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STUDENT PERSPECTIVES OF SUSTAINABLE TRANSPORTATION USE ON A
COLLEGE CAMPUS

AN UNDERGRADUATE THESIS

By Brynn Fuelberth

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COLLEGE CAMPUS

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University of Nebraska-Lincoln, 2023

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Abstract

As climate change grows in relevance in society, attention has often been turned to large universities to look at what solutions can help minimize the impacts contributing to the devastation. Sustainable transportation is an alternative that can help combat these issues. This study specifically focuses on what sustainable transportation looks like at the University of Nebraska-Lincoln (UNL), and what barriers and motivations are present in the undergraduate students' eyes. This was investigated through an open-ended qualitative survey administered to the undergraduate population of the UNL. This study asks how students make their mode decisions in relation to sustainable transportation methods, as well as what students think would encourage the campus population to use more sustainable methods to, from, and around campus. Results from the study indicate that factors influencing students' sustainable transportation use are distance, weather, timing, and safety. Student ideas for how to encourage more sustainable transportation use on campus fall into the themes of greater information/education, better infrastructure, and the introduction of incentives. These findings also acknowledge how while students are aware of their environmental impacts, they are not strongly inclined to take action on their own. This emphasizes the need for change at higher levels.

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Introduction

Background

For decades, the United States (U.S.) has had a large dependence on automobiles that has only continued to rise (Mays, 2022). The built environment of the U.S. has been designed to accommodate vehicles, with examples such as large signage, streets with multiple lanes, big driveways, excessive parking and so on. All of these factors not only encourage individuals to continue to use automobiles for transportation, but aid in accounting for 29% of greenhouse gas emissions (Wang et al., 2020). Along with environmental effects, issues related to traffic, accessibility, noise, and pressure on surrounding areas also remain prevalent due to vehicle use (Balsas, 2003). The United States Environmental Protection Agency (EPA) states that road transportation has become the largest source of carbon monoxide, nitrogen dioxide, and sulfur dioxide reaching the atmosphere due to the burning of fuel (Wang et al., 2018). Since around 250 years ago, marking the beginning of the Industrial era, global temperatures have been rising due to the increase in these gasses (Carr, 2018). This contributes to the growing environmental degradation society has become familiar with, such as the expansion of dry regions, increase in wildfires, unstable flooding, rising sea levels, and a gradual decline of many parts of the planet.

As climate change grows in relevance in society, attention has often been turned to large universities to look at what solutions can help minimize the impacts contributing to the devastation. Universities have worked to make their campuses a more environmentally sustainable place, with actions such as planting trees, emphasizing recycling and composting, conserving energy, and so on since the 1960s (Venetoulis, 2001). Even with past progress, there is still an unlimited number of things that need to be done to improve environmental impact. College campuses are far from escaping concerns related to transportation, with many needing to

begin navigating “serious mobility problems” due to car use by students, faculty, and staff at the schools (dell’Olio et al., 2019). Campuses all around the U.S. are cluttered with vehicles. For example, a 2016 U.S. News survey found that for some schools, such as Wayne State University in Michigan, 98 percent of their students had a car on campus (Friedman, 2016). A solution to the growing concerns of climate change is sustainable transportation methods. Improving and encouraging sustainable transportation to lessen their anthropocentric impact on the environment has been a goal for an increasing number of communities for years, including universities around the United States (Schneider, 2013). Sustainable transportation can take on many forms, but in relation to this study, it is associated with the use of a mode of transportation that has little to no impact on the environment (Saeed & Mahdi, 2021). Sustainable transportation is a subtopic of sustainable development (Fadhil & Waheeb, 2021), and includes examples such as walking, biking, carpooling, electric vehicles, and public transit use.

This study will specifically focus on what sustainable transportation looks like at the University of Nebraska-Lincoln currently, and what barriers and motivations are present in the students’ eyes. It will also dive into future possibilities for the campus to implement. By learning more about these topics, the findings can be used to increase the understanding of what improvements are needed regarding education, infrastructure, policies, and so on to increase the number of students and faculty who interact with said transportation methods to, from, and around campus.

Literature Review

College students and Sustainability

Thinking about sustainability on college campuses, students are one of the most influential stakeholders involved, and can make a large impact on decisions made at higher

levels. As discussed earlier, students on college campuses are part of the problem that has contributed to a degrading environment and have a responsibility to combat the negative change as much as they can. A college campus has the opportunity to educate and influence the next generation of individuals. Past researchers have shown that schools that share more environmental information consequently influence the students at the university into having a stronger environmental literacy (Dagiliūtė et al., 2018). The Virginia Department of Education defines environmental literacy as “having the knowledge, skills and dispositions to solve problems and resolve issues individually and collectively that sustain ecological, economic and social stability” (VDOE, 2014). An increase in this leads to a more sustainable and environmentally friendly lifestyle (Chepesiuk, 2007), such as interacting with sustainable transportation methods. In their 2018 study on student’s perceptions at green and non-green universities, Dagiliūtė, Liobikienė, & Minelgaitė found that environmental information and general campus sustainability are two of the most important factors in if a student decides to act sustainably themselves. Campus sustainability can lead to a greater sense of sustainability in a community overall, and prior research has found positive correlations with interest, motivation, and self-efficacy regarding sustainability (Chen. et al., 2021). Through a change in behavior and lifestyle, environmental sustainability can be improved on campuses.

