CAN EDUCATION CREATE A PARADIGM SHIFT IN TRANSIT USE BY BUILDING LIFELONG LOYALTY AMONG YOUNG TRANSIT RIDERS?

by

MARSHA DALE ANDERSON BOMAR

(Under the Direction of Rosanna Rivero and Jack Crowley)

ABSTRACT

Transit ridership is dynamic, responding to operational levels, perceived service conditions, marketing campaigns, and environmental impacts, such as COVID-19. COVID-19 resulted in most agencies experiencing dramatic decreases in ridership and recovery has been very slow. Transit ridership faces significant competition from the automobile focus in the United States. This can be seen in the media and is perpetuated by driver education classes and the perceived status associated with obtaining a license. Recent generations have been delaying obtaining their drivers' licenses, which creates an opportunity for transit, however youth are not pivoting to transit in large numbers Transit agencies offer numerous short-term training opportunities, addressing high-level topics such as how to ride (board or alight); stay physically safe, particularly around rail transit; and read a schedule or map with the intention of attracting more riders but this has not been sufficient. This qualitative study was an exploration of opportunities to incorporate diverse information about transit into the high school education curriculum. The purpose was to make transit interesting and engaging while disseminating practical information to attract more riders and build loyalty to the mode.

The research questions explore how transit education can be embedded in curriculum to create a generations of transit users and build a culture of public transit ridership and what key policies are needed to support successfully developing transit loyalty. The study used a qualitative case study methodology involving semi-structured interviews with transit experts as well as educators and analysis of their input through categorization of their remarks to identify themes. The findings showed a systematic, productive methodology through embedded educational content to grow the understanding of transit and, therefore, its use as a viable transportation mode.

The interviewees indicated merit in the concept and presented ideas for content to fit existing education standards. They also expressed ways in which the high school curricula could meet academic knowledge and skills. The study also indicated supportive policy areas such as investments in sidewalks or streetlighting, necessary to address for transit to succeed. Without a well-functioning complete system, including access to transit, education is insufficient to achieve greater ridership.

The key finding indicates that the transit community and educators see great promise in this approach while also identifying the challenges to implementation.

INDEX WORDS: Transit, Education, Ridership, Curriculum, Transportation, Outreach, Marketing, Training, Programs, High school students, Policy

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By

MARSHA DALE ANDERSON BOMAR

BS, Polytechnic Institute of Brooklyn, 1973

MS, Polytechnic Institute of Brooklyn, 1975

MSE, Princeton University, 1978

MS, Princeton University, 1979

A Dissertation Submitted to the Graduate Faculty of The University of Georgia

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MARSHA DALE ANDERSON BOMAR

Major Professors:	Rosanna Rivero John Crowley
Committee:	Kathryn Roulston Umit Yilmaz

Electronic Version Approved:

Ron Walcott
Vice Provost for Graduate Education and Dean of the Graduate School
The University of Georgia
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DEDICATION

It has been a complex and challenging road to accomplish this lifelong dream. I am grateful to those who supported me in the earliest days, decades ago when the journey began. Life has been full and meaningful, but this dissertation and degree were always at the end of my rainbow. For those who traveled with me, I am filled with appreciation.

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Finally, I dedicate this to my Grands Anderson and Tristan. Among the many great examples you have in your lives, I hope that I inspire you not only to pursue but also to accomplish your dreams.

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I once heard someone say, "Transit is transactional."

I say, for the long term, it must be personal.

Be an influencer.

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CHAPTER 1

INTRODUCTION

Transit ridership in the United States has fluctuated based on internal transit agency factors, external factors, and a lack of connectivity with public policy. Stabilizing and consistently growing ridership is essential to plan, deliver, and enhance transit service, which will have a wide variety of social, environmental, economic, and other benefits. The purpose of this qualitative case study was to develop and adopt an educational framework needed to create transit loyalty in youth through a partnership of transit organizations and academic institutions.

