmental campaigns and events that promote greener travel (Tahmasseby et al., p. 252). Partnering education and awareness with a platform that coordinates carpooling opportunities might help promote behavioural change amongst SOV users in favour of more sustainable modes of transport. As mentioned earlier, however, there could be barriers to overcome in developing a carpooling app, including reliability of service, expectations and regulation of driver/ride-seeker behaviour, flexibility of trip times, insurance, and safety concerns for drivers and ride-seekers. These concerns could be overcome, but further research is required to determine if the idea is possible.

E. Further Research

In addition to the recommendations identified in surveys and interviews by the respondents, we have identified a number of areas for further research. While these were beyond the scope of the project given time constraints, the research would provide valuable information that could help reduce the number of students commuting to UBC via SOVs. These areas include:

- Cost-benefit analysis of driving an SOV against other expenses (e.g., housing) and how cost factors into decision-making
- The connection between gender and SOV use: are there any correlations between household and childcare responsibilities and travel patterns?
- Feasibility of a carpooling app
- The ability/desire for TransLink to increase the number and frequency of busses
- TransLink's ability to create new bus routes and a SkyTrain line to UBC
- Determining the locations in the City of Vancouver and surrounding municipalities with significant gaps in transit access and connectivity

As suggested above, one limitation of our research is that our group's survey and interview instruments did not explore how cost factors into students' decision-making. For example, would more transit users drive if they could afford a car or parking fees? Two of the interviewees touched on financial rationales, revealing that cost does play a significant role in choices. One interviewee stated time as the main reason but also explained that "[he's] saving money by living at home so [he] can justify buying a parking pass and operating a car to cut [his] commute time in half." This respondent's rational cost-benefit analysis aligns with literature that explores how patterns of meaning influence mobility biographies (Sattlegger and Rau, 2016). Understanding whether and how the cost of driving influences students' modal choices would be a significant area for future research.

Gender is another important variable that our group discussed but did not explore in depth in this research. From the higher number of female respondents, we see a potential correlation between gender and SOV use. This is consistent with the literature on the relationship between household and childcare responsibilities and travel patterns. Research shows that continuous household and childcare responsibilities have prompted many women to adopt complex travel patterns that include multiple trip purposes (Rosenbloom and Burns, 1994; Turner and Niemeier, 1997 and Sermons and Koppelman, 2001, quoted in Vance and Peistrup, 2011). As a result of these multiple responsibilities, there has been an increased dependence on a vehicle; in Germany, for example, the vehicle kilometers driven by women increased from 31% in 1997 to 36% in 2007 (Vance and Peistrup, 2011). As one respondent told us in an interview, "I am trying to balance being a mom and full-time student commuting from White Rock." While investigation into how gender impacts reasons for driving is beyond the scope of this study, it is an important aspect for exploration in future research.

Bibliography

- Anderson, M. K., Nielsen, O. A., & Prato, C. G. (2017). Multimodal route choice models of public transport passengers in the Greater Copenhagen area. *EURO Journal on Transportation and Logistics*, 6(3), 221-245.
- Bamberg, S., Rölle, D., Weber, C. (2003). Does habitual car use not lead to more resistance to change of travel mode? *Transportation*, 30(1), 97–108.
- Beirão, G., & Cabral, J. S. (2007). Understanding attitudes towards public transport and private car: A qualitative study. *Transport Policy*, 14 (6), 478-489.
- Bordagaray, M., dell’Olio, L., Ibeas, A., & Cecín, P. (2013). Modelling user perception of bus transit quality considering user and service heterogeneity. *Transportation Policy*, 10(8), 705–72.
- Buehler, R., & Hamre, A. (2016). An examination of recent trends in multimodal travel behavior among American motorists. *International Journal of Sustainable Transportation*, 10(4), 354-364.
- Calvo, F., de Oña, J., de Oña, R., & Francisco J. (2012). A classification tree approach to identify key factors of transit service quality. *Expert Systems with Applications*, 39 (12), 11164-11171.
- Carreira, R., Patrício, L., Natal Jorge, R., Magee, C., & Van Eikema Hommes, Q. (2013). Towards a holistic approach to the travel experience: A qualitative study of bus transportation. *Transport Policy*, 25, 233-243.
- Cavill, N., & Watkins, F. (2007). Cycling and health: An exploratory study of views about cycling in an area of North Liverpool, UK. *Health Education* 107, 404-420.
- Ceder, A., Chowdhury, S., Taghipouran, N., & Olsen, J. (2013). Modelling public-transport users’ behaviour at connection point. *Transport Policy*, 27, 112–122.
- Chen H-K (2015) The structural interrelationships of group service quality, customer satisfaction and behavioural intention for bus passengers. *International Journal of Sustainable Transportation*, 10(5), 418-429.
- Chowdhury, S., & Ceder, A. (2016, May). Users’ willingness to ride an integrated public-transport service: A literature review. *Transport Policy*, 48, 183-195.
- Daley, M., Rissel, C., Lloyd, B. (2007). All dressed up and nowhere to go? A qualitative research study of the barriers and enablers to cycling in inner Sydney. *Road and Transport Research* 16, 42-51.

- Daraio, C., Diana, M., Di Costa, F., Leporelli, C., Matteucci, G., & Nastasi, A. (2015; 2016). Efficiency and effectiveness in the urban public transport sector: A critical review with directions for future research. *European Journal of Operational Research*, 248(1), 1-20. doi:10.1016/j.ejor.2015.05.059
- De Oña, J., Eboli, L. & Mazzulla, G. (2013). Perceived service quality in bus transit service: A structural equation approach. *Transport Policy*, 2, 219-226.
- De Oña, J., De Oña, R., Eboli, L., & Mazzulla, G. (2016). Index numbers for monitoring transit service quality. *Transportation Research Part A: Policy and Practice*, 84, 18-30. <http://dx.doi.org/10.1016/j.tra.2015.05.018>
- Dell'Olio, L., Ibeas, A., & Cecin, P. (2010). Modelling user perception of bus transit quality. *Transport Policy*, 17(6), 388-397.
- Dell'Olio, L., Ibeas, A., & Cecin, P. (2011). The quality of service desired by public transport users. *Transport Policy*, 18(1), 217-227. <http://dx.doi.org/10.1016/j.tranpol.2010.08.005>
- Diana, M. (2012). Measuring the satisfaction of multimodal travelers for local transit services in different urban contexts. *Transportation Research Part A: Policy and Practice*, 46(1), 1–11.
- Donald, I., Cooper, S., Conchie, S. (2014). An extended theory of planned behaviour model of the psychological factors affecting commuters' transport mode use. *Journal of Environmental Psychology*, 40, 39–48.
- Eboli, L. & Mazzulla, G. (2012). Structural Equation Modelling for Analysing Passengers' Perceptions about Railway Services. *Procedia - Social and Behavioral Sciences*, 54 (4), 96-106.
- Eboli, L., & Mazzulla, G. (2011). A methodology for evaluating transit service quality based on subjective and objective measures from the passenger's point of view. *Transport Policy*, 18(1), 172-181. <http://dx.doi.org/10.1016/j.tranpol.2010.07.007>
- Eluru, N., Chakour, V., & El-geneidy, A. (2012). Travel mode choice and transit route choice behavior in Montreal: Insights from McGill university members commute patterns. *Public Transport*, 4(2), 129-149.
- Eriksson, L., Friman, M., & Gärling, T. (2013). Perceived attributes of bus and car mediating satisfaction with the work commute. *Transportation Research Part A: Policy And Practice*, 47, 87-96. <http://dx.doi.org/10.1016/j.tra.2012.10.028>
- Ettema, D., Friman, M., Gärling, T., Olsson, L., & Fujii, S. (2012). How in-vehicle activities affect work commuters' satisfaction with public transport. *Journal of Transport Geography*, 24, 215-222. <http://dx.doi.org/10.1016/j.jtrangeo.2012.02.007>

- Fan, Y., Guthrie, A., & Levinson, D. (2016). Waiting time perceptions at transit stops and stations: Effects of basic amenities, gender, and security. *Transportation Research Part A*, 88, 251-264. doi:10.1016/j.tra.2016.04.012
- Fayne, J. V., Fuhrmann, S., Rice, M. T., & Rice, R. M. (2015). Exploring alternative map products to enhance transportation option awareness. *Cartography and Geographic Information Science*, 42(4), 345-357. doi:10.1080/15230406.2015.1053826
- Flamm, B., & Agrawal, A. (2012). Constraints to green vehicle ownership: A focus group study. *Transportation Research Part D-Transport and Environment*, 17(2), 108-115. doi:10.1016/j.trd.2011.09.013
- Frank, L. D. (2000). Land use and transportation interaction: Implications on public health and quality of life. *Journal of Planning Education and Research*, 20 (2), 6-22.
- Fujii, S., Kitamura, R. (2003). What does a one-month free bus ticket do to habitual drivers? An experimental analysis of habit and attitude change. *Transportation*, 30(1), 81–95.
- Garrard, J., Crawford, S., & Hakman, N. (2006). *Revolutions for women: Increasing women's participation in cycling for recreation and transport*. Melbourne: Deakin University.
- Garrido, C., de Oña, R., & de Oña, J. (2014). Neural networks for analyzing service quality in public transportation. *Expert Systems With Applications*, 41(15), 6830-6838. <http://dx.doi.org/10.1016/j.eswa.2014.04.045>
- Grotenhuis, J.W., Wiegman, B. W., & Rietveld, P. (2007). The desired quality of integrated multimodal travel information in public transport: Customer needs for time and effort savings. *Transport Policy*, 14(1), 27–38.
- Guell, C., Panter, J., Jones, N. R., & D. Ogilvie. (2012). Towards a differentiated understanding of active travel behaviour: Using social theory to explore everyday commuting. *Social Science & Medicine*, 75 (1), 233-239.
- Guirao, B., García-Pastor, A., & López-Lambas, M. (2016). The importance of service quality attributes in public transportation: Narrowing the gap between scientific research and practitioners' needs. *Transport Policy*, 49 , 68-77. <http://dx.doi.org/10.1016/j.tranpol.2016.04.003>
- Guiver JW. (2007.) Modal talk: Discourse analysis of how people talk about bus and car travel. *Transportation Research Part A: Policy and Practice* 41(3), 233–248.

- Guo, Z. (2011). Mind the map! The impact of transit maps on path choice in public transit. *Transportation Research Part A*, 45(7), 625-639.
doi:10.1016/j.tra.2011.04.001
- Heinen, E., & Bohte, W. (2014). Multimodal Commuting to Work by Public Transport and Bicycle Attitudes Toward Mode Choice. *Transportation Research Record: Journal of the Transportation Research Board*, 2468, 111-122.
- Hernandez, S., & Monzon, A. (2016). Key factors for defining an efficient urban transport interchange: Users' perceptions. *Cities*, 50, 158-167.
- Hernandez, S., Monzon, A., & de Ona, R. (2016). Urban transport interchanges: A methodology for evaluating perceived quality. *Transportation Research: Part A, Policy and Practice*, 84, 31-43.
- Hilden, E., Ojala, J., Vaananen, K. (2016). User Needs and Expectations for Future Travelling Service in Buses. *Proceedings of the 9th Nordic Conference on Human-Computer Interaction. Article No. 98*. Sweden - October 23-27, 2016.
<http://dx.doi.org/10.1145/2971485.2996733>
- Hopkins, D. (2016). Can environmental awareness explain declining preference for car-based mobility amongst generation Y? A qualitative study. *Transportation Research Part A: Policy and Practice*, 94, 149-163.
- Iseki, H. & Taylor, B.D. (2010). Style versus Service? An Analysis of User Perceptions of Transit Stops and Stations. *Journal of Public Transportation*, 13 (3). 23-48.
- Jen, W., Tu, R., Lu, T. (2011). Managing passenger behavioural intention: an integrated framework for service quality, satisfaction, perceived value, and switching barriers. *Transportation*, 38(2), 321–342.
- Klein, N. (2017) More than just a bus ride: The role of perceptions in travel behavior, *Urban Studies* 54: 2490-2503.
- Lai, W., & Chen, C. (2011). Behavioral intentions of public transit passengers—The roles of service quality, perceived value, satisfaction and involvement. *Transport Policy*, 18(2), 318-325.
- Lai, W.-T., Chen, C.-F. (2011). Behavioural intentions of public transit passengers—the roles of service quality, perceived value, satisfaction and involvement. *Transportation Policy*, 18(2), 318–325.
- Lopez-Lambas, M.E., & Monzon, A., (2010). Private funding and management for public interchanges in Madrid. *Research in Transportation Economics*, 29, 323–328.