Notable findings from previous research show that there is a significant difference in attitudes, interest, and motivation in relation to sustainability between male and female college students, with female motivation being evidently higher (Chen et al., 2021). Other studies have shown that females have more positive attitudes regarding campus-related environmental improvements, such as bike programs, than men (Kelarestaghi et al., 2019). These gender differences can be further investigated through this study at UNL. Regardless of gender

differences though, research has shown that incoming freshmen at universities have continued to express a greater amount of concern for the environment, as well as a growth in interest in this issue as they progress through college (Speer et al., 2020). All of these influences greatly impact patterns of behaviors on college campuses, especially when looking into sustainable transportation. Broadly, studies have shown that there is a lack of knowledge about the planning of policies aimed at achieving sustainable mobility on university campuses, so it is imperative this becomes a greater consideration (dell'Olio et al., 2014).

Factors influencing Transportation Methods

Transportation patterns at universities have come to the attention of policymakers in the past years (Crotti et al., 2022). Therefore, it's important to understand people's decision making behind what mode of transportation. When looking at walking as a mode of transportation, people tend to only walk if their desired end destination is relatively close, meaning it is primarily used by students living on campus, rather than those commuting to campus. For those students who live off campus that choose to drive, deciding to walk from place to place or take the bus once on campus is an option. This decision requires the need to only park once, which has proven to be an incentive for many individuals on campus (McMullen, 2020). Those who choose to walk also reduce energy usage, congestion on roads and parking lots, and reduce air emissions (Fadhil & Waheeb, 2021). The personal benefits of walking also relate to saving money and time, the obvious exercise, as well as virtually no environmental impact.

Biking has made itself known around the globe, with examples like the Netherlands, where a 2016 study found that 27% of all trips are made on bicycle (Harms & Kansen, 2018). This is strikingly high compared to the mere 1% of trips on bicycle made in the U.S. (Pucher &

Buehler, 2008). There are many purposes for choosing to ride a bike, such as leisure, exercise, commuting, etc. Contrary to general motivations behind sustainable behaviors, males are significantly more likely to use a bicycle as transportation than females, with much less concern behind risk-related indicators (Kelarestaghi et al., 2019). Using a bike as a mode of sustainable transportation is an environmentally, socially, and economically sustainable option for individuals (Pucher & Buehler, 2008), especially when thinking about students and faculty on a college campus. Deciding to commute on a bike is influenced by many factors, the most important being individual attitudes and constraints (Handy & Xing, 2011). A college campus is a prime place to dive into those perspectives and encourage more ridership.

Public transit is another sustainable transportation method that is much more widely used outside of the United States. That doesn't regard the fact that many universities around the U.S. do have some form of public transportation, such as buses. While using public transit (such as a bus) has an impact on the environment with its emissions, it does prevent someone from driving their personal car. Many improvements have been implemented and tested, such as electric vehicles, to create a more environmentally sustainable method. As electric vehicles have grown in relevance in the 21st century many schools have taken action to switch their entire fleet of campus shuttle buses to electric. Columbia University in New York City is an example of this, shifting their previous diesel-powered buses to electric in 2018 (Columbia, 2018). Columbia is also a school providing incentives for carpooling programs, such as green passes and reduced tolls. Carpooling is less common on college campuses, but still a "sustainable, economical, and environmentally friendly solution" (Dinesh et al., 2021). Value beliefs, overall safety, as well as quality have been found to impact an individual's decision to carpool (Dinesh et al., 2021). Further studies show individuals are more likely to walk, bike, or use public transit if they live

close to campus or access to the mode of transportation, such as a bus stop or bike share program (Zhou, 2012). As alluded to previously, frequency and length of trips also influence the transportation patterns of students (Crotti et al., 2022). Individuals that live by themselves are more likely to commute via driving alone than other students (Kelarestaghi et al., 2019). Past findings show that crime, traffic safety, built environment, and socio-demographics all impact the decision to use any sustainable transportation method as well (Chen et al., 2018). There is a general theme that for many people, using some sort of sustainable transportation is out of necessity, rather than an active choice (McMullen, 2020). This decision of necessity rather than choice can be further investigated to look at other motivations. All previous evidence of college commuting can be outlined in the following groups of factors that affect user choices of sustainable transportation. This includes, but is not limited to: physical environment (i.e., infrastructure), psychological factors (i.e., enjoyment), trip characteristics (i.e., distance, frequency), personal attributes (i.e., age, gender), mode-specific factors (i.e., accessibility, convenience), and implementation of Transportation Demand Management (TDM) policies (Crotti et al., 2022).

Examples of addressing Sustainable Transportation at Universities

There have been many studies conducted in the past that have looked at sustainable transportation specifically on college campuses all around the nation. Examples of mode specific changes, Transportation Demand Management plans, and stakeholder perspectives have been considered, and by investigating previous successes and failures, a better understanding of what factors and practices can be implemented realistically on UNL's campus can be gained.

Ohio State University

Referencing a 2012 study by Gulsah Akar, Chris Flynn, and Mi Namgung, Ohio State is an example of a school that has looked into the travel choices of students, faculty and staff at the university, linking it to Transportation Demand Management policies (Akar et al., 2012). Ohio State is a relevant school to investigate in comparison to the University of Nebraska-Lincoln because of location in the Midwest and involvement in the Big Ten Conference. Regarding sustainability, the university has over 600 faculty and researchers in sustainability and offers more than 900 courses supporting sustainability, including one specifically for sustainable transportation (Ohio State University, 2019). Already on campus, there are electric charging stations, bike racks, lockers, fix it stations, and paths, as well as a three-star certified green fleet, recognized by Ohio Clean Fuels (Schneider, 2017).