The core research questions were:

- How can transit education be embedded in curriculum to create generations of transit users and build a culture of public transit ridership?
- What are the key policy areas needed to support successfully developing transit loyalty or culture?

There were two expected outcomes for this study. The first was an educational framework with transit-supportive tools and content based on the research results. Second, the findings could lead to developing a menu of potential collaboration efforts with local governments, quasi-governmental entities (such as public improvement districts [PIDs]), or business partners that support or enhance the likelihood of success of the ridership growth initiative.

The significance of this work was to fill a gap evident in the literature and amplify participation in the industry. Ridership researchers have focused on operations, level of

service provided, short-term marketing efforts, and work commutes. There is a body of work related to high school outreach for workforce development but no counterpart for ridership growth. Numerous resources and programs exist to encourage driver education and licensure but not transit usage. Transport modes generally include walking, rolling (e.g., bicycle, scooter), transit (e.g., bus, rail, streetcar, light rail), transportation network companies (e.g., Lyft, Uber), and private automobiles. Only the automobile industry has a broad focus on training.

Research[1] shows that young riders stay as transit riders longer than those who start using public transit when they are older. Developing and deploying an educational framework could help transit become more culturally embedded, a part of everyday conversation and an individual's ongoing decision process. This exploration of modules that could support this educational concept spanned subject areas, including math, language arts, geography, health education, finance, and environmental studies. Transit systems could benefit from a stronger foundation of riders based on relationships and loyalty.

Transit is a combination of services historically centered around bus and rail operations. Individuals use bus systems primarily for local trips and rail connectivity for longer journeys. Newer modes of transit, including arterial and bus rapid transit, modern streetcar, light rail, and high-speed rail, follow the fundamental service principles to move many people along designated routes. Historically restricted to mobility-limited passengers, transit systems' on-demand services are under piloting for all users. With the

[1] Anne E. Brown et al., "A Taste for Transit? Analyzing Public Transit Use Trends Among Youth," *Journal of Public Transportation* 19, no. 1 (2016): 49–67, https://doi.org/10.5038/2375-0901.19.1.4.

competition from ride-hailing companies like Uber or Lyft and other mobility tools, transit agency administrators are exploring how to move people differently. In the future, the widespread use of self-driving cars will create another competitive alternative.

Some transit users lack a personal vehicle or mode of transportation; some are carless by choice, and others due to financial inability. When individuals delay licensure, sometimes into their twenties, they defer car ownership. As the environment and sustainability become more frequent in the public discourse, transit may become a more frequent mode of choice. There is increasing emphasis on transit-oriented development (TOD), creating more live-and-work options around transit stations and corridors.

Historically, transit routes centered around home-based work trip patterns during limited peak hours. There was less consideration in the service planning for chained trips, such as taking children to daycare or visiting the doctor. Although traditional work trips remain important, albeit with changes in frequency post–COVID-19, developers should consider other types of trips and other times to improve transit use. Despite population growth and marketing campaigns to encourage transit use, ridership continues to decline.[2] See Figure 1.

[2] APTA, *Fact Book 2021*, American Public Transit Association, 2021.