- Manaugh, K., Boisjoly, B., & El-Geneidy, A. (2017). Overcoming barriers to cycling: Understanding frequency of cycling in a university setting and the factors preventing commuters from cycling on a regular basis, *Transportation*, 44 (4), 871-884.
- Mao, Z., Ettema, D., & Dijst, M. (2016). Commuting trip satisfaction in Beijing: Exploring the influence of multimodal behavior and modal flexibility. *Transportation Research Part A: Policy and Practice*, 94, 592-603.
- Mathewson, C., & Cheyne, N. (2017). 2017 Vancouver Transportation Survey. University of British Columbia.
https://connect.ubc.ca/webapps/blackboard/execute/content/file?cmd=view&content_id=_4649484_1&course_id=_108845_1
- McAndrews, C., & Marcus, J. (2014). Community-based advocacy at the intersection of public health and transportation: The challenges of addressing local health impacts within a regional policy process. *Journal of Planning Education and Research*, 34(2), 190-202. doi:10.1177/0739456X14531624
- Mennis, J., Mason, M., & Cao, Y. (2013). Qualitative GIS and the visualization of narrative activity space data. *International Journal of Geographical Information Science*, 27(2), 267-291. doi:10.1080/13658816.2012.678362
- Molin, E., Mokhtarian, P., & Kroesen, M. (2016). Multimodal travel groups and attitudes: A latent class cluster analysis of Dutch travelers. *Transportation Research Part A: Policy and Practice*, 83, 14-29. Retrieved from
- Morton, C., Caulfield B., & Anable, J. (2016). Customer perceptions of quality of service in public transport: Evidence for bus transit in Scotland. *Case Studies on Transport Policy*, 10 (3), 199-207.
- Mouwen, A. (2015). Drivers of customer satisfaction with public transport services. *Transportation Research Part A: Policy and Practice*, 78, 1-20.
<http://dx.doi.org/10.1016/j.tra.2015.05.005>
- Muggenberg, H., Bursch-Geertsema, A., & Lanzendorf, M. (2015). A review of achievements and challenges of mobility biographies approach and a framework for further research, *Journal of Transport Geography*, 46: 151-163.
- Nesheli, M.M., Ceder, A., & Estines, S. (2016). Public Transport User's Perception and Decision Assessment Using Tactic-Based Guidelines. *Transport Policy*, 49, 125-136.
- Nordfjærn, T., Şimşekoğlu, Ö., Rundmo, T. (2014). The role of deliberate planning, car habit and resistance to change in public transportation mode use. *Transportation Research Part F: Traffic Psychology and Behaviour*, 27, 90-98.

- Nunes, A. A., Galvão, T., & Cunha, J. F. e. (2014). Urban Public Transport Service Co-creation: Leveraging Passenger's Knowledge to Enhance Travel Experience. *Procedia - Social and Behavioral Sciences*, 111, 577–585. <https://doi.org/10.1016/j.sbspro.2014.01.091>
- Redman, L., Friman, M., Gärling, T., & Hartig, T. (2013). Quality attributes of public transport that attract car users: A research review. *Transport Policy*, 25, 119-127. <http://dx.doi.org/10.1016/j.tranpol.2012.11.005>
- Sattlegger, L., & Rau, H. (2016). Carlessness in a car-centric world: A reconstructive approach to qualitative mobility biographies research. *Journal of Transport Geography*, 53, 22-31. doi:10.1016/j.jtrangeo.2016.04.003
- Shay, E., Combs, T. S., Findley, D., Kolosna, C., Madeley M., & Salvesen, D. (2016). Identifying transportation disadvantage: Mixed-methods analysis combining GIS mapping with qualitative data. *Transport Policy*, 48, 129-138.
- Shen, X., Feng, S., Li, Z., & Hu, B. (2016). Analysis of bus passenger comfort perception based on passenger load factor and in-vehicle time. *Springerplus*, 5(1), 1-10.
- Shove, E. (2010). Beyond the ABC: climate change policy and theories of social change. *Environment and Planning A*, 42, 1273-1285.
- Şimşekoğlu, Ö., Nordfjærn, T., Rundmo, T. (2015). The role of attitudes, transport priorities, and car use habit for travel mode use and intentions to use public transportation in an urban Norwegian public. *Transportation Policy*, 42, 113–120.
- Stelzer, A., Englert, F., Hörold, S., & Mayas, C. (2016). Improving service quality in public transportation systems using automated customer feedback. *Transportation Research Part E*, 89, 259-271. doi:10.1016/j.tre.2015.05.010
- St-Louis, E., Manaugh, K., Van Lierop, D., and El-Geneidy, A. (2014, September). The happy commuter: A comparison of commuter satisfaction across modes. *Transportation Research Part F: Traffic Psychology and Behaviour*, 26 (A), 160-170.
- Stradling S., Carreno M., Rye T., et al. (2007). Passenger perceptions and the ideal urban bus journey experience. *Transport Policy* 14(4): 283–292.
- Susilo, Y., & Cats, O. (2014). Exploring key determinants of travel satisfaction for multi-modal trips by different traveler groups. *Transportation Research Part A: Policy and Practice*, 67, 366-380. <http://dx.doi.org/10.1016/j.tra.2014.08.002>

- Thomas, R. (2010) "Why can't we get around?" Travelling under constraints in Metro Vancouver. *Canadian Journal of Urban Research*, 19(1), 89-110.
- Tirachini, A., Hensher, D. A., & Rose, J. M. (2013, July). Crowding in public transport systems: Effects on users, operation and implications for the estimation of demand. *Transportation Research Part A: Policy and Practice*, 53, 36-52.
- Tyrinopoulos, Y., & Antoniou, C. (2008). Public transit user satisfaction: Variability and policy implications. *Transport Policy*, 15(4), 260-272.
<http://dx.doi.org/10.1016/j.tranpol.2008.06.002>
- Wall, R., Devine-Wright, P., & Mill, G. A. (2007). Comparing and combining theories to explain pro-environmental intentions: The case of commuting-mode choice. *Environment and Behaviour*, 39(6), 731-753.
- Wall, R., Devine-Wright, P., & Mill, G. A. (2008). Interactions between perceived behavioural control and personal-normative motives: Qualitative and quantitative evidence from a study of commuting-mode choice. *Journal of Mixed Methods Research*, 2(1), 63-86.
- Watkins, K. E., Ferris, B., Borning, A., Rutherford, G. S., & Layton, D. (2011). Where Is My Bus? Impact of mobile real-time information on the perceived and actual wait time of transit riders. *Transportation Research Part A: Policy and Practice*, 45(8), 839–848. <https://doi.org/10.1016/j.tra.2011.06.010>
- Whalen, K. E., Páez, A., & Carrasco, J. A. (2013). Mode choice of university students commuting to school and the role of active travel. *Journal of Transport Geography*, 31, 132-142.
- Zeng, W., Fu, C., Arisona, S. M., Erath, A., & Qu, H. (2014). Visualizing mobility of public transportation system. *IEEE Transactions on Visualization and Computer Graphics*, 20(12), 1833-1842. doi:10.1109/TVCG.2014.2346893

APPENDIX A- Participant Observation Protocol

Plan 522 Participant Observation Protocol¹

Name of Participant Observer:

Location:

Date/Time of survey start:

Date/Time of survey end:

Observation	Bus 1	Bus 2	Bus 3	Comment
Bus Loop				
Arrival				
Departure				
Scheduled Departure				
Passengers Boarding				
w/ backpacks				
w/ bicycle				
w/ skateboard				
w/ stroller				
Bus Full (Y/N)				
No. people switching to another bus route				
No. people kept waiting at stop after bus passed				
Waiting: Sitting on bench in shelter				
Waiting: Standing under shelter				
Waiting: Standing in open				
What people are doing				
Additional Comments				
Inside Bus				
Passengers sitting				
Passengers Standing				
Stop where passengers get off				
What people are doing				

¹ Observations to occur between 7-9AM and 4-6PM

APPENDIX B - Survey Tool

AMS-SEEDS Project: UBC Students Transportation Use Patterns and Experience

SURVEY QUESTIONNAIRE:

RESPONDENT CODE: _____

Introduction:

I am a Masters in Planning student at UBC. We are working on an AMS research on public transit use patterns and experience to improve bus service to UBC. Do you have about 5 minutes to answer a short questionnaire about your use of public transit to UBC? Your response will be completely confidential. Your name will not appear on the final report. You will get a thank you gift card for your participation.

1.0 Selection Criteria:

1.1. Are you a UBC Student? _____ Yes (proceed to 1.2) _____ No (say thanks and good bye)

1.2. Are you ride the bus to campus? _____ Yes (proceed to 2) _____ No (say thanks and good bye)

2.0 Bus Rider Profile:

2.1. Age: _____ 19 below; _____ 20-24; _____ 25-29; _____ 30-39; _____ 40-64; _____ 65-above

2.2. What Gender do you identify _____ (Note: Let people Self-Identify. Some possible answers (Female Male, Other Possibilities (Queer, Transgender, Non-Binary, Gender-Non-Conforming, etc.)

2.3 What is your Postal Code (first 3 digits only) _____

3.0 Frequency and Connectivity:

3.1 How often do you come to campus? Please check which frequency ____ 1x day, ____ 2x day, ____ > 2x a day; ____ 2-3 days a week, ____ 4-5 days a week ____ > 5 days a week

3.2 How often do you commute to campus on this bus route? ____ 1x day, ____ 2x day, ____ > 2x a day; ____ 2-3 days a week, ____ 4-5 days a week ____ > 5 days/week

3.3. What time do you usually take this bus route?
_____ A.M. (Include Time Period) _____ P.M. (Include Time Period) _____

3.4. Why do you take public transit instead of driving? Please identify reason:

3.5. Do you take other routes to get to this route?
_____ Yes (Go to 3.7) _____ No (Go to 3.8)

3.6. What other routes do you take to get to this route? Please identify _____

3.7. Do you take the same route to and from campus or different routes? Why?
_____ Same Route;
Why _____
_____ Different Route;
Why _____

3.8. Which bus stops do you most frequently use? Name the stops or intersections

4.0. User Experience:

4.1. Do you experience the following at least once a week? (Check all that apply)
_____ Delays; _____ Pass-Up _____ Standing Room Only _____ Overcrowding

4.2. Which of these factors affect your choice of transit route: (Check all that apply)
_____ speed, _____ frequency _____, proximity, _____ pass-ups, _____ crowdedness, _____ accessibility, _____ safety, _____ others (Please identify _____)

4.3. Which of these factors are important to you as a public transit user?
_____ speed _____ frequency _____ proximity _____ schedule reliability

_____comfort _____leg room _____place to sit and do work
_____others (Please identify_____)

5.0 Wrap-Up:

What suggestions do you have to improve your travel experience to and from UBC? Please identify. _____

6.0. Closing:

6.1. Thanks for your participation in this survey. If you have any questions, about this research, please contact your AMS Vice-President for Public Relations.

6.2. Are you willing to be contacted to be interviewed one-on-one? _____Yes _____No

APPENDIX C - Interview Guide and Transcripts

AMS-SEEDS Project- PLAN 522: UBC Students Transportation Use Patterns and Experience

INTERVIEW GUIDE:

RESPONDENT CODE: _____

Introduction:

Thank you very much for agreeing to this interview. I am part of a group of Masters in Planning students working on an AMS research on public transit use patterns and experience of UBC students. Our research aims to improve public transit service to UBC. Your responses to my interview questions will be completely confidential. Your name will not appear on the final report. You will get a thank you gift card for your participation.

Warm Up Questions:

1. What program are you taking at UBC?
2. Where do you live off-campus?
3. How often do you come to UBC?

Prompt: Do you use the public transit more often than a car?

4. What bus routes do you often take when you come to UBC?
Probe: What times do you usually take these bus routes?
5. What bus routes do you often take when you leave to UBC?
Probe: What times do you usually take these bus routes?

Body:

6. Why do you take public transit instead of driving?
Probe: What do you value or like about public transit?
7. Why do you choose to use the specific line(s) you take to and from UBC?
8. What do you like best about these routes to UBC?
Prompt: Is it the frequency? Length of travel time?
Probe: What else do you like best about these routes?
9. What do you like least about these routes?
Prompt: Is it the overcrowding? Delays?
Probe: What else do you like least about these routes?
10. How do you get to your bus stop to take your bus to UBC?
Prompt: Do you walk or does someone drive you to the bus stop?
11. Coming back home from UBC, how do you get home from your bus stop?
Prompt: Do you walk home or does someone drive you home?
12. What do you value most when selecting a mode of transit to commute to campus?
Probe: Why are these important to you?
13. What specific bottlenecks or sites that cause delay on your specific route, and why?
Probe: Why do you think these bottlenecks or sites are particularly causing delay? How often do they occur during your commute to UBC?
14. What conditions would encourage you to continue taking this routes or try other routes?
15. What specific suggestions to you have to improve your travel experience to and from UBC?

Cool-Off:

16. Do you have any questions for me about our research?

Closing:

Thank you very much for your participation in this survey. If you have any questions, about this research, please contact your AMS Vice-President for Public Relations Sally. If you want to receive a copy of our final report to the AMS, here is my contact number. _____
 Good-bye.

ii. Coding Values

Codes	Themes
Crowdedness	Perception of Service
Reliability - Delays, Speed	Quality of Service and Facilities
Frequency	Quality of Experience - i.e. safety
Proximity	Temporal Experience - rush hour, late night
Convenience	How people choose alternative routes - Safety Factors
Postal Codes	Reliability/Speed
(Improvement Suggestions)	Incentives to use transit

iii. Transcripts

Code: IR8AV

Interviewer: I'm part of a group of Master's and planning students, as you know, working on the AMS research on public transit patterns and experience of UBC students. Our research aims to improve public transit service to UBC and your response to my interview will remain completely confidential. Your name will not appear on the final report and you will receive a thank you gift card for your participation once we have completed the survey...or the interview.