This study presented a survey to the entire population of Ohio State, gathering complete responses from around 2,300 individuals. The survey asked questions about people's transportation habits and attitudes in relation to sustainability. Many relevant findings were gathered through this survey and the additional analysis methods done in the study. When looking at the number of individuals commuting to campus by driving alone, it was found that 64% of off-campus residents fell into this category. The further the distance from campus, the greater the percentage of car commuters. Aligning with previous studies, this survey revealed that bicycle use, as well as bus use, was greater for the male population. Another major finding from this survey was that while over 75% of respondents believed their lives were dependent on cars, they also acknowledged that there might be other travel options available to them. This emphasized the concern that people aren't aware of what their options are. Around 40% of respondents expressed interest in carpooling, especially as the distance from campus increased.

This study shared that travel time, flexibility of departure time, and weather were the most important factors in mode decision. As mentioned earlier, weather is something that is relevant to both Ohio and Nebraska as they are located in the Midwest United States. Disappointingly, concern about the environment was not found to be of high importance from the population surveyed. It will be interesting to see if this is something that is similar across campuses when investigating UNL. This study did not discuss any future implementations, but these findings can be compared to future findings at the University of Nebraska-Lincoln to understand similarities and differences with what is already available, helping to understand possible plans for the future.

Colorado State University

Colorado State University, located in Fort Collins, Colorado, is a leader in the sustainability movement on campuses. With over 32,000 students, 25,000 of them being undergraduate students, the university has put in the effort to encourage sustainable actions by students. While there are no formal studies based on their sustainability efforts, they are still a relevant university to investigate when thinking about sustainable transportation in relation to this study.

In 2020, CSU became the only institution in the world to be awarded three Platinum ratings from the Association for the Advancement of Sustainability in Higher Education (AASHE) (Giordano, 2020). The university offers sustainability majors in all eight colleges, nearly all their food waste is composted, and they have a goal to reduce greenhouse gas emission to zero by 2040 (Colorado State University, 2022b). According to a recent commuter survey, nearly half of CSU's population use alternative forms of transportation to get to campus, such as

biking, walking, taking the bus, or carpooling (Colorado State University, 2022a). CSU's main driver is their bike culture, with the school being named a Platinum Bicycle Friendly University by the League of American Bicyclists, recognizing them for their infrastructure, maintenance, programming, and classes, amongst many other bike friendly plans (Walsh, 2019). CSU's campus offers more than 18,000 bike parking spaces and maps for students which includes information not only on destinations around the area, but pump and maintenance locations as well, as well as a Campus Bicycle Advisory Committee. Many clinics and classes are held to help educate riders and drivers alike, such as "Bicycling 101," which is for participants new to campus to serve as a guide safe riding, or "Bicycle Friendly Driver," which talks about the best and safest ways to interact with all users on the road. Every class is uniquely designed to best serve each individual and shares useful information relevant to not only CSU's campus, but biking in public in general (Colorado State University, 2022a).

A quote from a community member at CSU states "Most days, the weather is good enough to ride comfortably, and riding home is definitely the best part of the day because it's a relaxing break between work and home. CSU is definitely a bike-friendly campus, and most campus drivers are respectful and courteous to bikers. "Get on your bike...you'll be glad you did!" The university continues to take action to create a space for all individuals to feel comfortable and encouraged to participate in sustainable alternatives regarding transportation. All these actions in relation to sustainability help the school meet their Climate Action Plan, leading them to continue to be an innovative campus.

Sustainability at the University of Nebraska-Lincoln

As stated, it is important to look into stakeholder perspectives to help encourage sustainable transportation use as an alternative to combat the environmental issues apparent in our society. College campuses such as the University of Nebraska-Lincoln are a perfect opportunity to reach a rich demographic and make changes to become an innovative leader in communities, such as Nebraska and the Midwest. This study will be focusing on the University of Nebraska-Lincoln, which is located in the capital city of Lincoln, residing on almost 900 acres between its three campuses. There's over 26,000 students, faculty, and staff involved at UNL, with community members interacting everyday as well. Looking at the UNL's sustainability, a silver rating was awarded in 2020 through the Sustainability Tracking, Assessment, and Rating System (STARS), which is a national standard for sustainability reporting of higher education, developed by AASHE (UNL, 2022).

In relation to sustainable transportation, UNL offers options such as discounted bike rentals and maintenance at their Outdoor Adventures Center. There is a campus wide bus service that makes over 800,000 trips system wide each year, and the inclusion of charging stations for electric vehicles has provided almost 34,000 electric miles, reducing over 7,000 kg of greenhouse gas emissions since the start of 2022 (UNL, 2022). There are also small actions that have been taken where major shifts aren't possible yet, such as converting all parking garage lights to LED lighting. The University of Nebraska is one of the largest schools in the Midwest and can be a leader in innovation. As said in their Environment, Sustainability and Resilience Master Plan, UNL has a role to "value and promote the environmental, social, and economic well-being of Nebraska" (Chancellor's Environment, Sustainability and Resilience Commission, 2020).

In 2020, UNL presented their Environment, Sustainability and Resilience Master Plan. Made in discussion with a broad range of university constituencies, this plan serves as an aspirational framework for change and outlines improvements to be made at the University of Nebraska-Lincoln. Topics discussed include energy, health & wellness, land & ecosystem resources, research & innovation, teaching & learning, transportation, waste management, and water management. The plan seeks to promote and support the goals of the university to ensure it is a resilient, high performing and efficient campus, as well as keeping the health and wellness of not only the UNL community, but also the environment and surrounding ecosystems in consideration when making future decisions. The N150 report and N2025 strategic plans are used to help understand how the Master Plan aligns with other university objectives, outlining short-term and long-term goals to be accomplished.