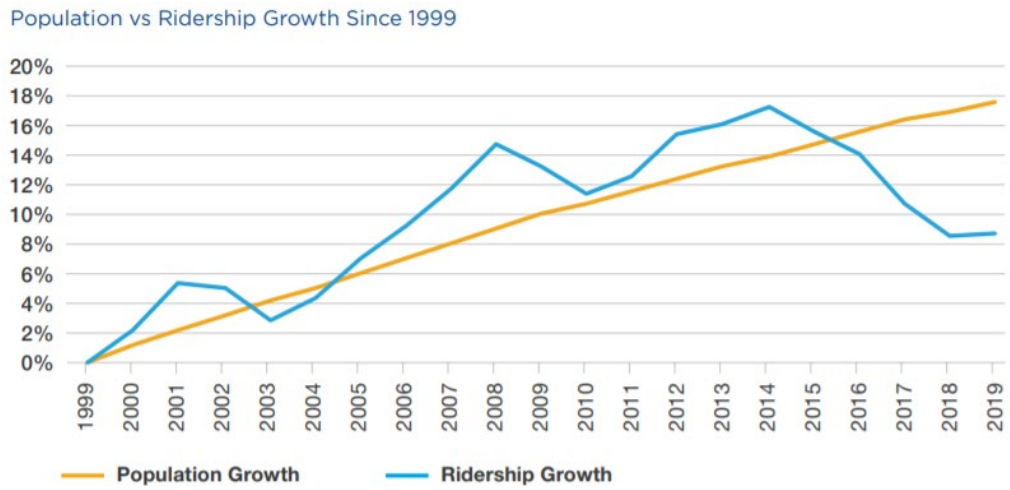

Figure 1. Transit ridership growth fluctuates with population growth. From APTA Fact Book Analysis and United States Census Bureau.

The onset of COVID-19, the increasing cases of infection,[3] and a quick pivot to telework dramatically impacted ridership numbers across all transit agencies in the United States. As telecommuting arrangements persist, returning to pre-pandemic numbers may take time or never occur, despite continued population growth, additional service and outreach continuing or expanding as compared to what they were before March 2020. See Figure 2.

[3] Centers for Disease Control and Prevention, "COVID-19 Cases: U.S. State Trends" (2021).

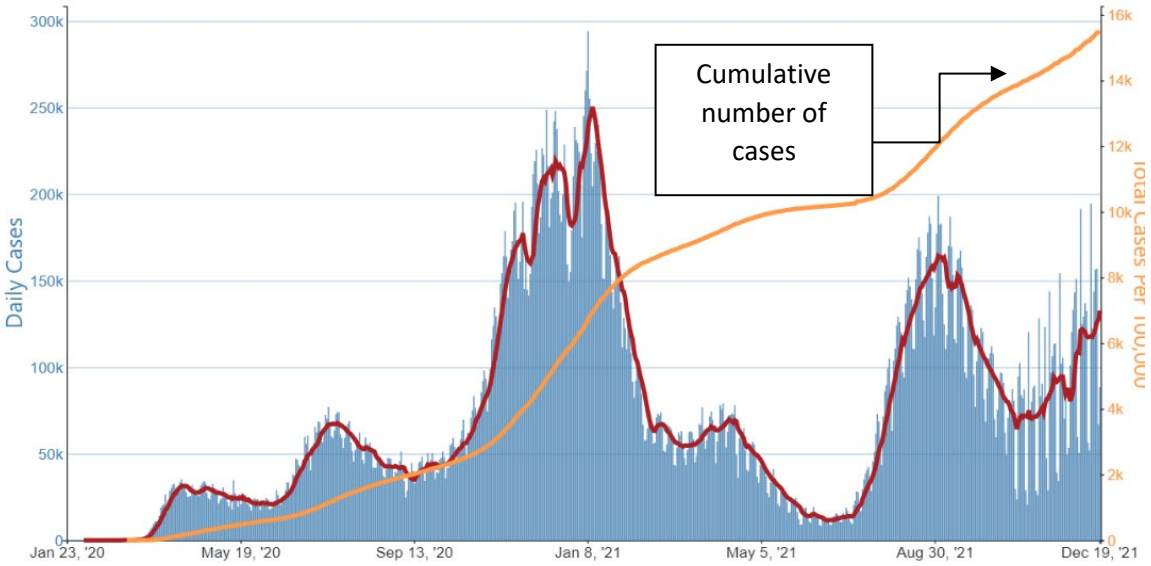

Figure 2. Daily trends in number of cases and cumulative incidence rate of COVID-19 cases in the United States. Reported by the Centers for Disease Control and Prevention per 100,000 population.