Respondent: Exciting

Interviewer: So just a few preliminary questions, it rehashes a bit of what we talked about in the survey. Um, but just so that the context is laid out for the interview.

Respondent: Yeah sure.

Interviewer: So what program are you taking here at UBC, as I know you are a student?

Respondent: I am a PhD student in the interdisciplinary studies program.

Interviewer: Ok great, and which neighbourhood of the city do you live in?

Respondent: Um I guess its called Fraserhood now but it could be called Cedar cottage..? Yeah

Interviewer: Ok and how often do you come to UBC from that neighbourhood?

Respondent: Uh..twice a week.

Interviewer: I know from previous conversation that you don't have a car....or sorry that you don't drive a car, but you have a car. Would you say that you take public transit still more than the vehicle, like in a shared capacity?

Respondent: Yeah...absolutely. I mostly take public transit.

Interviewer: And what types of routes do you usually take from UBC, either from home or other places?

Respondent: So there's two routes I take, if I'm coming from home I'll take the 25 direct to UBC um but I work downtown as well so usually I'll take the number 4 to get from the Downtown East Side to get to UBC.

Interviewer: And what times of day do these... do you take these routes...like does it vary based on route?

Respondent: Uhh... Yep so I typically take the number 4 in the afternoon, so around 3pm, and uh for the 25 I take it to get to campus like around noon and then I leave sometimes at 4pm and sometimes much later in the evening...like 8pm (chuckle).

Interviewer: Right. (chuckle)

Interviewer: Ok great, and do you take the same routes back home or which one do you usually take back?

Respondent: I always take the 25 home.

Interviewer: And then what's the intersection that you usually get off at...um coming, going back from UBC?

Respondent: Uhh King Ed and Fraser.

Interviewer: Alright and now getting into more specific about your feedback regarding transit and your interest in transit, some of the questions include... So why do you choose public transit over driving for example in your life...or commute?

Respondent: Uh it's way more affordable to do it that way, um, my pass is included in my tuition so...um, and I just think like, even if I was like willing to drive every day I think just environmentally it's better to take transit if you can.

Interviewer: Ok...um...and is there anything...so you mentioned sustainability uh.. and cost

Respondent: ...yeah...

Interviewer: ...as two of the major things. How about the specific route that you take, the number 25, or the 4, are there any specific things about those routes that you, like the reason that you take them?

Respondent: It's direct, so, there's really no point for me to take a different route because it's the most direct route.

Interviewer: From where you're coming from...

Respondent: Yeah from where I'm coming from.

Interviewer: Ok, and is there anything that you like particularly about these routes in term of like...if you think of the pros and cons of the routes what do you like best about them?

Respondent: Um...I...again the directness is a huge factor. I *hate* transferring, especially in the rain. And then that adds that element of unpredictability - you never know if the next bus is actually

going to come, so direct route is great with the 25. Um...anndd...it comes pretty frequently now, like I usually don't have to wait too long for one to arrive.

Interviewer: And are there any particular things that stand out to you as the things you don't like typically about these routes?

Respondent: Mm...it can get crowded especially at peak hours and uh...yeah...I feel like Vancouver hasn't quite figured out bus etiquette yet (laugh) so...like the process of leaving is sometimes chaotic...Still workin?

Interviewer: I'm just making sure... yeah (checking recorder)

Respondent: Yeah and... sometimes, if something goes wrong ...somewhere along the route it really can delay things a lot in Vancouver I find. So uh most of the time things run smoothly but when things go awry, especially if you're trying to leave from UBC, you can easily get stuck on campus for like hours.

Interviewer: Right, that's fair. Ok and part of the information gathering is about how you get to the route in the first place. So the next question is how do you get to your bus stop to take the bus to UBC..like from home

Respondent: From home? Yeah so I walk and it's just a few minutes.

Interviewer: Have you ever driven to the stop?

Respondent: No it's too close to drive haha.

Interviewer #2: And the same from work, do you also walk?

Respondent: Yeah also walk, also within a minute.

Interviewer: So does this pertain in the same way when you go home, you just walk back to your home from the bus stop?

Respondent: Uhh...so you're saying when I get off the bus and head home not when I'm walking to the bus stop at UBC?

Interviewer: Correct, sorry yeah. When you're...like when you come home on the bus...it's the same in both directions.

Respondent: Yes the same in both directions.

Interviewer: So we've kind of covered your valuation of buses versus like a vehicle, so you're saying that even if you did have a vehicle you would take the bus?

Respondent: Yeah probably.

Interviewer: So specifically about your commute to campus, what are some of the values that really come out for you when you come to campus, like as a student and as someone who takes classes?

Respondent: Does it get me there....I don't have many values when I'm choosing, it's just like what is the most direct route. There's not many options.

Interviewer #2: For example like do you like being able to read on the bus, versus if you were driving you wouldn't be able to .

Respondent: Oh...yeah, yeah, but I would totally give up the benefit of reading if it was just quicker. You know, like, to me like reading on the bus isn't what would change me...from driving instead, it's just the affordability question.

Interviewer: Right ok, and the lack of transfers. For example, if there was a route that was quicker but had one transfer at least...

Respondent: I might not take it, yeah I'd rather just take one bus, even if it's just 5 or 10 minutes longer, it's just the uncertainty of that transfer I'd rather avoid. I'm very risk adverse. (laugh)

Interviewer: That's fair. Ok great, and earlier you mentioned about delays and where things go wrong they go quite wrong on certain buses, so are there any particular spots along the 25 route that you see as causing delays or bottlenecks?

Respondent: Um...I mean a lot of the busses run along the same routes so if there's a downed line or something then all the buses need to be rerouted around that. So I've noticed with Vancouver since so many of them are going along the same main hubs, if something happens along those main hubs, I can't pinpoint a particular point where that's happening but yeah.

Interviewer: Are there any bus stops that you stop at that you notice maybe, does it slow down or get behind schedule or anything?

Respondent: Well I mean if you're pulling up to a skytrain station you're going to have a lot of people leaving and coming on so that can..there might be some delays there. But no I haven't noticed anything in particular its usually pretty smooth. I mean the number 8 going downtown, that's the big unknown. If you're coming from downtown you have no idea what the traffic is going to be like coming downtown. But I mean King Edward that's pretty smooth generally.

Interviewer: So in terms of...like further on that...in terms of the bottlenecks and stuff, you're saying you don't notice any on the 25 route...do you find that...do you know the schedule well that you would notice if it gets behind? Or is it just more comparative to other days or something?

Respondent: Honestly I don't even check the schedule for the #25, it comes so regularly I'll just walk to the stop and fully expect that one will be coming in the next 5-10 minutes. I'll really only notice it if I've been standing there for 10 minutes and one hasn't come then I'll look up and notice. Then I'll see on google that it's suddenly delayed 20 minutes.

Interviewer: Ok so it's more a comparison for you, like against your own...experience.

Respondent: Yeah in my experience they come like almost every 5-10 minutes so if it's anything more than that that's how I found out.

Interviewer: So are there any particular conditions either along the 25 route or along other routes that you take that would encourage you to...sorry I'm trying to think about how to word this better. Like is there anything about the route you require to remain the same like in terms of level of service or um...anything that stands out for you in terms of what you like about the route in order for you to keep taking the route and not switch to something else.

Respondent: Hm....

Interviewer: Yeah it's kind of a convoluted question.

Respondent: Yeah I don't know if I quite grasp the question.

Interviewer #2: What conditions would encourage you to continue taking this route or try other routes?

Respondent: Ohh...that's a double barreled question.

Interviewer #2: Ok well start with the first one...what conditions would encourage you to continue taking this route.

Respondent: I don't know how to answer that one, I mean it's just, I would just take the route unless, I mean **unless they completely rerouted it and it was no longer convenient, I would have to keep taking it.** Again, I don't have many choices.

And the second part was...like the double-barreled question.

Interviewer #2: So what conditions would encourage you to change your route?

Respondent: **Yeah so if there was a faster option, um, like a much faster option I would take a different route.** But I don't see that happening because it's very direct

Interviewer: So like directness is something that would encourage you to...

Respondent: **Yeah or speed like if there was something other than buses, if there was a skytrain option suddenly I would prefer to take that.**

Interviewer: So is there anything particular about your travel experiences coming to UBC on either of the two buses that you would ...prompt you to have suggestions for change or...

Respondent: Like things I would like to see changed on the routes?

Interviewer: Yeah

Respondent: **More information about delays with buses,** like I said I'm really just relying on...sometimes I look at the twitter accounts for Translink... but usually I'm just looking at google maps. It is really helpful when you have those stations that just say coming in like 3 minutes or 5 minutes. It just gives you some idea of when the bus is coming. And you see some stops that don't have like any schedule at all, especially at UBC, **so it would be great if there was just more information and clarity when there are delays.** And I think I mentioned in the surveys while **just lighting at some stops like some of those stops are really dark and it's not pleasant to wait at.**

Interviewer: And do you find those stops are they usually at main streets as well as side streets?

Respondent: Um...the main streets are well lit, UBC is not so great though. The main bay where you're waiting is pretty dark, especially along...I forget the name of the street...but where I wait for the 25. I think because there's construction or something, it's just like so dark.

Interviewer: Great so that kind of wraps up my part of the interview. Do you have any questions for me or anything that you'd like to add that I didn't cover in the questions that we discussed regarding your experiences?

Respondent: Nope I think that's it.

Interviewer #2: I have one follow up question. So when you talked about earlier about Vancouver bus etiquette, is there anything specific about that that you wish that people did?

Respondent: Um...especially on the route to UBC, because it's a lot of students, a lot of us are looking at phones and we're like really plugged in to...you know we're thinking about our class and people aren't really alert and conscientious about different mobility needs of people and

making space for people that need to sit down. So I've often found that no one is really paying attention when an elderly person comes on and they're struggling to make their way through this sea of students. So that's something I've noticed. But in other ways Vancouver etiquette is quite good because people line up and it's very orderly, unlike other cities people where people just like clump around. But you can't really change the way people engage with cell phones and their own work so it's just a personal gripe really.

Interviewer: Ok great, well thank you so much for your participation and here is a gift card for you efforts.

Code: IR22EJ

EJ: So, just a couple warm-up questions, what program are you taking at UBC?

IR22EJ: First year MCRP

EJ: Which neighbourhood do you live in?

IR22EJ: um dunbar southlands..

EJ: How often do you come to UBC?

IR22EJ: five days a week

EJ: five days a week.. and do you use public transit more often than a car?

IR22EJ: Yes, that's the only transit I use.

EJ: and then what bus routes do you usually take to UBC?

IR22EJ: 25, and excuslively 25.

EJ: exclusively 25. Okay. Um.. and you take the bus back to and from?

IR22EJ: Yup.

EJ: and what time do you usually take the bus?

IR22EJ: (Laughs), ummm I know the options from the survey so I'm trying to think. Um.. well, if its like today law class it's early morning, but its like on average I would say is the 9 to 12 period.

EJ: Pause. Um.. what intersection do you usually get off at?

IR22EJ: Oh Bleneheim and king ed. The ID is 51590 and 51459 haha cause I text it every morning.

EJ: (Laughs) um okay, so why do you prefer to take public transit instead of driving?

IR22EJ: first of all I don't have a car, I don't have a full licence, um but also just because it just allows me to not pay attention. So I really see taking public transit for an opportunity to just like partially relax. Cause I can listen to music I can think my own stuff its my reflection time of day, I uh have never really driven before so I could be bias, but I just think taking public transit allows me to really have that time to myself to not pay attention to things cause like when you are driving you have to really pay attention to things. Whereas transit is just a way for me to relax and not pay attention. And its also more sustainable, it's cheaper for sure because I have UPAsS. But other than that you know I just enjoy public transit, I think it's a way for it to not be stressfull. **Unless it gets overcrowded which is a different topic.**

EJ: right, how long do you think you spend on the bus each day?

IR22EJ: I... pause, actually on the bus I would say probably 40 minutes, but my transit time is definitely an hour in total everyday.

EJ: Ok, so um, you only take the 25 is there a reason that you only take the 25?

IR22EJ: **it's the closest. It is only 2 blocks down** from me, so I , and also because there is not enough motivation for me to walk up six blocks to take the 33. **It's its just less frequent.** So if, if walking up six blocks leads me to 99 I would probably walk up six blocks, **but because 25 is closer and its relatively frequent,** coming to my stop, I take 25 exclusively.

EJ: Ok. Um. You already kind of answered this but are there any other things other than the relaxation that you like about this specific route?

IR22EJ: I think its um, I **wouldn't say its reliable but it's relatively reliable compared to um the other options I have.** At least I know they roughly come every five to ten minutes, **and it usually runs pretty late, like it runs until pretty late, it runs its one of the later busses.** So even when you know it is close to midnight I know it is still operating. **So that's why kind if you know I take the 25 because compared to some other routes, it's just relatively more reliable.**

EJ: Okay. Um, what do you like the least about the route that you take. 25.

IR22EJ: **Overcrowding, overcrowding during rush hour,** and also um... Uneven distribution of the bus. So passbys is annoying, for sure, but the more annoying thing is when a bus would come, and then it wouldn't come for 20 minutes, and then suddenly three busses come by. And that is very frustrating because then the line gets accumulated very very long, and then sure there will be three empty busses but not all of them stop because some of them just skip the stop and go to another stop. So, the uneven distribution of the bus is really frustrating. Cause that really like, the line starts accumulating at the stop. Which is unpleasant and there are definitely people who will cut the line which really pisses me off.