The transportation section of this plan defines the goals aligning with sustainable transportation, summarizing the objectives, strategies, outcomes, performance measures and metrics, and actions to be taken in the short term, 2020-2025, and long term, after 2025. Notable objectives aimed for 2027 include to increase the use of alternative forms of transportation, reduce traffic and the number of parking spaces needed on and around campus by 30%, and establish low emission zones with collaboration with the city of Lincoln. Short term goals include examples such as receiving perfect scores in all transportation categories in AASHE STARS, increasing sustainable commuting (bus, bike, carpooling, walking) by 20% and reducing the number of single-occupancy drivers to campus by 75%. There is also the goal of looking into Transportation Demand Management strategies to optimize the university's transportation system, which this study will dig into along with stakeholder perspectives.

As stated in the plan, hopefully the basis of these goals will provide a stronger foundation for interaction among faculty, staff and students, which impact the needed behavioral change that results in a more sustainable campus community. This plan is a well thought out start to make positive changes, but a greater demand for implementing these policies regarding the creation of a more sustainable system is needed. For one, to enhance environmental awareness in relation to transportation, and two, to ensure economic growth in a sustainable and environmentally protective way (Wang et al., 2018). There is still a large dependence on personal automobiles on campus that impacts it greatly. By looking at other universities' experiences and learning about the perspectives of the local community here, we can understand what will work best at UNL. Acknowledging UNL's current culture can help to create and encourage aspects of a more sustainable one. Previous research has been effective in creating a conversation that can open the door to encourage people to use said methods of transportation, and applying these findings can help create a more desired culture.

Research Questions

With information from the literature review in mind, this study will continue to investigate sustainable transportation topics, specifically looking at students at the University of Nebraska-Lincoln. The focus of this study will be multifaceted, with a focus of learning more about current perspectives of students at UNL, as well as how these perspectives can in turn impact future implementation regarding sustainable transportation at the university. This study aims to look into the motivations, effects, and future of involvement with sustainable transportation methods through the following research questions:

- RQ1: How do students at the University of Nebraska-Lincoln make mode decisions in relation to sustainable transportation?
- RQ2: What actions can be implemented to increase the number of individuals at the University of Nebraska-Lincoln using sustainable transportation methods?

Methods

Study Design

The methods of this study are based in social science research, using a qualitative approach (University of Southern California, 2012). Previous studies relating to sustainable transportation on college campuses are continuing to be reviewed and a survey was administered to participants of this study. Previous research indicates that surveying a population on sustainable transportation perspectives and use might provide insight on why individuals choose to participate or not, helping to answer RQ1 in this study (Akar et al., 2012) Surveys are cost-effective and have the advantage of gathering large group responses (Treadwell & Davis, 2020). This survey was cross-sectional research, meaning the analysis and conclusion was based on the observations found at a specific point in time, data collected during the Spring semester of the 2022-2023 school year.

The survey was made and completed through Qualtrics. It consisted of three open-ended questions asking about 1) what students use as their main mode of transportation and why, 2) how they perceive sustainable transportation, and 3) what they think the University of Nebraska-Lincoln can do to encourage more sustainable transportation use. The study is based on students' past experiences and future goals. Gathering qualitative data provided a richer understanding of personal perspectives on sustainable transportation on college campuses.

Participants

To investigate the questions of this study, my participants included current undergraduate students attending the University of Nebraska-Lincoln during the Spring semester of the 2022-2023 school year. Participants were recruited virtually, as well as through various environmental studies related courses. Convenience sampling, which is a technique used to recruit participants that are easily accessible or convenient to researchers, was used to gather data from the greatest number of individuals (Treadwell & Davis, 2020). The pool of participants gave plenty of unique answers, but due to the systematic and rigorous nature of analyzing qualitative data, it was important to not receive too many responses (Pope et al., 2000). The only requirement for overall participation was that participants are undergraduate students at the University of Nebraska-Lincoln. In total, I received 80 responses ($N=80$). The number of students from each grade who participated in the survey varied, with the highest number of respondents being seniors ($n = 27$), and lowest being freshmen ($n = 13$), with juniors ($n = 18$) and sophomores ($n = 22$) participating as well. More females filled out the survey than male individuals, with 68% of the participants identifying as female. An overwhelming majority of respondents were White, at 92%, with Hispanic/Latinx (1.6%), Black (3.2%) Asian (1.6%), and individuals identifying as other (1.6%) participating as well.

Since this study involved human subjects, it is also imperative that all participant confidentiality was ensured (Kaiser, 2009). Participants completed informed consent at the start of the survey and all participation was voluntary and could be stopped at any time. No sensitive data such as name or address was gathered or shared during the survey or analysis.

Analysis methods

The open-ended questions from the survey were explored using a reflexive thematic analysis, which aims to provide a coherent and compelling interpretation of data to find more generalizable themes (Braun & Clarke, 2019). Qualitative research involves the dissection of textual data, so identifying the thematic framework is necessary to apply the findings in the future (Pope et al., 2000). Looking for patterns in responses helped to understand common perceptions held by UNL undergraduate students regarding sustainable transportation. These patterns were generated by looking at key issues and concepts discussed in the participants' short answers.

A reflexive thematic analysis is broken up into six steps. As described in Braun and Clarke (2006), I began the first step of reflexive thematic analysis by familiarizing myself with the data. This included reading the data and noting initial ideas. My second step was generating initial codes. This looked like finding interesting features in the data or organizing them in a systematic method across the data set. The third step is developing themes. This required putting my codes into themes, and gathering the data relevant to each theme. The fourth step is reviewing themes, where I checked if the themes worked in relation to the coded extracts (Level 1) and the entire data set (Level 2), and further I created a thematic 'map' of the analysis. Step five is defining and naming each of the themes. And finally, I finished the sixth step by producing the actual report based on the codes and themes found earlier.