Some modes of transit are recovering more quickly than others. Transit ridership is the slowest to show signs of recovery. See Figure 3.[4]

[4] Bureau of Transportation Statistics, "The Week in Transportation," December 2021, https://www.bts.gov/covid-19/week-in-transportation.

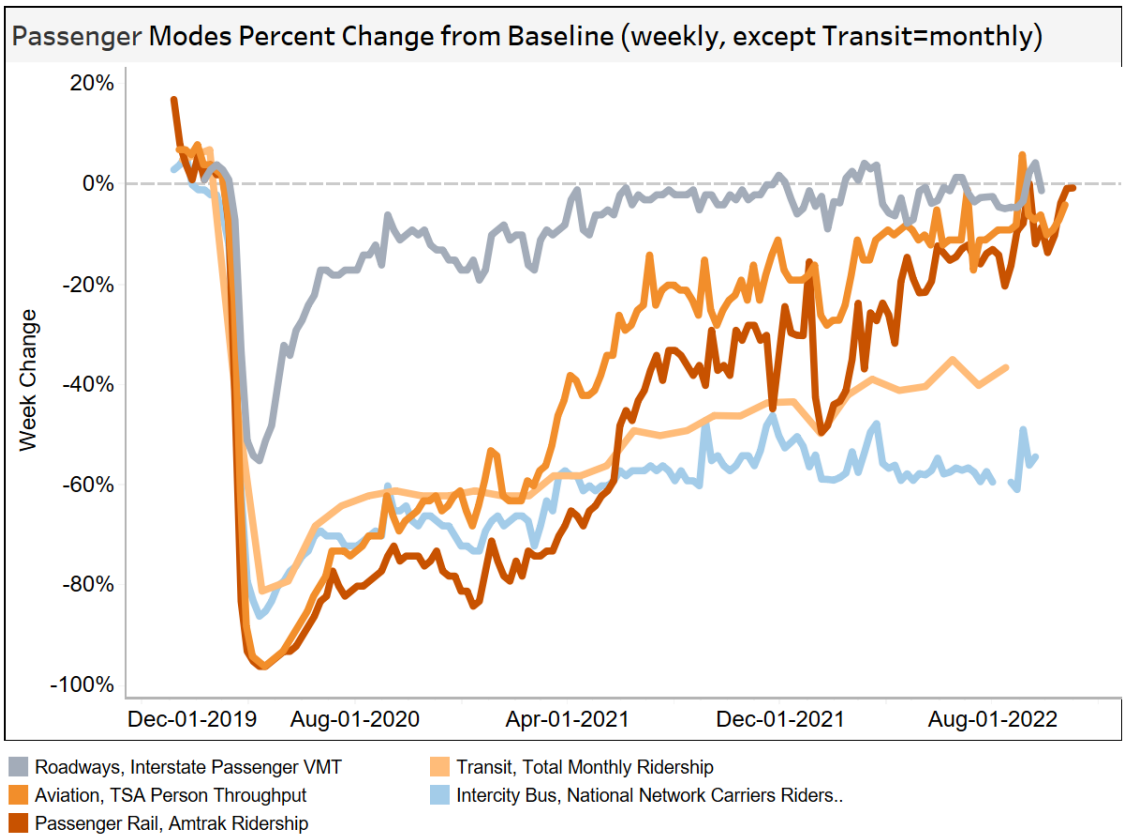

Figure 3. Passenger modes percent changes from baseline. Weekly, except transit = monthly.

The purpose of this qualitative case study was to develop and recommend an educational framework needed to create transit loyalty in youth through a partnership of transit organizations and academic institutions. The aim was to determine comprehensive programmatic steps to create a culture where transit is a mode of choice over a traveler's lifetime and where public policy addresses the elements within that realm that support success.