EJ: Ya, does that, do you think that happens at specific stops like do you notice at some stops more than others?

IR22EJ: Um, ya my stop is my stop is a pretty popular one because it is right outside of an elementary school so it is one of the bigger stops. Um Alma and Dunbar, sorry no not alma, just dunbar and king ed, that's another bottle neck, um and the next bottleneck is Wallace cause that is where lord bing highscool is. These three are probably the stops with the most people lining up. Um sometimes we will get a line at blanca if busses start skipping blanca a lot, then blanca will start to kind of have a line. But blanca is not its not everyday, it depends. But these three stops usually everyday by default there will like..a line. Especially dunbar and king ed.

EJ: Okay. Um.. K so we talked about overcrowding, delays, bunching up of the busses, any other things that are super annoying, or that you really don't like about...

IR22EJ: passbys. **Passbys is very annoying, I don't. It's it's almost like there is no pattern at all like it totally depends on the bus driver.** And as someone growing up from Asia like when I see a bus pass by saying sorry bus full, and I see that it is actually not full... I'm like this is not full. So, it's very hard to tell why they decided to pass a stop or not. Cause logically for me it makes sense, like even if they could pick up one or two person from a stop then I feel like they should stop. But then I guess from a drivers perspective they don't want to stop unless you know like they have capacity to pick up most of the line. So, I think it's the judgement there, me as a passenger and driver as a driver, I feel like they should have stopped even if to pick up one or two, but like it's

probably more efficient that they stop at stops where they can pick up more people. But ya. That's annoying.

EJ: Do you think that changes with the different bus drivers?

IR22EJ: definitely, I feel like most bus drivers when they see a long line and they know they can't pick it up they will pass. But there are bus drivers that even if they see a long line they will stop and try to cram as many as possible on. So definitely. I don't blame them for passing by, If I'm a driver I probably will because that's more efficient to pass a stop and to wait till stop and actually pick up more, than to like stop at every single stop and pick up two. But as the passenger it's very frustrating.

EJ: okay. Ok so how do you get to your bus stop?

IR22EJ: Walking, it's very easy, it's two blocks I can't justify myself doing anything else. I mean occasionally, once or twice a month I will get a ride from a friend who lives in Kerrisdale, but that is once or twice per month so.

EJ: What do you value most when selecting a mode of commute to campus?

IR22EJ: Transfer is one, I would pick a bus with less transfer even if it might take longer. So for example, I would pick 49 over 99 and skytrain if 49 can get me there without transferring. I also prefer, if there is no time constraint, I would prefer comfort over speed. So if both 33 and 25 is running, I wouldn't mind taking 33, because I know 33 will be less crowded, so basically comfort level matters more than speed.

EJ: And so when you take the 33, would you say you still only do that when you are leaving UBC or when you are coming here as well? Because you were saying before that you wouldn't walk up the 6 blocks to the 33 because the it is not as reliable but then...

IR22EJ: yes, going from campus I am less concerned about what bus I take. But there will be occasions where because I have a friend who live on alma, I will take the 99 to alma with them and then take the 7 down because time isn't a factor when I go home usually.

EJ: Yup. Ok so with that that is kind of a social aspect? Like if you don't have a time constraint or anywhere to be you will change routes to be on the bus with a friend?

IR22EJ: Ya, ya so basically, I am trying to enjoy that experience. So even on weekends when I am going somewhere I wouldn't necessarily pick the fastest route, I would pick the route that is the most comfortable for me to get to.

EJ: Ok. So, when we were talking earlier about the passbys, or bunching up of the busses, how often do you think that happens?

IR22EJ: I think if it's before 9 like for Tuesday and Thursday like for law classes, I usually don't get passups. Cause its, the line is just not that long, but if I am coming to campus for a 9 or 10 am class passbys just unavoidable. Definitely I'll be lucky to get on the second bus that comes, but usually it's one or two is normal. Cause I would say like last semester even when I would come for 8:30 am, there was a big difference. I have to leave an hourly early, but I only live half an hour away. But everyone is trying to get there at 8:30 because it is a Tuesday and UBC classes start at 8:30 its a lot harder. I think the reason why 8 am is easier is most Tuesday classes at UBC start at 8:30, but for last term I was hitting the rush hour and the crowds for Tuesday classes. So for that I have to leave an hour early just to be on time which is ridiculous, because the whole purpose of

paying more rent to live close is to get to campus faster, but it defeats the purpose. Its very annoying, when you feel like you paid more rent to live closer, but you don't actually save a lot of time.

EJ: and a lot of the stops you mentioned having bottlenecks are next to high schools do you think that influences, the like between 8 and 9 time period? Is it mostly high school students?

IR22EJ: for 25 yes, cause lord bing is a really well known high school it's it's pretty prestigious highschool too. So lots of students do commute to go to lord bing. So, you do get like I won't say half the bus, but like a quarter of the bus will leave at lord bing.

EJ: What conditions would conditions would encourage you to continue taking this route or try other routes?

IR22EJ: If 25 becomes less reliable, then I might opt for 33. But I think there is currently no other option. I would definitely hope for more even distribution of frequency. Like even not just coming frequently, but coming like regularly. Like if the bus is every 5 minutes, not like 1 comes and then 20 minutes later three busses come. So I don't know if there is a way to make just even during peak hours, make sure the bus comes frequently, but also actually regularly.

Also just switching to longer busses on the 25, just increasing the capacity, because I do think 25 is a high capacity route and 41 has the longer buses 84 has long busses, so I don't see why 25 can't. Cause I feel like 25 could hold up that capacity. But that's up to trans-link.

EJ: Ok so do you have any other suggestions to improve your travel experience?

IR22EJ: then it comes down to individual people, take down your backpacks and move to the back of the bus. But then it's it's like individual thing, I don't know public education? Bus etiquette? Move towards the back of the bus.

EJ: and do you think people don't move to the back for a particular reason? Or?

IR22EJ: I don't know I almost think it might be a cultural thing, cause growing up in Hong Kong and china, when people are coming up, you just go and push and pack like sardines. But I think probably here we are more hesitant to be kind of pushy moving back, because then you are intruding on people's personal space. So I feel like it's a cultural thing, I don't have any way to prove it, but it is just very different the experience I get. In China and in hong kong, you just push keep pushing, and no one find that offensive because you just need to move back and create more space. But I think here we are just more conscious about like like personal space, not like necessarily having... especially for stranger's, and people get really uncomfortable when you get too close, which I totally get, but it's like what you need to compromise sometimes to just, get to your place.

EJ: So kind of a cultural thing, but since we are talking about hong-kong and cultural things, do you think there are any indicators that help people know to get their backpack off and go to the back, or do you think it is just like a known thing?

IR22EJ: I think it has to be more personal, like the driver has to say you know – hey everyone ..- its more work on the driver but people will feel more pressure to actually move to the back of the bus. But even maybe putting signs up? But then it's really mainly bus routes that come to UBC that has this problem with people with lots of backpacks, so I don't think translink is likely to like invest in putting signs up all over the bus, just because it's usually during that four hours of rush hour everyday at those buses that come to UBC. But I dunno maybe UBC could do something

about it, putting posters all over campus saying if you are taking public transit could you please take off your backpack or something? I definitely do feel like it's a social behavior thing, I do think it's a culture thing, like student culture too.

EJ: Any other areas of concern or suggestions to make your experience better?

IR22EJ: I once thought about adding an additional route, but then I actually don't know where it would go. Cause I just feel like there needs to be a way to balance out the heavy flow, because there are so many students living around Dunbar, that both the 33 and 25 run through because students want to live closer to campus. So Dunbar Southlands pretty much every single basement has students living in it so I am not sure is there a way to kind of alleviate that? It puts a lot on 25 and 33, because 41 is like a lot more down, so it kind of feels like 25 draws a crowd from both sides. So it is carrying a lot of load, so the capacity is just not enough. I'm not sure if that would be more busses, or more frequency, or longer busses, but it just doesn't have the capacity.

Code: IR39KA

1. What program are you in?
 - a. Graduate student
2. What neighbourhood do you live in?
 - a. "Cambie Corridor"
2. How often do you come to UBC?
 - a. "Maybe 3 times a week."
2. Do you use public transit more often than a car?
 - a. Yes
2. What routes do you take to UBC?
 - a. "The 25 and the 33."
2. What times do you normally take these bus routes?
 - a. "Between 7:30 from 9:30 in the morning"
2. What routes do you normally take home from UBC?
 - a. The 25 and the 33."
2. What times do you normally take these bus routes home?
 - a. "Anywhere from 5:00 to 10:30pm."
2. Why do you normally take public transit instead of driving/value about it?
 - a. "It is cheaper. I can read on the bus. I don't have to worry about parking and it's relatively convenient"
2. Why do you choose the specific routes you take?
 - a. "They both stop within a block of each other, so I'll take whichever one is coming. I'll stand on the corner, and if the 25 comes first I'll run and catch it, and if the 33 comes first I'll run and catch it. Purely based on timing"

- b. Prompt - is that true of both directions
 - i. "Yes, actually."
 - 2. Favourite
 - a. "The bus normally empties out at cambie, so I usually can get a seat. And it's direct so I don't have to transfer"
 - 2. Least favourite
 - a. "The 25 gets really busy, especially with school children. And people not taking their backpacks off. The bus etiquette is horrible"
 - 2. How do you get to your bus stop?
 - a. "I walk."
 - 2. What is the determining factor in selecting your mode of transit?
 - a. "Cost"
 - b. "Convenience (mixture of frequency at which it arrives)"
 - c. "Consistency (I don't want to be wait 10 minutes one day, and 20 another. Even if the route is a bit faster, I really like knowing when I can catch it)."
 - 2. Bottlenecks
 - a. "Construction slows the 33 down, but I can't think of anything for the 25."
 - 2. Encourage you to keep taking it
 - a. "Higher frequency of buses. The 25 is notoriously overcrowded. If it was a little more frequent and a little less crowded i'd probably take it even more and it would probably be faster."
 - 2. Suggestions
 - a. "More buses more frequency. In the morning, really the morning is the tricky one is around school hours."
 - 2. Questions for me
 - a. "No"
- Code: IR40KA**
- 1. What program are you in?
 - a. "I'm an undergraduate in the faculty of arts, majoring in psychology with a minor in health and society."
 - 2. What neighbourhood do you live in?
 - a. "I live in the Douglas Park Neighbourhood, so around Heather and King Edward."
 - 2. How often do you come to UBC?
 - a. "Everyday, Monday to Friday and sometimes on Saturdays."

2. What routes do you take to UBC?
 - a. “The 25 and the 33.”
2. What times do you normally take these bus routes?
 - a. “Between 8:30 and 9:30am”
2. What routes do you normally take home from UBC?
 - a. The 25 and the 33.”
2. What times do you normally take these bus routes home?
 - a. “Anywhere from 5:30 to 8:30pm.”
2. What stop do you use?
 - a. “Willow.”
2. Why do you normally take public transit instead of driving?
 - a. “I’m really big on the environment. I think it’s wasteful if it’s just one of me driving all the way to campus. I also don’t have access to a car everyday and the cost of parking on campus is really really expensive. So I feel like in the morning it’s nice to be able to just sit or read a book. On days that it’s really nice I try and bike.”
2. Why do you choose the specific routes you take?
 - a. “They are the ones that go closest to my house, that’s why.”
2. Favourite
 - a. “When you are going down the hill at dunbar, it’s really elevated so you get a really pretty view of the mountains and downtown.”
2. Least favourite
 - a. “There are a lot of high school students on the route, especially between 8:30 and 9:00am”
2. How do you get to your bus stop?
 - a. “It’s only one or two blocks away so I walk.”
2. What is the determining factor in selecting your mode of transit?
 - a. “I’d say it’s two things, time and weather. If i’m feeling pressed for time or worried about missing a meeting, I’ll drive. If the weather is really really good I’ll try and bike.”
2. Bottlenecks
 - a. “When you get off near the hospital, it tends to take a lot longer as there are more passengers with wheelchairs. I’d don’t see it as a bad thing though, as I understand why.”
 - b. “Getting off at the high schools, such a kitsilano takes quite a while.”
2. Encourage to keep taking or change routes?
 - a. “Currently it’s my only route to UBC, so even if it was a lot worse I’d probably keep taking it. Is that a bad answer?”
2. Suggestions

a. "I found that buses come fairly often from 9 to 5, but they really drop off after that. It's really challenging, they'll come like every 30 minutes. So yesterday for example I left a friend's house and the 25 wasn't set to come for over 20 minutes, and it was raining and I was cold so I ended up just hailing a taxi because I'm a bit sick right now. Especially late at night, when the buses are only coming every 30 or 40 minutes it can be a big challenge when you're just trying to get home. And the end point really, they end around midnight, so sometimes there isn't a safe way for me to get home unless I cab. I'm student so it's expensive."

2. Questions for me

a. "No"

Code: IR7WL

Warm Up Questions:

1. What program are you taking at UBC?

SCARP – Faculty of Applied Sciences (second year)

2. Which neighbourhood do you live in?

I live in, like, Riley Park/Cambie corridor.