Comparing previous findings in the literature such as past policies and future goals from the UNL master plan and the findings from this study can also help to reach conclusions regarding the research questions. By categorizing common perceptions from UNL students, main takeaways can be utilized by important stakeholders, such as university officials, for developing

more sustainable transportation methods and communication of sustainable goals. Finally, I engaged in member checking, a technique for investigating if results are credible by having participants validate findings, to verify these findings (Birt et al., 2016).

Results

This study aims to gain an understanding of college student perspectives on sustainable transportation methods. From the survey, I engaged in a reflexive thematic analysis of 80 responses from the UNL undergraduate population. Through this process, I generated four themes for Research Question 1, which asked about how students make their mode decisions, and three themes for Research Question 2, which asked what students think would influence more sustainable transportation use. In this section, I will describe these themes in relation to these research questions.

Research Question 1

In Research Question 1, I asked about how students at the University of Nebraska-Lincoln made transportation (mode) decisions, aiming to gather an understanding of why students choose to use a sustainable transportation method or not. Through analyzing survey responses, I developed four main themes regarding issues that influenced undergraduate students' transportation decisions. These included: 1) Distance, 2) Weather, 3) Timing, and 4) Safety. In honoring the voices of my participants, I used in vivo coding, a form of qualitative data analysis that places emphasis on the actual spoken words of the participants (Manning, 2017). Thus, each of these categories is captured by real quotes from survey participants.

Distance: “If the distance seems great enough, I’ll drive”

Participants greatly emphasized the influence distance and access had on their decisions to use a sustainable transportation method or not. Based on their responses, the majority of students that drive to campus choose to because their place of residence is within a certain distance from campus that they deem as too far to walk/bike/etc. For example, one survey respondent said, “I live off campus so I mostly use my car,” (Participant 52) and another said, “I only drive around if the place I’m going is more than a 20 min walk” (Participant 69).

On the other hand, distance is the reason that students choose to use a sustainable method. One participant said, “I normally walk from my apartment to campus. It’s approximately 0.6 miles to campus from my apartment” (Participant 30). Students living closer to campus or on campus consistently choose to walk, bike, and bus more than students who have a farther distance to travel. Overall, unless students were located on campus or very close, there was no thought given to transportation methods apart from their own personal vehicle. These results exhibit how the culture the United States holds of defaulting their transportation method to driving has influenced individuals.

Weather: “It’s harder when we have extreme weather”

A common perspective from survey respondents was the impact that Nebraska weather has on their sustainable mode decisions. With the inconsistent ups and downs that come with the temperature and precipitation in the Midwest, students often did not want to deal with it more than they must. Students tend to opt into driving a personal vehicle rather than using any other form of transportation. For example, one participant noted “on days with extreme winds or really bad weather, I will use my car to transport around,” (Participant 71) and another said “if the

weather is bad, I will consider driving so I don't have to walk in the cold" (Participant 16).

Respondents also noted how often trails and sidewalks aren't cleared off well for more active transportation methods such as biking.

For as much bad weather as there is, though, there is also good weather, which influences students' decision-making about sustainable transportation as well. One participant said, "in the fall and late spring, I bike to campus, and I will occasionally do this on nice days in the winter, too" (Participant 59). Findings like this presented in the theme of weather represent a barrier that is not relevant on every college campus, and may require different or unique solutions to encourage more individuals to choose sustainable transportation.

Timing: "I don't really have the time to do anything else."

A third common response resulted in a theme regarding time, specifically how students make transportation decisions based on if they are in a rush or not. One participant quotes, "I mostly use a personal vehicle due to being required to get to work immediately following my last class" (Participant 60), emphasizing the busyness of college students' lives. Survey respondents emphasized how it is more important to think about how to get from place to place most efficiently, with timing often being their priority. One student emphasized how our (Western) society is fast paced, and this relates to transportation use as well: "In the USA, everything goes fast and so are the people. I drive so I can save time" (Participant 5).

For some individuals, a car is necessary to get from one requirement to another within a certain amount of time. Specifically, Participant 28 said, "I ride my bike mostly, but sometimes I drive a vehicle depending on how much time I have." This finding emphasizes how prioritization of things like prior commitments, activities, and simplicity may impact mode decisions.

Safety: “I think people are scared”

The final theme respondents discussed regarding sustainable transportation choices was Safety. Participants completing the survey acknowledged their apprehension towards certain forms of sustainable transportation methods because of a fear related to them, whether this was a learned societal fear or personal uneasiness. This theme had a wide range of responses, but all impact whether students chose to use their own car or opted to utilize public or more sustainable transportation options. For example, some responses related to the idea of feeling unsafe on a bike because of cars, feeling uneasy walking when it’s dark because of the threat strangers impose, or the fear of riding the bus because an individual doesn’t know how it works.

Regardless of why, these emotions often prevent students from even just considering using a sustainable method. Thinking about bikes, one student states: “The bike lanes on campus feel unsafe since they are just painted lines and not actually separated from traffic by a physical barrier” (Participant 59). Another participant says: “I know multiple students who travel between City and East by only driving because they are anxious about how the bus systems work” (Participant 37). These reflections illustrate how important other factors, such as proper education and better infrastructure can have on students’ comfortability and confidence.

