

Creating a prioritization tool that will help increase the walkability of Charlottesville's schools.

Examining the history of equity in transportation planning and exploring how equity is currently being addressed by other planning methods.

A Thesis Prospectus
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Bachelor of Science in Systems Engineering

By
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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Introduction

In the last fifty years, there has been nearly a 60% decrease in the number of children that walk or bike to school, despite only a 10% increase in the number of students who live further than a mile from school. The main reasons for this include concerns about distance, safety, weather, and crime (SRTS, 2021). In the spring of 2020, Charlottesville experienced a bus shortage due to COVID-19 that exposed weaknesses in the current system of transporting students to and from school (Knott, 2021). Pressure could be taken off of the bus system if more students walked or biked to school; however, many students who live within walking distance choose not to use an active mode of transportation to get to school. A report from Safe Routes to Schools shows that locally, key issues include traffic along main routes to schools, inadequate infrastructure for pedestrians and cyclists, concerns about safety, and lack of time.

Families and schools will continue to feel stress around getting students to school if the City cannot provide safe and reliable transportation options for all students attending its public schools (Knott, 2021). The project's technical topic will be to create an approach to infrastructure improvement that will make the schools in Charlottesville more walkable. A key aspect of this approach will be a prioritization tool that will help the City decide which projects to invest in - the goal being to provide an efficient and flexible approach to improving the infrastructure around schools. The STS topic of this prospectus will be to investigate what non-infrastructure related reasons prevent people from walking to school and explore the role that equity plays in the accessibility of active modes of transportation.

Creating a Prioritization Tool That Will Help Increase the Walkability of Charlottesville's Schools.

The City's current approach to infrastructure improvements relies heavily on input from residents as well as the 2015 Bike and Pedestrian Master Plan. While there is some prioritization, it is not robust or systematic. The current system does not prioritize improvements with the specific goal of making areas around schools safer places to walk, and it also depends on residents speaking up, resulting in some areas being overlooked despite being in need of better infrastructure. The APT was used by the City in 2015 in the Bicycle and Pedestrian Master Plan to prioritize infrastructure related to bikeability. However, the team has identified several fundamental flawed assumptions within the tool, and it is unclear whether these exist for the sake of usability or if they were overlooked by the group that designed the tool. Without a more robust prioritization system to improve walking infrastructure around its schools, the City will continue to be reliant on buses as the primary mode of transportation (Knott, 2021).

Previous prioritization tools have identified key metrics in grading walkability (Marcelo, 2015; ActiveTrans Priority Tool, 2021), and evaluation of projects in other cities provides insight into previous work that has been done in this area (Moudon, 2020). Our approach will focus on walkability and bikeability within a certain radius of Charlottesville's schools, and aim to provide a prioritization tool to help the City identify projects that would be the most effective in making these areas safer. My capstone team will start by assessing Clark Elementary school by conducting field research on the current modes being used to transport students, and also observing traffic, road, and sidewalk conditions in the surrounding area. The figure below is an example of one route taken during one observation period.

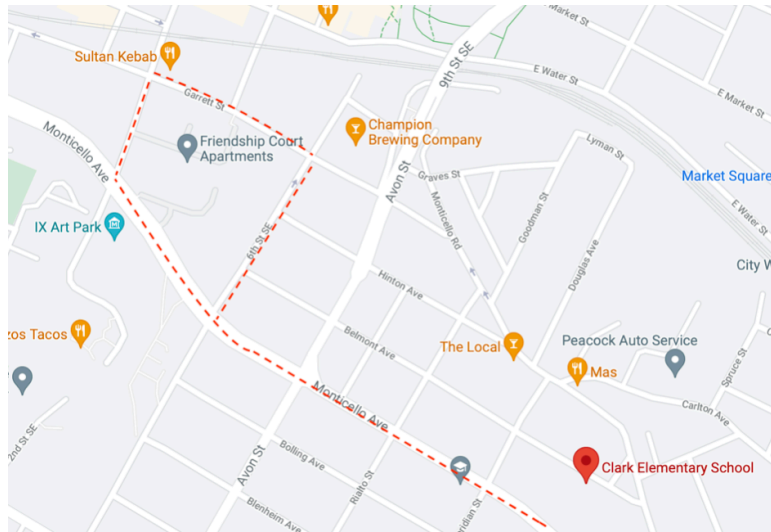


Figure 1: One observation route taken during a trip for field work (Created by Author)

The purpose of this research is to gain insight into what factors are important in determining if people will walk to school or not, and what data will need to be used in order to evaluate potential projects. The team will use this research to develop a prioritization approach that can then be applied to other schools in the city. The following characteristics have been identified as important for the final decision approach to have:

1. Transparent
 - a. Easy to understand results by a wide range of people
 - b. Clear documentation on how results were reached – sensitivity analysis gives insight into why one alternative is preferred over another
 - c. Engage community in process
2. Easy to implement and usable
 - a. Tool can be used with minimal training

- b. Tool is able to integrate well with the work that has already been done
- 3. Equitable
 - a. Tool doesn't bias in favor of communities that are more vocal or that have more accessible data
 - b. Intentional about addressing communities that are not vocal but have needs
- 4. Measurable
 - a. Tool quantitatively predicts how different projects will improve the areas that they are targeting
 - b. Metrics are applicable to projects that are considered frequently and would affect ratings
- 5. Adaptable
 - a. Tool can be updated as Charlottesville's needs change in the future

The final deliverable will be a working tool to be used with data that the city currently has or could easily gather, that will prioritize infrastructure improvement projects with the goal of making it easier and safer for families to engage in active modes of transportation to get to and from school.