3. How often do you come to UBC?

Just once a week now.

Prompt: Do you use the public transit more often than a car?

Yeah, definitely.

4. What bus routes do you normally take to get to UBC?

Usually 25, but sometimes the 33

Probe: What times do you usually take these bus routes?

These days I'm only going, like I'm going to UBC for 930 in the morning, so I'll get on at like 8:30, and then I'll come home at usually around 430.

5. What bus routes do you normally take when you leave from UBC?

Do you take the same bus route when you leave UBC as you do when you go to UBC?

Yep.

6. What intersection/bus stops do you usually get off at (only ask this if it is not answered in the survey)

I get off at usually right at Cambie and King Ed.

7. Why do you take public transit instead of driving?

Well, I don't have a car, for one. Well actually I do have a car but I choose not to have it in Vancouver. I leave it in my hometown because it's just, like way cheaper, so cheapness is the main reason.

8. Why do you choose to use the specific line(s) you take to and from UBC?

Yeah, just it's the fastest and closest to my house.

9. What do you like least about these routes?

Well it's almost always busy and crowded and it takes a long time, so it's not that enjoyable.

10. How do you get to your bus stop to take your bus to UBC?

I just walk.

11. Coming back home from UBC, how do you get home from your bus stop? Do you walk as well?

Yep.

12. What do you value most when selecting a mode of transit to commute to campus?

Well my favourite way of getting to campus is to bike. Like if it's a nice day out then I will not take the bus at all and I'll just bike instead.

Probe: Why are these important to you?

It's just way more enjoyable than being on the bus and it's exercise at the same time.

13. What specific bottlenecks or sites that cause delay on your specific route, and why?

There is a school that's like most of the way to UBC and it's like somewhere along, I think it's actually on 16th, I think the 25 goes down to 16th and I think it's along there, and when you're going past the school there's all the parents in all their cars dropping off kids at school so that is always really slow.

Probe: Why do you think these bottlenecks or sites are particularly causing delay? How often do they occur during your commute to UBC?

Yeah, it's just every time that you're taking that bus at the same time as when school starts, so if you're trying to get to class for like 9 in the morning then you usually get caught in that.

14. What conditions would encourage you to continue taking this routes or try other routes? It's more related to how could this route be improved, essentially.

Well to be honest since last year they did add a bunch of buses onto the 25 bus route, so it's actually a lot better this year than it was last year and it's not as crowded anymore. So the 25, it's honestly not that bad. The thing I don't like about it the most is just that it takes a long time but that's just because I live far away from UBC, so that's not really their fault.

15. What specific suggestions do you have to improve your travel experience to and from UBC?

I guess, I don't even know if this is something they can fix, but sometimes I feel like the bus drivers are like angry at, just like the passengers, and they'll like slam on the breaks and stuff when there's like, so many people standing in the bus and everyone's like falling over and it's like they forget they're driving a bus full of people so, I feel like, yeah, that is more to do with the bus drivers than the bus route but that's the only that I feel like, is annoying or like the main thing that annoys me.

Code: IR25ZZ

Introduction:

Thank you very much for agreeing to this interview. I am part of a group of Masters in Planning students working on an AMS research on public transit use patterns and experience of UBC students. Our research aims to improve public transit service to UBC. Your responses to my interview questions will be completely confidential. Your name will not appear on the final report. You will get a thank you gift card for your participation.

Warm Up Questions:

1. What program are you taking at UBC?

I am studying software engineering at UBC

2. Where do you live off-campus?

I live near Kingsway and Nanaimo station. It's a pretty far commute to UBC but I don't really have a choice.

3. How often do you come to UBC?

Are usually come to UBC about four times a week depending on if I need to study which could mean five times a week usually Monday to Friday but occasionally on the weekend there's some software that I need to use that's only available on campus

Prompt: Do you use the public transit more often than a car?

How use public transit more often because it's cheaper and I don't want to pay for parking on campus I do occasionally drive but sometimes it's just not worth it with all the traffic and fees associated to it. I already paid for my upass so I guess I that's why I use it. I also like using kartoo go because it might sometimes be cheaper depending on the bus delays and if I need to get to campus quickly.

4. What bus routes do you often take when you come to UBC?

I usually take The 25 bus route because it is the closest, but sometimes there are delays which force me to take another route I usually assume but the bus runs a few minutes late near my house because of all the traffic normally when I'm on campus it's on time because they take it at the first or the parting stop.

Probe: What times do you usually take these bus routes?

I tried to campus early in the morning usually arriving at around 830 because I have classes that start at nine at 10. Sometimes I come extra early to go to the swimming pool but it's quite difficult with my schedule.

5. What bus routes do you often take when you leave to UBC?

i usually take the 25 bus but I also take of the 33 or the 99. Even if I have to transfer one or two times it sometimes beats taking the 25 since there are express buses.

Probe: What times do you usually take these bus routes?

In the afternoon to attend to leave between three and 6 o'clock. If I go to the recreation facility then I tend to leave a little bit later maybe 730. It really depends on the day

Body:

6. Why do you take public transit instead of driving?

I think the number one reason why I take public transit over driving is because more cost friendly to a student. Even though I could take a car to go or borrow one from a family member I think the bus is more sustainable but at the same time financially feasible Plus I don't have to worry about congestion it does have disadvantages though

Probe: What do you value or like about public transit?

There's not really much to like about public transit instead it's more of an efficient service could be more valuable to some but I just use it from getting to point A to point B there are definitely better and more efficient transit systems but you're kind of stuck with what you got

7. Why do you choose to use the specific line(s) you take to and from UBC?

I'm in a really comes down to just being the closest or the one that is available at the time that I'm trying to leave. Other times it's more about comfort if I'm tired I rather take maybe a longer bus ride but I'll be sitting down most of the way so at least I can read over relax before I get home

8. What do you like best about these routes to UBC?

I like the proximity to my house and that it's pretty reliable knock on wood

Prompt: Is it the frequency? Length of travel time?

Well it is pretty frequent and it definitely takes a while to get to UBC but I have some friends that live further away and they definitely have a worse commute I don't know how frequent it is while I'm at school but I'm assuming it must be since it's pretty busy area

Probe: What else do you like best about these routes?

I like that it brings me to a skytrain station or I could use it to cut through the West End it's pretty convenient to meet with friends especially if they live near a skytrain

9. What do you like least about these routes?

This line is definitely overcrowded and sometimes I tend to miss the bus because there are too many people I think Translink should do a better job counting how many people get on at certain times also I would probably suggest to get more extended buses since there're so many people trying to get from either Brentwood or Nanaimo to UBC

Prompt: Is it the overcrowding? Delays?

Probe: What else do you like least about these routes?

I would say there are certainly delays but I don't know if it's due to Translink or just the road network being too congested

10. How do you get to your bus stop to take your bus to UBC?

Prompt: Do you walk or does someone drive you to the bus stop?

I usually walk and sometimes if it's pouring rain then I'll ask for a lift to the bus stop. If I traveled during the spring or summer then I'll use it usually take my bike that way I can do different activities. It is pretty convenient to have a bike racks but I have to say they're usually taken in the summer so it's quite hard or you have to have a good luck to use it

11. Coming back home from UBC, how do you get home from your bus stop?

On my way home I usually just walk or if I have my bike bike it's a lot harder to ask for a lift because the buses very unpredictable also I don't want to burden anyone

Prompt: Do you walk home or does someone drive you home?

12. What do you value most when selecting a mode of transit to commute to campus?

I think it's important to have fast and on-time service if I can't rely on the bus and I can rely on my car then chances are I'll find a way to use the car. Also if I don't want to pay for parking then I'll park on SW. Marine Dr. And take a bus to campus at least that way I won't have to wait to get home but I'll deal with traffic. Also I think having more frequent buses could have a positive impact on my travel because at least I could sit rather than stand for 30 or 40 minutes. Also sometimes I could get a seat but after a few stops an elderly person gets on and I give it up

Probe: Why are these important to you?

I don't know if there is considered important but I would consider them essential to basic public transportation services maybe I approach it interest to systematic approach

13. What specific bottlenecks or sites that cause delay on your specific route, and why?

I think the bottlenecks really start after Granville because there's a lot of congestion between people getting home from the north to south core door which is then on spill to the west east Corridor also near Kingsway there tends to be a lot of congestion due to the lights synchronization process

Probe: Why do you think these bottlenecks or sites are particularly causing delay? How often do they occur during your commute to UBC?

I would definitely say there are too many cars at specific times of the day causing the bus to be delayed also when I lived in other cities public transit have their own lanes making them always on time I wonder why Vancouver hasn't done it already

14. What conditions would encourage you to continue taking this routes or try other routes? What specific suggestions to you have to improve your travel experience to and from UBC?

I think if there were real-time indicators at bus stops and approximation of the level of people on the bus it could make my travel more convenient because I could better plan I think it really comes down to Comfort and reliability of service and without those two things I wouldn't encourage anyone to take a bus because it would be like them suggesting to me an activity to waste time

Code: IR30ZZ

Introduction:

Thank you very much for agreeing to this interview. I am part of a group of Masters in Planning students working on an AMS research on public transit use patterns and experience of UBC students. Our research aims to improve public transit service to UBC. Your responses to my interview questions will be completely confidential. Your name will not appear on the final report. You will get a thank you gift card for your participation.

Warm Up Questions:

1. What program are you taking at UBC?

I'm doing a business management masters at UBC

2. Where do you live off-campus?

I live near Nanaimo station

3. How often do you come to UBC?

I come four times a week but sometimes six if I have group projects

Prompt: Do you use the public transit more often than a car?

I use public transit more than the car for sure...

4. What bus routes do you often take when you come to UBC?

I usually take the 25 because it goes to Nanaimo station near my house

Probe: What times do you usually take these bus routes?

Depends on when I have classes, I usually take the bus every morning to get to UBC and then I leave at different times depending on when I finish class. Maybe the latest is 6:00 pm.

5. What bus routes do you often take when you leave to UBC?

I live and die with the 25 because it takes me to Nanaimo station, and I usually find seat. On weekends I don't come to UBC but still take the 25 to meet friends. Sometimes If I have group meetings especially off peak then I would use EVO.

Probe: What times do you usually take these bus routes?

I take the bus in the mornings at 8 am, I am an early bird and my classes all start in the morning. I come back to Nanaimo station around 4 pm or 6 pm depending if I go to my yoga class or stay studying on campus. All that is on week-days when I have class... on weekends I don't come to UBC, like I told you already.

Body:

6. Why do you take public transit instead of driving?

I take public transit because its reliable and fits needs pretty much. Price is included in tuition so its great to not think about it. Its 100% more affordable for my long distance than driving, but I still love the convenience of a car. A car means extra expenditures in gas and permits that I really don't want to focus on so transit it is hahaha. Compared to other cities I have been, people are so much more polite to the bus driver and between each other, it makes me feel safe. That and the fact that there is diversity in the bus. Also in the bus I can enjoy the view of the nice Vancouver streets or read a book or browse on my phone without worrying.

Probe: What do you value or like about public transit?

7. Why do you choose to use the specific line(s) you take to and from UBC?

I take the 25 because is the closets direct bus to UBC. Sometimes I take the SkyTrain towards downtown and switch to an express bus like the 99 but the 25 is usually my safe bet.

8. What do you like best about these routes to UBC?

I don't know what I like the best. I guess the diversity I get to experience and that I am using a sustainable transport service. Maybe it's the cost, being a student in Vancouver sucks.

Prompt: Is it the frequency? Length of travel time?

Not really, the current schedule fits my needs but I wouldn't mind more comfort on board. Maybe free WIFI could make it more enjoyable or long buses since its usually busy.

Probe: What else do you like best about these routes?

9. What do you like least about these routes?

The bus is usually over- crowded and it is hard to understand the street names when said by the bus speaker. I am an non-English speaker and **the bus is usually crowded, windows are open.** Also, the board to read the name is only at the center- entrance of the Bus so if you are seating and the Bus is very busy, you cant really see the board. I wish messages where displayed in a costumer friendly way which more clarity, space and different locations of the bus. Is not like the don't have the space to put 4 or 5 of those tiny boards so everyone in the bus can read the important information. I guess a communication problem, or not understanding the needs of the costumer is what I don't like.

Prompt: Is it the overcrowding? Delays?

Probe: What else do you like least about these routes?

10. How do you get to your bus stop to take your bus to UBC?

I usually walk or ask my friend to drop at the station. I enjoy a quick walk in the morning or late in the afternoon. Sometimes when my friend is coming downtown I ask if I she can drop me in a station closest to UBC.

Prompt: Do you walk or does someone drive you to the bus stop?

11. Coming back home from UBC, how do you get home from your bus stop?

After I hop off the bus I walk home, it takes me like 10 – 15 minutes walking to get to my house, not bad. Plus, I have a good jacket, so I don't mind the cold walk.

Prompt: Do you walk home or does someone drive you home?

12. What do you value most when selecting a mode of transit to commute to campus?

Probe: Why are these important to you?

I value price, as a student in Vancouver with a part time job, it is very difficult to support the standard of living imposed in the city. So certainly price, and **then maybe location and convenience of the service.** The service works well overall, the compass card are easy to recharge, carry and use when entering the bus. I also value that the TransLink system treats employees fairly and that they have a lot of benefits. I can see the happiness of working there in their faces, they are polite and if you have questions they often help you and guide you. Also, I value that the bus has included space for people with carriages and the elderly and bike racks, I don't use those spaces but I value how the TransLink system incorporated mobility concerns into an effective bus distribution.