Table 1. Research Question One Themes and Quotes:

Theme	Participant Quote
Distance	“I live off campus, so I use my personal vehicle to get to and from campus each day” (Participant 38).
Weather	“If the weather is bad, I will consider driving so I don’t have to walk in the cold” (Participant 16).
Timing	“I mostly use a personal vehicle due to being off campus and required to get to work immediately following my last class” (Participant 60).
Safety	“The bike lanes on campus feel unsafe since they are just painted lines and not actually separated from traffic by a physical barrier” (Participant 59).

Research Question 2

In Research Question 2, I wanted to know what actions could be taken at the University of Nebraska-Lincoln to encourage students to use more sustainable transportation methods. Through this research question aimed to gather UNL student ideas about innovative approaches to sustainable transportation on campus since they are the target audience at the university. Participant responses pointed to potential future actions taken on campus by various individuals and organizations. I organized the results from the qualitative survey into three themes: 1) Information/Education, 2) Infrastructure, and 3) Incentives.

Information/Education: “They should share more information”

Participants identified the need for greater information/education. Students consistently mentioned how becoming more well informed would influence them to use more sustainable transportation methods. Students had ideas ranging from providing general resources about biking, to showcasing the routes the buses take in a more public way around campus. There was a common consensus that students had not received much information or education on the transportation methods to, from, and around campus, with a major emphasis on information about the bus system. One participant explained:

“I think providing more literature or awareness for the bus system and how easy it is to use would be super helpful. A lot of people I know have a more stigmatized idea of the bus system which I think is due to misinformation or education, or just a lack of resources” (Participant 42).

An idea that one participant had to solve this problem regarding the campus bus system was creating a curriculum with sharing bus information and assistance as a part of New Student Enrollment. With this, students would all be given specific applicable information, giving all individuals involved a common goal.

Another mode of transportation emphasized was biking, particularly the lack of knowledge related to effective biking around campus and the city. One student said, “They should make the biking protocol more clear. Advertise how you can register your bike, how you can lock it safely, and how easy it is to use bike paths” (Participant 47). Participants thought that incorporating more signage and communication around campus in general regarding bikes would better inform UNL’s population.

For issues that students pointed out in RQ1 as reasons why students do not choose to walk or bike (i.e., sustainable transportation modes) such as weather and safety, one recommended “having some more tips on how to safely bike and having places for people to hang clothes to dry” (Participant 3). Using social media as a resource to share information to a large number of individuals was recommended. Covering bases of safety, access, routes, and protection information should be a priority. Together, these findings show how regardless of the type of transportation method, students did not feel informed about sustainable transportation overall. They emphasized that this should encourage the University to make it a priority to communicate important information to incoming students to create a more conscious and competent community on campus.

Infrastructure: “If the public infrastructure is there”

Next, participants emphasized the impact that improved infrastructure could have for undergraduate students in relation to transportation. Ideas to improve infrastructure focused on biking/walking, bus stops and routes, housing, and parking.

Biking/Walking.

For biking and walking, respondents pushed for better bike lanes and trails. Requests for lights along them and more protection and separation were commonly mentioned throughout the survey. More access to bike/skateboard/scooter parking was also encouraged, such as indoor or covered parking to protect from the weather. The addition of cameras on busy bike parking areas was also mentioned to counteract the concern of theft. A common complaint from survey respondents was the lack of maintenance with sidewalks and bike lanes on campus. Prioritizing this could encourage more students to use them.

Bus Stops.

Bus stop accessibility was a common issue with why people choose to drive instead of bus, so students advocated for more bus stops around the city. Buses were commonly used by students to get to and from City and East Campus, but many mentioned extending the bus routes to include students' homes. Specifically, a participant noted, "Another way [to encourage sustainable transportation use] would be by increasing public transit throughout the city and not just between the two campuses" (Participant 28). For students living on or near campus, using the bus is more accessible and an obvious choice, so pushing sustainable infrastructure off campus is encouraged.

Housing.

A surprisingly common idea from respondents was having the University and City of Lincoln "provide more affordable close housing to campus;" (Participant 30). This would create an opportunity for students to minimize the distance needed to travel to and from campus, hopefully influencing them to use a more sustainable method. While this type of infrastructure would be a big and expensive change, it is something to consider as the campus is updated.

Parking.

Another infrastructure change suggested was parking. One student said, "I think UNL doesn't need to incentivize parking as much as it does," (Participant 50) bringing up the prioritization the school currently has on automobiles. Removing parking spots, forces students to find other methods of getting to, from, and around campus. One respondent's solution pointed to where parking spots should be located on campus. They said, "There are too many cars on campus. Parking should be on the periphery (except for handicap parking/access), and then people can take the bus into campus or walk" (Participant 59).

Overall, there were consistent mentions of expansion and accessibility within this theme of infrastructure, and these findings exhibit how the built environment around students can influence their perceptions of sustainable transportation.

Incentives: “I think there could be incentives”

The final theme generated to answer Research Question 2 was the idea of incentivizing students’ sustainable transportation use by giving students rewards. One respondent said, “I think that there could be incentives, such as gift cards or other scholarships for not driving as much” (Participant 18). The introduction of some kind of app to track biking, carpooling, walking, etc. was also mentioned. Students would have to input their data, similar to other apps used in the past for other types of activities. Depending on how many miles they bike, days they commute by foot, etc., they would be met with rewards such as free food, drinks, gift cards, and such. Another student agrees, saying “UNL could provide rewards for people who choose to walk or bike rather than drive as much as possible as a way to incentivize it” (Participant 26). This input from participants lends itself to the belief that incentives do work for the students in other day to day situations, whether that be in classes, apps, organizations, and so on.