Like roadway planning, transit systems and structure development have focused on peak demand and work commutes. The typical radial highway and transit patterns are a legacy from the suburbs-to-downtown trips that have dominated for years. Although

this purpose remains important, commute patterns have become more complex, including trip-chaining for multiple purposes. The ability to grow ridership requires recognizing the wide variety of trips that could involve transit, the non-radial nature of many of those trips, the time of day, and the need for adequate quantity and quality of service to address those trips. Ridership growth also requires a transit mindset.

Transit agency administrators seek to increase ridership, allowing for expansion and service enhancements. These improvements, in turn, would attract more riders, providing more certainty for future investment. The challenge has been to consistently attract new riders to provide this growth opportunity.

It is essential to understand the motivation behind targeting youth, particularly high school-aged students. The following elements represent some of the key factors:

- Young riders are curious, educatable, and enthusiastic.
- Young riders often like digital and other kinds of games and prizes.
- Young riders like to be part of group activities.
- Young people are becoming independent and making their own choices.
- Young people may not have access to an automobile or driver's license or choose to delay obtaining them.
- Young people have not fully formed their preferences and may be more open to transportation and housing choices.

It is important to note that not all young people are digital natives or have access to technology tools, which requires consideration.

Transit agency leaders could develop and implement public policies to support educational messaging and increase ridership. The policies could address equity and

inclusion, environment, climate change, electrification, automation, and sustainability. As a result, there could be more corridors that are pleasant and enjoyable to travel, widespread sidewalk and bicycle lane programs, and streetlight improvements. A successful marketing program could lead to more transit-oriented development.

To inform the research questions, this study was an exploration of a long-term, programmatic reimagination of attracting and retaining lifetime transit riders. Proper positioning could place transit as a key factor in many important decisions, including the following:

- Where am I going to school, and is there a way to use transit? Will I need to choose another place to live to be able to use transit while I am in school?
- Do I search transit-accessible locations when seeking employment?
- When I choose a place to live, should I research the availability of transit within walking distance?
- Am I making housing decisions based on transit availability?
- Are there shopping opportunities within walking distance or accessible by transit?
- Should I buy a car or use another method of transportation (e.g., rental, transportation network company) when transit is not accessible?

Short-term, single-purpose efforts to grow ridership have not produced long-term, sustainable ridership gains. Even when youth transit use is high, the frequency of use diminishes over time. Thus, it was vital to determine what other education or policy changes could reverse that pattern.

Schools began promoting seat belt use in the 1980s. As a result, youth urged their parents to use seat belts, and a quiet revolution occurred. Seat belt use increased from 50–60 percent in the 1970s to more than 90 percent in 2010, as reported in the National Highway Traffic Safety Administration's annual reports on seat belt use.[5] The power of young people to be influencers could be a significant component in determining how to transform their decision-making to become part of the transit culture.

In 1976, Peter Finn made the case for incorporating the discussion of transit into classroom education,[6] and after a long absence in the educational discourse, a pilot was conducted in 1999.[7] by a researcher at the Texas Transportation Institute. The salient points included environment, energy, crashes, congestion, sociological imbalance and others that remain relevant today. Education on the importance of transit focused on youth becoming advocates for the common good, investment in extensive mass transit, and political action to encourage the adequate funding and growth of transit. Another suggestion was to refute the stereotypes associated with transit use. Transit as a career was an additional topic and tool for engagement.

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[5] U.S. Department of Transportation, "Seat Belt Use in 2010—Use Rates in the States and Territories," 2011, https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/811493.

[6] Peter Finn, "Transportation Education and the Social Studies," in *The Social Studies*, 1976, 128–31.

[7] B. T. Kuhn, "Transportation Education and Outreach Pilot Program Targeting Students in Grades K–12." (Texas Transportation Institute, The Texas A&M University System, College Station, Texas, 1999).