Examining the History of Equity in Transportation Planning and Exploring How Equity is Currently Being Addressed in Common Planning Methods.

The technical topic of this capstone aims to provide a tool to help prioritize infrastructure that will make the schools in Charlottesville more walkable. However, in researching current tools and methods that are used for prioritization, it has become apparent that equity is a difficult factor to quantify. In a paper on the relationship between social inequality and transportation, Xiao and Wang (2017) define transportation disadvantage as “the barriers or limits on the

participation in daily socioeconomic and political life due to the reduced physical accessibility to services and opportunities” (pg. 29). They conclude that in the area studied, transportation disadvantage is most commonly seen in areas that are also “socioeconomically disadvantaged”. It should also be noted that in many cases when transportation infrastructure and policies are being considered, more weight is given to issues that are more easily quantifiable (Manaugh, 2015) . Such a decision is due to many reasons, but according to Manaugh, it is often because “there are... less tangible outcomes related to issues of social equity or exclusion” (pg. 4). This lack of quantifiability makes equity difficult to incorporate into plans relative to other metrics that have more clear cut measurables. Another issue that Luna (2015) brings to light when it comes to equity in planning is underrepresentation. In analyzing the Boston Regional metropolitan planning organization (MPO) Luna points out that “The subtext of underrepresentation for inner-city urban interests in transportation planning is that it might mean a bias against minority and low-income communities” (pg. 283).

While the issue of equity is quite nuanced, many approaches to planning and prioritization do attempt to include it as a factor. A key component of the planning process is the tool or method that will be used to prioritize how resources are allocated. One tool, the ActiveTrans Priority Tool, accounts for equity by allowing the user to enter data on percentages of the target population in poverty, without cars, of a certain age, etc. In this tool equity is one of several factors that the user can select and weight how they choose. There is also evidence of equity being addressed effectively in a cost benefit analysis (Martens, 2009). Another tool, the Infrastructure Prioritization Framework, developed by the World Bank, measures alternatives against two different composite indices, one of which is a combination of social-environmental factors (Marcelo, 2016). The figure below shows one visual display from the tool.

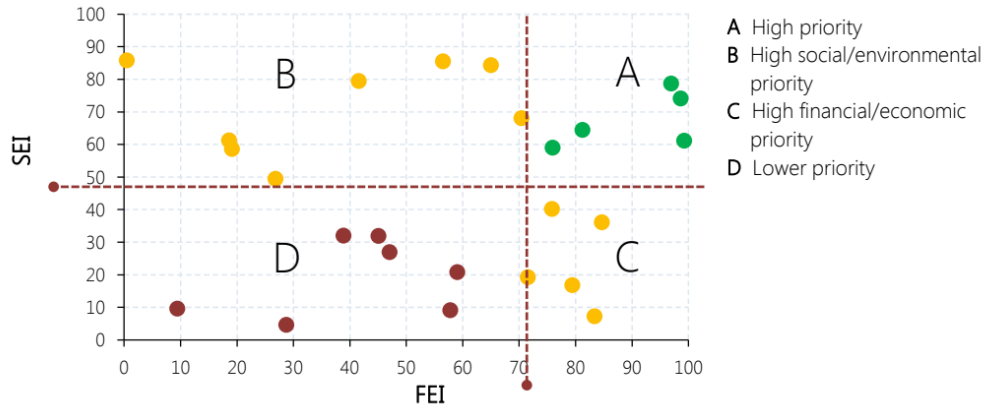


Figure 2: Example of the output generated by the Infrastructure Prioritization

Framework (Marcelo 2015, pg. 20)

The goal of this analysis is to understand how other approaches have handled equity, in order to better address this issue within the technical component of the project. By realizing the historical issues around planning and equity and researching how others have attempted to address these issues, I hope to draw conclusions that will help my team in developing a robust and fair tool for the city.

Intended Project Outcomes

The deliverable will be a prioritization tool that can be used to systematically improve the walkability of the schools in Charlottesville. I hope to better understand how equity plays a role in infrastructure improvement and integrate that knowledge in order to address the needs of everyone who is facing challenges getting to school. A prioritization tool will streamline the decision process, leading to faster and more effective improvements that will ultimately result in more people having walking/biking access to school. The deliverable of my STS research will be a set of recommendations for how the City can make the prioritization process more equitable, based on the review I have done of literature in this area. By educating myself on past

approaches to integrating equity into transportation planning and better understanding the historical context of equity in this realm, I will better be able to help my team create a tool that best serves the needs of all communities within Charlottesville.

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