Table 2. Research Question Two Themes and Quotes:

Theme	Student Ideas	Participant Quote
Information/ Education	<ul style="list-style-type: none"> • Increased signage for biking and busing • Educational class options • NSE curriculum change 	<p>“A lot of people I know have a more stigmatized idea of the bus system which I think is due to misinformation or education, or just a lack of resources” (Participant 44).</p>
Infrastructure	<ul style="list-style-type: none"> • Biking/Walking maintenance • More bus stops • Housing near campus • Less parking 	<p>“It would be nice to see parking protected bike lanes... Also, the bus network could easily be expanded to be more useful for trips outside of East campus to City campus” (Participant 52).</p>
Incentives	<ul style="list-style-type: none"> • Rewards for using sustainable methods • Potential app 	<p>“I think that there could be incentives, such as gift cards or other scholarships for not driving as much” (Participant 20).</p>

Student’s Ideas of Sustainability

Finally, there was one additional question on the survey that was asked to gain a greater understanding of UNL student perception of sustainability, relating to their answers for RQ1 and RQ2. We asked whether students thought their mode of transportation was sustainable or not, and their answers led to some interesting findings beyond the scope of RQ1 or RQ2.

There was a general consensus from students that driving a personal vehicle was not sustainable and that biking/walking/skating, etc. was sustainable. Regarding bussing and carpooling, there were mixed opinions, with some viewing it as sustainable and others not. For example, one student said, “Mass transit like buses are more sustainable because it serves more civilians, and requires less vehicles on the road.” (Participant 6). The majority of students, though, did not define their usual mode of transportation as sustainable. One participant said, “I don’t think my mode of transportation is efficient or has little to no impact on the environment, but it gets me where I need to go” (Participant 39). Responses indicated that students also did not see the environment as a factor when making mode decisions, whether their transportation method was considered sustainable or not. By asking about if students think their transportation method is sustainable, there is a lot of insight on how students value the environment (or not) in relation to transportation specifically and overall as well. This information helps to understand motivations and what types of changes would work best in the future, working in part with answers from RQ1 and RQ2.

Discussion

In this study, I investigated student perspectives on sustainable transportation use on the UNL college campus, using a qualitative survey that gathered perspectives from 80 undergraduate students. To answer the research questions of this study, I asked students about how they make mode decisions regarding sustainable transportation to, from, and around campus, as well what they think could be implemented on campus to encourage more sustainable transportation use. Through this survey, I found common themes for each question, with Distance, Weather, Timing, and Safety for RQ1 and Information/Education, Infrastructure, and Incentives for RQ2, as described in the results section.

Implications from Findings

My findings emphasize many common factors whether or not undergraduate students choose to use sustainable transportation methods or not. Similar to the Ohio State TDM study, where they found that students who lived near campus used more sustainable transportation methods, distance has an immense impact on-sustainable decision making (Akar et al., 2012). My study confirmed that students who live closer to UNL's campus or on campus indicated they were more motivated to use a sustainable transportation method, rather than students who live one or more miles from campus. As expected, students that live near bus stops and bike share locations used those resources more as well. Having greater access to sustainable transportation methods is known to positively influence students (Barnett et. al, 2019). Again echoing Akar, Flynn, and Namgung's study, weather is extremely influential for Nebraska undergraduate students. Respondents shared how weather often impacted if they decided to drive or not, affirming previous findings of how conditions such as rain, wind, snow, and low temperatures reduce the use of public transit, walking, and bicycling and correspondingly increase the use of passenger cars (Mirzaei et al., 2021). This is a consideration that is extremely important in the Midwest, but isn't relevant in some places that have more temperate conditions, such as Stanford University in California, which has gotten a Platinum rating from The League of American Bicyclists (Stanford University, 2023). This theme generated from participant's responses highlights the importance of considering weather with future planning in Lincoln specifically, accounting for possible snow, rain, wind, and so on in the inconsistent seasons.

Timing also plays a large part in decision making based on findings from my survey, with students being more inclined to drive due to the faster transportation time than a more active form such as walking. Students closer to campus are more likely to use a sustainable

transportation method greatly due to the fact that resources such as buses are closer or more consistent, making the whole process faster than it could be for students further from campus. Regarding gender, my findings indicate that men are more likely to use a bike as a transportation method, as well as other active forms. With this in mind though, similar to Chen and others' (2021), investigation of college students' understanding of sustainable development goals, my study confirmed that in general, females tended to be more environmentally motivated in general. From respondents in the survey, female identifying individuals were the only ones who fell into the Safety category, emphasizing previous findings correlated with less male concern behind risk-related indicators (Kelarestaghi et al., 2019). Findings from survey responses also highlighted a lack of knowledge undergraduate students at UNL possessed, ranging from bus information to bike safety, which supports the need for further incorporation of this information in daily life. In general, the decision to use a sustainable transportation method is often out of necessity, rather than choice, which reiterates what one survey participant said, that "people are always unfortunately going to choose the option that is cheaper, more flexible, and faster before choosing an option for its sustainability" (Participant 10). More resources need to be offered for individuals to become not only educated, but comfortable and confident with using a sustainable transportation method.

Further, findings from my study illustrate how undergraduate students at UNL *are* consistently aware of the negative impact their usual transportation method can have on the environment, emphasized by the second question on the survey, which asked if students' think their method is sustainable or not. Students emphasized how they rely on their own personal vehicles, which supports the knowledge that Americans depend greatly on their personal cars (Mays, 2022). Even though students are cognizant of their impact, their own personal priorities

take precedence over environmental factors, thinking about efficiency, comfortability, and so on.