Transit and the Public Good

Infrastructure and policies do not always align with the best interests of public transportation officials. There should be a perception of transit systems as an asset to maximize among communities fortunate to have a system in place. Transit can be impactful as part of economic development, increasing the value of land around the transit system. The long-term value of fixed route systems, such as rail lines, streetcars, bus rapid transit (BRTs), light rail transit (LRTs), and others, should be a priority in policymaking. Atlanta zoning ordinances include a special allowance for rail transit corridors, with the areas near rail stations designated as special public interest (SPI) districts. Table 1 shows the parking requirements for a typical SPI district.

Table 1. City of Atlanta zoning ordinance – Parking requirements.

	Parking spaces		
	Minimum	**Maximum**	
		Within parking limitation district	**Not within parking limitation district**
Residential dwellings/lodgings			
Hotels and motels (spaces per lodging unit)	None	1.0	1.5
Residential dwelling			
• Per each one-bedroom unit	None	1.25	1.5
• Per each two-or-more-bedroom unit		2.25	2.5
Nonresidential uses (spaces per 1,000 sq. ft. of floor area			
Eating and drinking establishments	None or 1.5*	2.5	3.0
Commercial/retail (not eating and drinking establishments)	None	2.5	3.0
Institutional	None	2.5	3.0
Office	None	2.5	3.0
Recreation/entertainment	None	1.5	2.5

As shown in Table 1, there are no minimum parking requirements in SPI districts, and the required maximums are less than in non-SPI district areas. Atlanta has a commendable example of a transit-supportive public zoning policy. In obtaining project financing, however, developers are more likely to focus on perceived parking supply needs as well as banking requirements and rarely take advantage of the minimum opportunity. Other community leaders have implemented policies with reduced parking requirements. For example, officials in Portland, Oregon, manage and limit off-street parking, supporting the public transit system's continued development and use. Other communities, such as those in the following list, have parking maximums for transit-accessible neighborhoods.

- Charlotte, North Carolina, Code of Ordinances, Zoning, § 9.1208 (6) (2018) – sets parking minimums and maximums in transit-oriented districts only.
- Flagstaff, Arizona, Zoning Code § 10-50.80.040 (C) (1) (2018) – sets a maximum amount of parking at five percent higher than the minimum.
- Vancouver, Canada, Parking Bylaws § 4 (2019) – implements conventional parking maximums as wells as a total parking cap in the downtown area.
- Denver, Colorado, Municipal Code § 30-50 (2018) – requires developer to ask special permission to include parking above the parking minimum.
- New Haven, Connecticut, Zoning Ordinances § 45 (8) (D) (2018) – provides for a parking maximum in mixed-use districts of three spaces per 1,000 square feet.
- Burlington, Massachusetts, Zoning Bylaw §§ 7.2.4, 7.2.5 (2015) – sets both parking minimums and maximums for various types of developments.

- Knoxville, Tennessee, Zoning Regulations Art. 5 § 7 (D) (2018) – creates parking minimums and maximums with exceptions from the department of engineering.
- New York, New York, Zoning Resolution Art. 2 Ch. 5 (2018) – creates parking maximums, no minimum requirements for specific buildings.

Public Sector Opportunities to Support Transit

This study was also an exploration of the barriers to success in attracting and retaining riders. An often-cited obstacle to attracting riders is the condition of transit access. For example, sidewalks may be in poor condition, too close to high-speed traffic, or nonexistent. An example of funding for these improvements could be a local-option sales tax dedicated to sidewalk infrastructure, including ADA accessibility. Also helpful would be a programmatic approach to enable children to walk or bicycle to school. One such program is the Safe Routes to School program,[8] which could be a model for transit, such as Safe Routes to Transit.

Transit agency administrators plan lines and stops; municipal, county, and state agency leaders plan roads and sidewalks. Support for transit involves the intersection of these plans and funding to support the development of non-automobile transportation. There is an opportunity for new public policy and local and state government and transit agency partnerships to increase ridership.