13. What specific bottlenecks or sites that cause delay on your specific route, and why?

Probe: Why do you think these bottlenecks or sites are particularly causing delay? How often do they occur during your commute to UBC?

Nanaimo is so busy. There Is so much people every morning waiting for the bus. **But honestly I am usually reading or on my phone so I don't pay much attention to the route, just because it is a long commute.**

14. What conditions would encourage you to continue taking this routes or try other routes?

Price rebates or a point system for using the bus, rewards you for contributing to sustainable and green environment, that's it.

15. What specific suggestions to you have to improve your travel experience to and from UBC?

Improving information sharing while on the bus.

Cool-Off:

16. Do you have any questions for me about our research? Not really, It's cool that you guys are interested in the perspectives of users. You guys might be the regulators effecting new sustainable and more inclusive policies. It starts like this, asking people what their options are in regards to a matter. Thanks.

Appendix D - Participant Observation Protocol – Route # 33

	Detail and Count
Name of Participant Observer	
Location	
Date/Time of survey start	
Date/Time of survey end	
Weather	
Observation at Bus Loop (UBC Exchange 3)	
Arrival	
Departure	
Scheduled Departure	
Passengers boarding	
w/ backpacks	
w/ bicycle	
w/ skateboard	
w/ stroller	
Bus full (Y/N)	
No. people switching to another bus route	
No. people kept waiting at stop after bus passed	
Waiting: sitting on bench in shelter	
Waiting: standing under shelter	
Waiting: standing in open	
What people are doing	
Comments	

Appendix E - UBC Students Transportation Use Patterns and Experience

Survey Questions

1. Age

- 19 or younger
- 20-24
- 25-29
- 30-39
- 40-64
- 65 or older

2. Gender

- Female
- Male
- Prefer not to say

3. Postal Code (First 3 Digits Only)

4. How often do you come to campus?

- Less than one day a week
- Once a week
- 2-3 days per week
- 4-5 days per week
- More than 5 days per week

5. How often do you take the 044 bus route?

- Less than one day a week
- Once a week
- 2-3 days per week
- 4-5 days per week
- More than 5 days per week

6. What time do you usually take the 044 bus route, in either direction?

- Early morning (6am to 9am)
- Mid morning (9am to 12pm)
- Early afternoon (12pm-2pm)
- Late afternoon (2pm-5pm)
- Evening (5pm-7pm)
- After 7pm

7. What bus stops or intersections do you usually use to get on/off the 044 bus?

8. Do you use other routes of means of transit to get to the 044 route?

- Bike
- Skytrain
- Another bus (please go to next question)

- Other

9. If you selected “another bus,” which bus line do you transfer to/from?

10. Do you take Route 044 when you are coming to campus? Please explain why or why not?

11. Do you experience any of the following at least once a week?

- Delays
- Being passed up by the bus while waiting at a stop
- Standing for the entire commute
- Overcrowding
- Feeling unsafe
- Other

12. Which of these factors affect your choice of transit?

- Speed
- Frequency
- Proximity of stops
- Pass-ups
- Crowdedness
- Accessibility
- Safety
- Schedule reliability
- Comfort
- The ability to study or do work while on the bus
- Other

13. Why do you take public transit instead of driving?

- I don't have a car
- My UPass is covered in my tuition
- It is more sustainable
- I get to UBC faster
- I can study/read on the bus
- I don't want to pay for parking on campus

14. What suggestions do you have to improve your travel experience to and from UBC?

Appendix F - Sample Interview Questions

Participants were selected based on a criteria of being frequent users of Route 044 (UBC/Downtown). Interviews lasted for approximately 15-20 minutes. Below is a sample structure of the interview questions used to better understand the patterns, experiences, and preferences of students.

1. What program are you taking at UBC?
2. Where do you live off-campus?
3. How often do you come to UBC?
4. What bus routes do you often take when you come to UBC?
5. What bus routes do you often take when you leave to UBC?
6. Why do you take public transit instead of driving?
7. Why do you choose to use the specific line(s) you take to and from UBC?
8. What do you like best about these routes to UBC?
9. What do you like least about these routes?
10. How do you get to your bus stop to take your bus to UBC?
11. Coming back home from UBC, how do you get home from your bus stop?
12. What do you value most when selecting a mode of transit to commute to campus?
13. What specific bottlenecks or sites that cause delay on your specific route, and why?
14. What conditions would encourage you to continue taking this routes or try other routes?
15. What specific suggestions to you have to improve your travel experience to and from UBC?
16. Do you have any questions for me about our research?

Appendix G - Research Tools- route # 49

1. Observational Data Gathering

- 1) Arrival/Departure of the #49 and its punctuality in relation to the scheduled time
- 2) Number of people loading onto bus and specific qualitative features: *Were students running to catch the bus? Wearing a backpack? Wearing their headphones? On their phone? Interacting with one another? Weather?*
- 3) Comment section regarding individual observations

Halina, Cody, & Sean(2018/01/17)	Bus 1	Bus 2	Bus 3
Arrival	5:07PM	5:15PM	5:23PM
Departure	5:12PM	5:17PM	5:24PM
Passengers Boarding	57	29	25
w/ backpacks	52	25	23
Robbie (2018/1/22)	Bus 1	Bus 2	Bus 3
Arrival	10:00AM	10:11AM	10:17AM
Departure	10:03AM	10:11AM	10:18AM
<i>Scheduled Time of Departure</i>	<i>10:02AM</i>	<i>10:10AM</i>	<i>10:17AM</i>
Passengers Boarding	9	8	3
w/ backpacks	9	8	3
Lily & Desiree (2018/02/02)	Bus 1	Bus 2	Bus 3
Arrival	8:45AM	8:52AM	8:56AM
Passengers Exiting	41	42	35
<i>Schedule Time of Arrival</i>	<i>8:45 AM</i>	<i>8:53 AM</i>	<i>8:59 AM</i>

2. Interview Coding

Convenience/ Comfort/ Crowdedness/Reliability

“It is very slow, and frustrating in the morning because I will get there really early, and will have to wait in the morning. Sometimes the bus will pass by 3 times because it is too crowded, so I just prefer not to take it at that time.” (DI1) → **convenience/ crowdedness/ reliability**

“I’m used to it and in Vancouver, it’s so easy.” (HI1)- **convenience of using transit**

“#49 is more convenient because she can sleep on the bus.”(HI1)--> **comfort/ convenience of 49**

“The second one by the Hospital, everyone just crowds, and it goes from being okay to super squishy, but I’m already usually sitting down.” (HI2) → **crowdedness/ comfort of 49**

HI2: She said that taking the 49 is more appealing when leaving from UBC, not only because the 480 comes less frequently but also because “[she] prefers to get on buses when they start their route... so [she] can also guarantee a seat and if [she] wants to study, [she] can study on the way home.” (**comfort, crowdedness issue on 49**)

DI1: “I take the 43 instead of the 49 in the morning because the 49 is crowded and slow in the morning. And the corner where I would get picked up often gets passed up because the bus is full, and is picking up students at Cambie (Langara Skytrain Station). It is easier to take the 3 and then the 41/43. It feels like I am more likely to get on the bus.” (DI1) **overcrowdedness; unreliability; 43 being a substitute for 49**

I think it's caused by people coming from earlier stops and Metrotown station. There are several schools on the 49 as well as 2 skytrain stations, so it’s a popular route for people that live pretty far South and East.

Frequency

HI1: It is important to note that this student gets on the UBC-bound 49 bus fairly early in its route, which is why she might find space to sit. She added that the “43 is not really frequent” and has observed that for every 43 that comes, three 49 buses will come.- **frequency / suggestion that 43 could be more frequent to alleviate overcrowding on 49**

Cost Savings

“If parking were free I would definitely drive because it would mean a 20-minute drive rather than an hour-long commute [to/from campus]” (LI1). → **cost savings from taking transit**

“I decided to just take the bus because it is convenient and I don’t want to pay for parking”.

Cost savings/ convenience from taking transit

Speed

LI1 said that what he likes least is how much the bus stops. Especially during peak hours, it feels like the bus stops every block and that it takes a lot longer than it needs to.

Bus efficiency was the most important quality

At least 2 students (GI1 and GS4) suggested creating an Express #49, while 6 of the survey respondents suggested more buses or less stops - **speed, express bus**

HI1 responded: “so I don’t waste my time. My time is valuable to me.” (**speed**)

HI1 suggested that for students coming from or going to Richmond that there be an express bus to eliminate the need to take a Skytrain and transfer to a UBC- bound bus. With enthusiasm she added: “express buses are great”

3. Follow-up Intercept Survey Questions

- 1) What is your overall satisfaction with the 49 bus route from 1-5?
1-Very Dissatisfied 2-Dissatisfied 3-Neutral 4-Satisfied 5-Very Satisfied
- 2) In one word, how would you describe your experience on the #49 bus route?
- 3) What would you change about the #49 to better serve your needs as a student?

APPENDIX H – Survey Data Results - Route #99 BLine:

Age		Postal Code	
19 or younger	6	V3	1
20-24	18	V3R	1
25-29	2		
30-39	5	V4	2
No response	2	V4K	1
		V4N	1
Gender			
Male	14	V5	8
Female	16	V5B	1
		V5N	2
How often do you come to campus?		V5R	1
Less than one day a week	1	V5T	1
Once a week	1	V5X	1
2-3 days per week	5	V5Y	1
4-5 days per week	17	V5Z	1
More than 5 days per week	7		
No response	1	V6	17
How often do you use this bus route to go to and/or from campus?		V6C	1
Less than one day a week	1	V6E	1
Once a week	1	V6G	1
2-3 days per week	5	V6h	1
4-5 days per week	17	V6K	2
More than 5 days per week	7	V6R	3
No response	1	V6S	1
		V6T	7
What time do you usually take this bus route, in either direction?		V7	3
Early morning (6am to 9am)	16	V7M	2
Mid Morning (9am to 12pm)	10	V7T	1
Early Afternoon (12pm-2pm)	5		

Late Afternoon (2pm-5pm)	19	No response	1
Evening (5pm-7pm)	19		
After 7pm	6		

What bus stops or intersections do you usually use to get on/off this bus?

Cambie St	7
Granville St	6
West 10th Ave / Alma	6
Commercial Drive	5
Main St	4
McDonald St	4
Alison Rd	2
Arbutus St	2
Fraser St	2
Clark St	1
Heather St	1

Do you use other routes or means of transit to get to this route?

No	14
Canada Line	1
Skytrain	5

If you selected "Another bus", which Bus Line do you transfer to/from

14	4
4	3
44	2
7	1
10	1
16	1
19	1
22	1

33	1
258	1

While riding this bus route, do you experience any of the following at least once a week?

Standing up for the entire commute	25
Overcrowding	24
Being passed up by the bus while waiting at a stop	11
Delays	10
Feeling unsafe	2
Annoyance with backpacks and crowdedness	1

Do you take the same route when you are coming to campus? Please explain why or why not.

Respondent 1	Yes, because the Skytrain drops me directly to the 99 Express line.
Respondent 2	Yes, I take the same route
Respondent 3	No, because I have to transfer
Respondent 4	No, sometimes I can take the 44 which is one less transfer
Respondent 5	No, sometimes I drive and sometimes I take the 44 if I make it in time
Respondent 6	I often take the 44 as well
Respondent 7	Yes, routine times I know when it's busy or not
Respondent 8	Yes, because it's the route that's closest to my house
Respondent 9	Yes.
Respondent 10	I take the 99 home, because it runs more consistently
Respondent 11	Yes, (It is the) fastest way.
Respondent 12	Yes, because the 99 is the most frequent and therefore, the most reliable.
Respondent 13	No, just the ones (that) come first
Respondent 14	Yes, it's the most convenient.
Respondent 15	Yes, because it is convenient.
Respondent 16	Yes, I live on campus so a direct bus back is convenient.
Respondent 17	Yes, it is convenient and fast
Respondent 18	I prefer (the) 99 because it's faster
Respondent 19	No, sometimes I take the 14
Respondent 20	Yes, I have no more alternatives
Respondent 21	Yes, my brother drives me to Broadway every day.

Respondent 22	Yes. Convenience
Respondent 23	No, sometimes I take the 9 if there are seats I'm not late
Respondent 24	No, sometimes I take the 84
Respondent 25	Yes, buses are more frequent
Respondent 26	Yes
Respondent 27	Yes
Respondent 28	25 33 closer to house, but 99 is closer to work and shopping
Respondent 29	Yes, 9s are slow
Respondent 30	Yes.
Respondent 31	<i>No response</i>
Respondent 32	Sometimes the 9 coming to campus and always 99 leaving

Which of these factors affect your choice of transit?

Frequency	29
Speed	21
Proximity of stops	14
Schedule Reliability	14
The ability to study or do work while on the bus	14
Crowdedness	10
Pass-ups	10
Comfort	8
Accessibility	5
It feels like I'm participating in a community and I like to people watch	1

What suggestions do you have to improve your travel experience to and from UBC?