In general, there was a lack of concern for the environment when making mode decisions, echoing findings from the 2012 Ohio State study. As mentioned in my findings, students tended to prioritize other aspects such as distance, weather, timing, and safety over sustainable transportation. These findings point to the importance of action taken at higher levels, as it is apparent students aren't strongly inclined to make their own changes. This is where respondent answers to RQ2 become relevant, regarding what changes would encourage more sustainable transportation use on campus. Recommendations of more education and information not only emphasize students' lack of knowledge as mentioned before, but highlight the interest students have in this realm. Previous studies have shown that younger students are coming into college more curious about the environment/sustainability (Speer et al., 2020). This is important to consider when deciding what education to incorporate into curriculum. As already described, Colorado State University has a bike culture on campus that is very apparent, and having classes offered such as their "Bicycle Friendly Driver" helps to create this culture (Colorado State University, 2022a). As students shared recommendations in the survey, such as incorporating education into the New Student Enrollment curriculum, this change and desire for a shift is reaffirmed, thinking about a quote from one student "I think there would just need to be a culture change where fewer people drive." Other ideas such as incorporating incentives emphasizes the student perspective of wanting decisions and action taken by those in power at UNL. Even with the consciousness of understanding the negative impact of a daily drive, students expressed needing more of a reason to participate in sustainable transportation methods than just "saving

the earth,” because often these mentioned methods are more difficult to use than driving personal vehicles.

Practical Applications

The University of Nebraska-Lincoln has already started on improving the environmental impact the school has by creating the Environment, Sustainability and Resilience Master Plan (Chancellor's Environment, Sustainability and Resilience Commission, 2020), administering surveys gathering student experiences with things such as the bus system, and incorporating electric vehicles stations. As mentioned, though, there is still endless work to be done. Using information from this study and other similar ones, the University can gain a greater understanding of what actual student goals are. By looking at participant responses to RQ2, tangible examples are given that not only help expand on previous ideas, but introduce new concepts as well. Findings can also be compared to other schools, looking deeper into what others do, such as CSU, Ohio State, or other similar schools with high success such as University of Minnesota. These findings can be applied to the goals of the Master Plan, to make a plan to fully accomplish them.

Looking at recommendations given from respondents, we can see examples around the school and city of similar successes. One solution in Lincoln for combating the issue regarding dangerous bike lanes, or lack of any lanes, is on N St. in downtown Lincoln. This “cycle track” is the state’s first protected bike lane, introduced in 2016 (City of Lincoln, 2022). The information from student participants, including common trends and themes about sustainable transportation, is useful in understanding how student perspectives may differ from leadership perspectives, and

help to take action that will actually help undergraduates use more sustainable transportation methods.

Limitations and Future Direction

Although findings from this study contributed new information and supported previous studies' conclusions about college students and sustainable transportation, there are still limitations to note. While the nature of a qualitative study means there will be a smaller pool of participants to develop richer insights into individual experiences (Vasileiou et al., 2018), when comparing the 80 respondents to the entire undergraduate population of just under 20,000 at UNL, it is not entirely representative. If there were to be a similar study in the future, it would be beneficial to have a team of researchers together to be able to dissect even more responses at a deeper level. The group of participants in this study specifically were biased and lacked great diversity, attracting a WEIRD sample (white, educated, industrialized, rich, and democratic; Afifi & Cornejo, 2020). It would be advised in the future to get a more diverse group of participants to be more representative of the variety of past experiences and perspectives in the UNL community. While the study administered for this survey did answer the questions being asked, it would be useful to ask more pointed questions to gain more distinct responses for each part being asked. For example, more explanation behind "why" and not just "what." This could be accomplished through actual interviews in conjunction with a survey in the future (Treadwell & Davis, 2020).

Implementing some of the actions and doing further research on how these changes actually impact the student body decisions would be a beneficial step in the future as well. Gaining this understanding could help finalize plans and goals that have either already been set

(such as in the UNL Master Plan) or some that are still being considered. The University of Nebraska-Lincoln is a huge part of what makes Lincoln, Lincoln. Working together with the city and learning from one other would create a more cohesive and environmentally friendly city. For example, the City of Lincoln introduced “Lincoln Safe Routes to School,” which is a multi-year implementation project that “will improve the safety and function of school zones and walking routes for students and pedestrians” (City of Lincoln, 2022). Finally, as mentioned in the UNL Master Plan, a more precise and in-depth Transportation Demand Management study would be beneficial for the campus and Lincoln community. Improvement in these areas in a future study could help contribute even stronger ideas to encourage more sustainable living.

Conclusion

Each day, many students at UNL use a personal vehicle to get either to, from, or around both campuses. As we move forward as a society, it is important to acknowledge the dependence we have on our own personal vehicles and recognize alternatives that are more sustainable. This study aims to highlight the undergraduate student perspectives on sustainable transportation use on a college campus, specifically the University of Nebraska-Lincoln. This was done through an online survey where I collected open ended responses from 80 undergraduate students. Responses from this survey resulted in the development of themes that focused on what factors influenced mode decisions for the students, as well as what would encourage more sustainable transportation use on UNL’s campus. While students are aware of the environmental impact driving personal vehicles has, this doesn’t highly influence students’ decisions and they are not strongly inclined to take action on their own, emphasizing the change wanted at higher institutional levels. College students are future decision makers, so it is important to understand

the goals and actions to take at this level to then apply them and progress to bigger scales. It's crucial we continue to promote and spread information about the impact our habits have on the environment to open doors to new sustainable alternatives and lessen human impact overall.

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