[8] "US DOT Safe Routes to School Programs" (US Department of Transportation, 2023), https://www.transportation.gov/mission/health/Safe-Routes-to-School-Programs; "Safe Routes to Transit (SR2T) Program in California," *Transportation Research Record* 2534 (n.d.): 92–100.

Community improvement districts (also called business or public improvement districts, CID/BID/PID) have the power to tax and build within their defined boundaries. They can also leverage their member companies to benefit transit through discounted passes or free service. Pre–COVID-19, Atlanta's Buckhead Community Improvement District offered a free shuttle service (The Buc) to take people who worked or shopped in the area to the nearest MARTA rail station. Texas PIDs allow property owners in a defined geographic area to create a funding stream for local improvements, which may include transit supportive features.

The purpose of TODs was to provide housing and jobs near rail transit services. The synergy created by the proximity to transit seemed clear, but the number of transit riders generated by TODs was low. Pre-pandemic, the staff of an Atlanta improvement district (Central Atlanta Progress) proposed a project to the Urban Land Institute Leadership program called "Putting the T back in TOD." Although the study did not occur, its proposal highlights an important issue.

Private investors who do land development recognize the value of fixed guideway transit. In many cities, identifying the location of heavy rail lines tracks the line of high-density construction. See Figure 4 for an example.

Figure 4. City view of Toronto – Density developed along rail corridor.

Tax increment financing and tax allocation districts are tools to finance infrastructure and other developments in areas considered blighted or needing revitalization. After legislators define an area, they set the current revenues collected as a baseline. As investments in infrastructure or new vertical construction occur and property values increase, the taxes collected above the baseline are available for further investment in the defined area. The future anticipated collections could serve as a basis for bond financing or other innovative methods to accelerate the investment and, therefore, the collection of additional tax dollars.

In Duluth, Georgia, city leaders used the Tax Allocation District tools and Payments in Lieu of Taxes bonds to develop downtown, including parking decks, high-density residential areas, a commercial town center, and a hotel. These efforts accelerated development over traditional methodologies by three to five years. The result was

approximately $25 million in future revenues against which the city has sold bonds to advance other infrastructure projects. The county in which Duluth is located developed a comprehensive transit plan and because of the density and activity in Duluth's downtown. That plan now includes transit service for both local connectivity and regional transit access.

Efforts to build the population and activity density needed to support transit are happening in many places and in many forms. The focus needs to shift to systematically building ridership.

Structure of this Dissertation

Chapter 2 provides a summary of the early research that was conducted which inspired the topic and framework for the study conducted for this inquiry. An in-depth literature review, presented in Chapter 3, demonstrates that the high school timeframe is key in forming lifelong behaviors. It also provides the extensive background of efforts that have been made on the operational side to influence mode choices. Finally, it examines recent areas of related curriculum development.

Chapter 4 presents the study methodology while chapter 5 summarizes the case study approach. In Chapter 6 the findings from the interviews are developed and Chapter 7 frames the recommendations for educational content and delivery. Finally, Chapter 8 presents the author's conclusions.

CHAPTER 2

INITIAL TRANSIT-RELATED CONTENT IDENTIFIED TO SUPPORT RESEARCH TOPIC

Some transit agency and organization leaders have addressed educational outreach and developed programs or materials for students. Chapter 2 includes a cross-section of the content identified through web searches and traditional literature reviews. Many of the presented materials have received prior use, and some remain in place. Some of the outreach programs, particularly those aimed at a young (elementary) audience, are for individuals to discover and use independently.

A topic discussed in this chapter is the implementation and outcomes of educational programs for the Dallas Area Rapid Transit (DART) system. Although some programs are accessible through the DART website (see Figure 5), staff interviews presented other documentation and insights. The fifth-grade curriculum is a promising element woven into other study areas, including reading, math, and science.

Figure 5. DART Jeopardy.

The following section is a list of outreach programs and activities used by transit agencies throughout the United States. The programs provide general information on safety and the "how-to" of using transit. These were identified by extensive online searches, outreach to agencies and conversations with industry representatives.