Respondent 1	Make a Skytrain directly to UBC.
Respondent 2	Get to the stop early to be in line and get to campus earlier to avoid rush hours
Respondent 3	The Skytrain should be extended to UBC
Respondent 4	<i>No response</i>
Respondent 5	<i>No response</i>
Respondent 6	<i>No response</i>
Respondent 7	More frequent buses to avoid overcrowding or not being able to get on
Respondent 8	<i>No response</i>
Respondent 9	<i>No response</i>

Respondent 10	<i>No response</i>
Respondent 11	For buses to come on time
Respondent 12	Improve cleanliness of bus
Respondent 13	Rainy day shelter
Respondent 14	More 99 buses
Respondent 15	I am satisfied as is
Respondent 16	<i>No response</i>
Respondent 17	<i>No response</i>
Respondent 18	After 3am (It) is impossible to find a bus to campus
Respondent 19	More buses
Respondent 20	More cars
Respondent 21	More buses on peak hours
Respondent 22	<i>No response</i>
Respondent 23	<i>No response</i>
Respondent 24	More buses
Respondent 25	Better ways to get to the opposite (west) side of the campus by transit
Respondent 26	Bus more frequently
Respondent 27	<i>No response</i>
Respondent 28	<i>No response</i>
Respondent 29	<i>No response</i>
Respondent 30	Have more busses in the morning
Respondent 31	<i>No response</i>

Why do you take public transit instead of driving?

My Upass is covered in my tuition	22
I don't have a car	20
It is more sustainable	10
I don't want to pay for parking on campus	10
I can study/read on the bus	6
I don't have a license yet	1
Cost of gas	1
More convenient	1

Appendix I: Interview Transcripts – Route #99BLine

Interview Transcript #1

Preamble

Interviewee (I): The only other thing that I enjoy about the 99 is that it feels like I'm participating in some kind of community of people as well. I like to people watch on the bus. It's kind of fun [laughs]. It's all these people I don't generally see. They must come out of somewhere and then we all end up in this weird space together for fifteen minutes.

█ (S): Why do you take public transit instead of driving?

I take public transit instead of driving because we have the Upass primarily. If we did not have the Upass I would probably bike to work and to school, to be honest. But the Upass just makes it so convenient. And really... and instead of driving... I think that UBC does a good job of disincentivizing driving. It's so expensive. It's not faster. I actually drove on Wednesday because I had to go to Burnaby to BC Housing after, and it took me longer and it was more frustrating and the parkings are full, which you know, I guess there's not many of them. It's just more convenient than driving.

S: Do you own a car?

I: I do own a car. I don't know why. I never drive it any more. I should get rid of it.

S: We do Modo.

I know I actually need to sit down and do the numbers. My car, I don't really put any money into it besides insurance. And so I use it to go, like [inaudible] so I can drive to the mountain and things like that. I'd rather just have a car to share with someone or do a car share.

S: I've worked it out... and we spend about six or seven hundred dollars a year.

Yeah, it's cheaper. That's how much my insurance was for six months for my car. But like right now my mom has my car because she's driving to the Coquihalla and she wants my snow-tire car, so anyways. [inaudible] I don't know what to do.

Survey Instrument Section

S: What neighbourhood do you live in?

I: I guess it's actually Kits-West Point Grey. I voted in the West Point Grey riding, so David Eby is my MLA. And I see him a lot on Broadway. I've seen him three times since he's been elected.

S: How do you feel about him?

I: I get excited that I can see MLA on the street. I feel, kind of get a thrill every time it happens. And in general, I actually don't know... I know he used to be a lawyer, like a civil rights... civil liberties lawyer. Now I haven't really been following his work as our Attorney General very

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closely. So I don't really know. In general, I think he's the MLA I've liked the most, that I've ever had. So... he used to let the non-profit I worked for use his office for our board meeting for free. So that was nice.

S: Can you say what you said about the 9 [during the survey]?

I: So the 9 and the 14 have a stop right in front of my apartment, but my system for taking the bus is I come out to Broadway, I look down Broadway, which is kind of scary because there's a lot of traffic, but I look. If I see the 9 or the 14 then I will wait and I will catch it at my bus stop. Because it's actually a much more comfortable ride, and I don't mind being delayed by five minutes because it's slower. But if I can't see it anywhere, then I walk to the 99, which is most days. I'd say at least four out of five days I take the 99. And then I catch the 99 there, at Alma. Even though I live about five blocks from there.

S: For the 99, what do you like best about it?

I: I like that it comes on a consistent basis and there's less waiting around. Sometimes there is waiting around, especially if you get passed up. But in general it kind of makes me feel reassured that I know one will come within, under ten minutes. So it gives kind of also, it gives me a little bit of flexibility in my morning to be not be as rigid when I leave. So for example, if I was to take the 9 or the 14 on a regular basis, I would have to be there every day at 7:34 to get to our 8 AM class. If I was two minutes late, then I would be in trouble. But with the 99, you know what, you'll catch the next one in three minutes. It's not the end of the world. So you kind of just leave whenever. So if you want to spend a little more time making your lunch, then that's nice. And then maybe you're only going to be three minutes late for your 8 AM class. Whereas with the 9, you'll be like half an hour late, which is really annoying.

S: What are the things you dislike about the 99?

I: I dislike that... it seems to me that maybe it's just the volume of people in there, but it seems that people are a little bit less considerate on the 99, i.e., not taking their backpacks off. And that's pretty much it. I just really dislike the crowding.

S: You walk to your bus stop?

I: I walk to the bus stop.

S: And you walk home [from the bus stop]?

I: Walk, yes.

S: So when you are considering your choices for transit, what do you value most?

I: The frequency of the 99. It's the closest thing to feeling like you're not really beholden to someone else's schedule. It's the closest thing to feeling, you just kind of do your own schedule and the bus will just be there. It's kind of like taking the Skytrain.

You know, like, if you go to catch a Skytrain, there'll just be on there. You don't have to be rushing to get to one or making sure you are leaving enough time to walk there in time, because another one will just come.

S: You don't have to plan around...?

I: Exactly. And I just feel like I'm really disorganized. So the less planning I have to do the better.

S: In terms of delays are there any spots that you see as...

I: I only really have two stops. I have Alma and Sasamat. I get on at Alma and then there's Sasamat. I notice that they pass up people at Sasamat consistently. And it seems to me that there's a lot of people at the Sasamat stop, and my suspicion is that some people drive to Sasamat and then park their cars and get on there. That's my suspicion. There always seems to be a large volume of people waiting there.

S: Would there be any incentive that make you choose other routes?

I: Well the only thing... if we didn't have the Upass, I don't think I would take the bus. I just don't think I would pay for it. I would just encourage myself to ride my bike, because I am so close. But other than that... other routes? If other routes came as frequently as the 99, I would take them too. But they just don't. I feel like that would be uneconomical.

S: Going back to suggestions on how to improve your travel experience in general...

I: I don't know. I think I would love some form of light rapid transit somewhere out to UBC. I think keeping busses on the same road as cars creates a lot of congestion. And the one thing, the one vigilante issue that I have that drives me crazy, is that people ride their bikes on Broadway and it just scares me so much. Because of the... I feel like the 99 is going to run them over. And it's so scary the cyclists and the 99 on the same road. This is kind of an aside, but I just... I don't know how... I want to talk to cyclists, because I'm a cyclist too, why you would want to ride on Broadway when there's 8th and 10th. I just don't understand. I can't figure out why you would want to ride with the B-line. I can't figure that out. So, that's an aside.

I think I like the idea of separating different modes of transportation, if possible. So maybe having a Skytrain would be great. So then you don't have to worry about cars or other people causing traffic. It's just like a direct route. It makes it more reliable. Unless there's a medical emergency, which happens.

You know like if someone jumps in front of one, then you'll be delayed for hours. So it's not foolproof.

Do you ride your bike on Broadway? Why do people do it?

[crosstalk about bikes]

S: Do you want to add anything?

I: No, that's fine.

Interview Transcript #2

█ (N): Thank you for agreeing to do this interview. I am part of a group of Masters and planning students working on AMS research on public transit use patterns and experience if UBC students. Our research aims to improve public transit services to UBC, your response to my interview questions will be completely confidential and your name will not appear on the final report. You will get a “thank you” gift card for your participation.

N: So, what program are you taking at UBC?

Interviewee (I): BA Science in Forestry science

N: Okay, and where do you live off campus?

I: North Vancouver

N: How do you come to UBC?

I: By bus, transit, the 99 [B-Line]

N: Do you use public transit more often than a car?

I: Yes

N: And, are there any other routes that you might take when you come to UBC?

I: Maybe one other route

N: And, what would that route be?

I: 44

N: Taking the 44? And, what times do you usually take these bus routes?

I: 8 AM

N: Okay, and why do you take public transit instead of driving?

I: Because I don't have my license and it's too expensive to drive

N: What do you value or like about public transit?

I: Wait, what I like?

N: Yea, what do you value or like?

I: I like that, I guess it's with the school so it's in your tuition

N: And, why do you choose to use the specific line you take to and from UBC? So why do you choose to take the 99 more often than the 44?

I: because [99 B-Line] is the express one and the 44 doesn't have as much service as the 99

N: What do you like best about taking these routes to UBC

I: it's usually just one bus and it's pretty fast. It takes the same amount of time from anywhere

N: How do you feel about the frequency of the 99

I: I think it's okay, its good

N: And the length of travel time? So, when you get on at the bus stop to UBC?

I: Decent

N: What else do you like best about the 99?

I: I like, there's like infrequent stops and yea (less stops)

N: That's fine. What do you like least about the 99?

I: Like it can be really packed or it can be not packed at all. So, there is no middle.

N: And, have you felt any delays with the 99?

I: No

N: is there anything else that you would like to outline about what you least like about these routes?

I: No

N: Okay, how do you get to your bus stop that you take to UBC?

I: I walk, and drive towards west Broadway as in I carpool first

N: And then, when you're not carpooling how do you get to the 99?

I: Then I bus 240 and Skytrain and then take the 99

N: And what form of Skytrain do you take?

I: The Canada Line

N: Okay, so you said you carpool and you take the Canada line. And, coming back from UBC how do you get home from you bus top? So when you get off

I: The UBC bus stop?

N: Yea so how do you get home form the bus stop near your house?

I: I walk

N: okay and, what do you value most when selecting a mode of transit to commute to campus?

I: Time (speed)

N: Time? And do you value like sitting or standing?

I: Yea, I guess like amount of people, like I want there to be less people, so I don't go during rush hours

N: And, why is this important to you?

I: It's just comfortable, since it's [pp B-Line] is the only option

N: What specific bottlenecks or sites do you see that cause delays on specific routes?

I: Lions gate

N: And any on the 99?

I: Yea on the 99, near Granville and West Broadway

N: And, why do you think that these bottlenecks at these sites are particularly causing delays? Such as, how often do they occur during your travel?

I: I think they occur because there are bridges. So, it's like limits and then how often? Maybe like once a week

N: And, what conditions would encourage you to continue taking the 99 or trying other routes? So why would you not want to take the 99 anymore?

I: I don't know, I don't see any reasons not to take it when it's the only option kind of thing

N: What specific suggestions do you have to improve your travel experience to and from UBC in general?

I: More express busses but not from downtown

N: okay, and do you have any questions for me about our research?

I: No.

N: Thank you for participating in this survey. If you have any questions about our research please contact the AMS VP for PR, her name is Sally. And if you want a copy of our final report to AMS, here is my contact number.

Interview Transcript #3

█(J): What program are you taking at UBC?

Interviewee (I): I'm an exchange student of engineering.

J: Which neighborhood do you live in?

I: I live between West Point and Kitsilano, close to Broadway.

J: How often do you come to UBC?

I: I have classes four days per week, but I usually come from Monday to Friday to the library or do team assignments.

Information has been redacted from this report to protect personal privacy. If you require further information, you can make an FOI request to the Office of University Council.

J: What bus routes do you normally take to get to UBC?

I: I almost exclusively take the 99, but sometimes I take the 14, specially when I'm not in a hurry.

J: What bus routes do you normally take when you leave from UBC?

I: I take the same ones, the 99 or the 14

J: Why do you take public transit instead of driving?

I: I don't have a car and even if I did, it would take me longer to find parking or even rent a room with a garage or parking space.

J: Why do you choose to use the specific line(s) you take to and from UBC?

I: If I'm late, I prefer to take buses even if they're crowded as there are much less stops to campus.

J: What do you like best about this route to UBC?

I: I like it because it's not a big deal if one or even two buses pass up because I know that there are more every couple minutes. That is not the case in other regular routes like the 14 where I'd have to wait for another 10 or 15 minutes if I miss the bus or if it passes up.

J: What do you like least about these routes?

I: When I go to campus, the buses are always crowded and sometimes they don't even stop because they're full, but it is only like 10 minutes to UBC so it doesn't bother me too much in the end. It is much less of a problem when I come back home.

J: How do you get to your bus stop to take your bus to UBC?

I: I walk like 5 minutes.

J: Coming back home from UBC, how do you get home from your bus stop?

I: I do the same, I walk back home.

J: What do you value most when selecting a mode of transit to commute to campus?

I: I love that the 99 comes every 3 min so I don't have to plan with too much anticipation when I leave home.

J: What specific bottlenecks or sites that cause delay on your specific route, and why?

I: I couldn't say exactly because I think the buses are already full when I get on.

J: What conditions would encourage you to continue taking this routes or try other routes?

I: If frequency was increased in the other routes, I would maybe take them but the 99 has less stops so it is the fastest route, anyway.

J: What specific suggestions do you have to improve your travel experience to and from UBC?

I: More buses would be great.

J: *Probe:* Can you tell me why do you think more buses would be improve your commute experience?

I: Well. With more buses, it would be more probable to find ones that are not crowded so I would even be able to read during the commute in peak hours.

Cool-Off:

J: Do you have any questions for me about our research?

I: No, it's fine.

Interview Transcript #4

█ (P): Your name is?

Interviewee (I): █.

P: You will be interviewed about B-99. Thank you for agreeing to this interview, if at any moment I make you uncomfortable you can leave. So let's start. What program are you taking at UBC?

I: I'm in the dentistry department and I'm doing my specialty in Root Canal.

P: Thanks, what neighborhood do you live in?

I: Here in UBC, specifically at St. John's College.

P: Do you use public transit more often than a car?

I: Yes.

P: Okay, what bus routes do you usually take?

I: I'm taking 99 and 84.

P: In which conditions do you take 99 and when do you take 84?

I: So, I'm taking 84 to go to Livingstone Park to play soccer. And I take 99 to go to see some friends in Main Street. So yeah, it depends on where I'm going.

P: What bus stops do you usually get off in the bus stop?

I: Usually when I'm taking 99 I'm getting off at Main or at Fraser. And when I take 84 I get off at Ontario street I believe it is called.

Information has been redacted from this report to protect personal privacy. If you require further information, you can make an FOI request to the Office of University Council.

P: Perfect Why do you take public transit instead of driving?

I: Because I don't want to pay parking in UBC and only sometimes I'm using the Car2Go thing.

P: What do you value or like about public transit and taking a bus?

I: I like that they are right on time. I mean the schedule is reliable, so I know if the app says 2 minutes, that the bus will be here in 2 minutes.

P: Thanks! Now, what do you like less about 99-B?

I: Sometimes it's a little bit crowded. Yes, I think this is the most problematic. Apart from this, it is quite fast.

P: Okay, and what do you like most of 99?

I: Yes, well it comes on time, it has multiple buses in a small period of time and it covers a very important part of the city.

P: Ok. How do you get to the bus stop when you are in UBC?

I: Walking, I go walking.

P: You always walk? You never take a bike or drive or take another bus?

I: Yes, well I have been here for a year and a half and I have taking the bike once hahaha.

P: Hahaha, okey and taking the bus home how you move once you got of the bus?

I: Walking also.

P: What do you value the most when coming to campus and selecting a mode of transport?

I: Can you repeat?

P: Yes, What do you value the most when coming to school and selecting a mode of transport?

I: Oh, time efficient, fast and that I know that I will be there in a specific time.

P: Have you identified specific places that have bottlenecks or delays in the route? Like intersections where you notice that the bus is in a jam longer than usual?

I: You are taking about 99, right?

P: Yes.

I: No, I haven't noticed.

P: Okay, and in 84?

I: Yes 84 on 4th street close to Burrard street.

P: Ok, What conditions would encourage you to continue taking route 99 or to try other routes? What would make you change the route?

I: Nothing, but if I had to take a decision like that, if there was another route that would offer the same amount of buses and could be so reliable, then I could do that.

P: Do you have specific suggestions to improve the traveling experience out and in UBC?

I: Wifi in the buses? Hahaha.

P: Hahaha, okey, Wifi in the buses. Dou you have any questions to me about our research?

I: Yes, why are you doing this?

P: Yes, whe are doing this for an assignment that has some sort of deal with the student body to make suggestions to make a better bus system to UBC.

I: Nice.

P: Well, thank you very much for your participation in the survey and interview. I hope you enjoy your gift card!

I: Thank you so much!

Interview Transcript #5

█(E): What program are you taking at UBC?

Interviewee (I): Currently I'm in the Bachelor of commerce program, Sauder

E: Which neighbourhood do you live in?

I: I live in the North Burnaby neighbourhood

E: How often do you come to UBC?

I: I come Monday to Thursday, so four days a week

E: *Prompt:* Do you use the public transit more often than a car?

E: What bus routes do you normally take to get to UBC?

I: Yes, I use it (public transit) everyday, I ride the 99 everyday

E: *Probe:* What times do you usually take these bus routes?

I: That's different everyday. In the morning sometimes it's 9 am, other times will be 11:30 am and then leaving probably around 6 pm.

E: What bus routes do you normally take when you leave from UBC?

(answered above)

E: Why do you take public transit instead of driving?

I: I don't have a car...

E: *Probe*: What do you value or like about public transit?

E: Why do you choose to use the specific line(s) you take to and from UBC?

I: I like that it's convenient, I don't have my license, so I can't drive, so transit is a convenient way to get to school. For the most part it's reliable so I can get to class on time

E: What do you like best about these routes to UBC? (Can be skipped if #7 is answered thoroughly)

I: Frequency, most people from North Burnaby take the 84, but for me I find that the 99 is always there.

I like the it's an express bus, so it skips a lot of stops, so it's very fast. I get car sick, so less stop is smoother for me so I can read

E: What do you like least about these routes?

I: When it's snowing very hard, it's very delayed and the line is very long so it takes forever to get on the bus. I find that it always happen when it snows, so that's very unreliable.

Is it just snowing? What about raining?: Raining is fine, it's just the snow, generally it's pretty good

E: How do you get to your bus stop to take your bus to UBC?

I: I will get a ride from my house to Holdom and I will take the skytrain to Commercial and then I take the 99. Same when I come home

E: Coming back home from UBC, how do you get home from your bus stop?

(answered above)

E: What do you value most when selecting a mode of transit to commute to campus?

Probe: Why are these important to you?

I: Convenience and speed because I'm usually running late. Comfort, that's pretty important because getting a seat is important.

E: What specific bottlenecks or sites that cause delay on your specific route, and why?

I: I think Cambie and Granville are the busiest areas, but after you get past that point it's ok. It's sometimes and it depends on the time of day, at 9 am it's delayed but after it's faster since it's not rush hour. At 5:30 it's very slow.

E: What conditions would encourage you to continue taking this routes or try other routes?

I: Frequency. If the 84 is always there. Capacity is important too because 84 can't board as many people. I think they sped it up too but I don't trust it to go on so I always end up on the 99. Especially when I'm leaving, but the 84 you have to wait 15 minutes

E: What specific suggestions do you have to improve your travel experience to and from UBC?

I: Sometimes there's garbage on the bus. Cleanliness of the bus will make it more pleasant to be there and if they could deal with the snow better that could ease a lot of frustration for people. Around the station, is where people are unhappy.

Cool-Off:

E: Do you have any questions for me about our research?

I: No

Appendix J: SOV Study Intercept Survey and Semi-Structured Interview Questions

Introduction

I am a Masters in Planning student at UBC. We are working on an AMS project on transportation patterns in order to provide information that will support the AMS in advocating for system improvements and to inform transit advocacy. Do you have 5 minutes to answer a short questionnaire about your single occupancy vehicle (SOV) use to UBC?

Your response will be completely confidential and no identifying information will appear on the final report.

1. Are you a UBC student?

YES / NO

2. What gender do you identify with?

FEMALE / MALE / DO NOT WISH TO SHARE / OTHER:

3. What are the first 3 digits of your postal code?

4. What would you say is your main reason for driving?

- Multiple stops
- Infrequency of busses
- Indirect routes
- Weather

- Frequency of travel to UBC
- Health
- Safety
- Other

5. How often do you carpool to campus?

6. How often do you take transit to school?

7. How often do you bike?

8. How often do you walk?

9. Based on your own estimate, how long do you think it would take for you to take transit home?

10. Have you taken transit to school in the past, and if so, why have you switched to driving?

11. How could you be encouraged to take public transit to UBC more frequently?

12. Do you have any other comments you would like to share with us?

Closing

Are you willing to be contacted to participate in a further one-on-one interview? If so, what is the best way to communicate?

Thank you for your participation in this survey. If you have any questions about this research, please contact your AMS vice president of public relations.

Appendix K: SOV Compilation of Research Data

Reasons for driving

Time	(N1) house nearby but poor connections (Vancouver Musqueam)
IIIIII (N7)	
IIIIIII (KM8)	(N2) multiple stops (Vancouver downtown)
IIIIII (KY7)	(N3) distance and infrequent service (Vancouver Hastings-Sunrise)
IIIIIII (M7)	
III (G3)	(N4) childcare pickups (New Westminster) and/or motion sickness add time
TOTAL = 32	(N5) poor connections and distance (Richmond Steveston)
Vancouver: 19	(N7) reliability of busses because of weather (Vancouver Southlands/Marpole-Oakridge)
Downtown: I	(N8) poor connections and distance (Richmond)
Hastings-Sunrise: I	(KM1) saves sleep (Delta)
East Van: I	(KM2) (White Rock)
Marpole: IIII	(KM3) (Vancouver)
Musqueam: I	(KM4) childcare pickups (White Rock)
Fraserview: I	(KM5) (Vancouver)
Kerrisdale: III	(KM7) time of day, early AM classes (Burnaby)
Commercial Drive: I	(KM8) (Vancouver)
Mt Pleasant: I	(KM9) (Vancouver)
UBC: II	(KY1) (Richmond)
Kits: I	(KY2) (Surrey)
South Granville: I	(KY3) small time on campus, doesn't make sense to spend a long time on bus (Vancouver)
Arbutus Ridge: II	(KY4) (Vancouver)
Coquitlam: I	(KY5) (Langley Township)
	(KY7) multiple stops (child pickup) (Vancouver)
North Vancouver: II	(KY9) walking to bus adds time (Richmond)

<p>Richmond: IIIII III</p> <p>New Westminster: I</p> <p>Delta: I</p> <p>White Rock: II</p> <p>Burnaby: III</p> <p>Surrey: II</p> <p>Langley: I</p>	<p>(M1) (Vancouver)</p> <p>(M2) busses take longer because traffic (Richmond)</p> <p>(M5) too long to wait for bus (Vancouver)</p> <p>(M6) twice as long to bus (Richmond)</p> <p>(M7) childcare pickups (Vancouver)</p> <p>(M9) reliability (Vancouver)</p> <p>(M10) (North Vancouver)</p> <p>(G2) low frequency of busses at night (Richmond)</p> <p>(G5) when running late for class (Vancouver)</p> <p>(G8) (North Vancouver)</p>
<p>Distance</p> <p>I (KM1)</p> <p>II (KY2)</p> <p>TOTAL = 3</p>	<p>(KM6) far walk to classes from bus loop (Vancouver)</p> <p>(KY2) far walk to bus stop from house (Surrey)</p> <p>(KY9) distance to bus stop</p>
<p>Flexibility</p> <p>I (N1)</p> <p>II (KY2)</p> <p>II (M2)</p> <p>III (G3)</p> <p>TOTAL = 8</p>	<p>(N7) to leave campus (Vancouver Southlands/Marpole/Oakridge)</p> <p>(KY6) Option to choose driving when rushed (Burnaby)</p> <p>(KY8) not want to plan around transit schedule</p> <p>(M8) option to make multiple stops (Vancouver)</p> <p>(M10) come and go as you please</p> <p>(G3) when bringing big items to campus (Burnaby)</p> <p>(G6) infrequency of coming to campus, option to bring son</p> <p>(G7) normally bikes, drives when tired</p>

<p>Comfort</p> <p>III (KM4)</p> <p>II (KY2)</p> <p>III (M4)</p> <p>III (G3)</p> <p>TOTAL = 13</p>	<p>(KM1) cleanliness (Delta)</p> <p>(KM5) cleanliness/reliability (Vancouver)</p> <p>(KM7) crowdedness (Burnaby)</p> <p>(KM9) coldness on bus (Vancouver)</p> <p>(KY4) bike when nice weather (Vancouver)</p> <p>(KY8) crowdedness, no seats available (Richmond)</p> <p>(M1) crowdedness (Vancouver)</p> <p>(M2) does not like bus (Richmond)</p> <p>(M3) privacy of car (Vancouver)</p> <p>(M4) does not like bus (Vancouver)</p> <p>(G1) weather, getting a ride (Vancouver)</p> <p>(G4) saved money to buy car for comfort (Coquitlam)</p> <p>(G9) convenient, don't have to walk, crowdedness (Vancouver)</p>
<p>Health</p> <p>I (N1)</p> <p>II (KM2)</p> <p>1 (G1)</p> <p>TOTAL = 4</p>	<p>(N4) motion sickness (New Westminster)</p> <p>(KM4) motion sickness (White Rock)</p> <p>(KM7) motion sickness (Burnaby)</p> <p>(G2) on crutches (temporary) (Richmond)</p>
<p>Safety</p> <p>I (N1)</p> <p>I (KM1)</p> <p>TOTAL = 2</p>	<p>(N5) SkyTrain/bus stops at night (and lack of light) (Richmond)</p> <p>(KM1) (Delta)</p>

Location of all Respondents

Municipality	Number of respondents
Vancouver	25
Richmond	8
Burnaby	3
White Rock	2
North Vancouver	2
Delta	1
Surrey	1
Langley Township	1
Coquitlam	1
New Westminster	1
Total	45