General Categories of Programs Currently Offered by Some Transit Agencies

- School presentations in the classroom and on the bus
- Programs designed for elementary (K–5), middle (Grades 6–8), and high school (Grades 9–12) students
- Independent activities, such as coloring and activity books, activity pages, worksheets, and puzzles
- Transit safety information (e.g., handouts and brochures)
- Online activities and reading
- Informational videos and DVDs – any age
- Informational tables and attendance at youth-oriented public events
- Free or discounted transportation services to students (e.g., to the library)

- Teacher-directed structured activities for students
- Assistance with school field trips and trip planning
- Posters and poster contests
- Slide shows or PowerPoint presentations – any age
- Facility tours highlighting topics such as operations, maintenance, bus washes, and more
- Art contests (e.g., design a bus wrap, bus message board, cardboard or foam buses and trains)
- Speaker's bureau available to discuss transit-related topics
- Essay contests
- Programs providing transportation to economically disadvantaged youth.

The material identified is largely intended to be delivered one time, many are for a day or less in duration. Many are special event focused and few provide an on-going flow of information or activity.

Issues Addressed by Program

The programs identified above cover a wide range of subjects related to transit. The lists below present the major topical areas and examples of the content within that area.

Transit Safety

- Stand back from the curb until the bus stops.
- Do not stand until the bus has come to a complete stop.
- Always keep your head, hands, and arms inside the bus.
- Stand back from the curb as the bus pulls away.

- Look both ways before crossing the street.
- Never walk in front of a bus.

Transit-Riding Process and Procedures

- Plan your trip by reviewing the schedule
- Wait for the bus at bus stop signs
- Arrive at the bus stop five minutes early
- Read the sign above the front windshield to make sure you board the right bus.
- Enter at the front of the bus.
- Take the correct change for the fare; the bus driver cannot make change.
- Have a pass or money ready when you board.
- Save the front seats for people with special needs.
- Stay seated when the bus is moving.
- Pull the cord once to let the driver know you want to get off at the next stop.
- Exit at the rear of the bus.
- Use common sense and good manners.
- No littering.
- No running or fighting.
- No food or drink.
- No loud talking.
- No playing music without headphones.

Environmental Issues

- Riding transit helps to prevent air pollution (e.g., smog, acid rain) and improve air quality.

- Transportation alternatives to single-occupant vehicles to reduce traffic congestion.

Transit campaigns have generally been paper-based, with limited online, web-based information and activities. Current video games are action-packed, crisis-type bus or train activities or simulators, like learning how to drive a bus. Some games are more thrill-seeking adventures that promote dangerous and bad behaviors like subway car surfing and jumping between platforms. See Figure 6 for some of the more informational video game examples.

Figure 6. Video games featuring a transit component. Source: YouTube.[9]

Although existing materials are fun and may be good building blocks, they are insufficient to develop a lifelong commitment to transit.

Tools in Practice

In a search for "transit" on YouTube, the top video related to transit use is "Why American Transit Is So Bad to Use," which focuses on route planning that does not respond to demand. Modifying the search to "transit education" returns a wide variety of videos about how to use certain aspects of transit (e.g., maps, fare systems) and news stories about programs to teach kids to get out and ride.[10] If one wanted to incorporate transit into any curriculum, there would be few supportive tools readily available.

[9] Snakeybus. "Trailer." YouTube. Educational video, April 3, 2020. 0:55. https://www.youtube.com/watch?v=3a2Ru1d5YCc.

[10] AM 1240 WJON, "Kids Get Lesson on Public Transit through Metro Bus," 2017.

Transit agency marketing personnel have posted many videos about their systems, mainly to provide information about current services or events. In some cases, the videos are means to celebrate aspects of agency systems, events, or team members. Other videos readily available on YouTube for children of all ages focus on teaching about types of transportation, including all the different modes that are part of transit. See Figure 7.

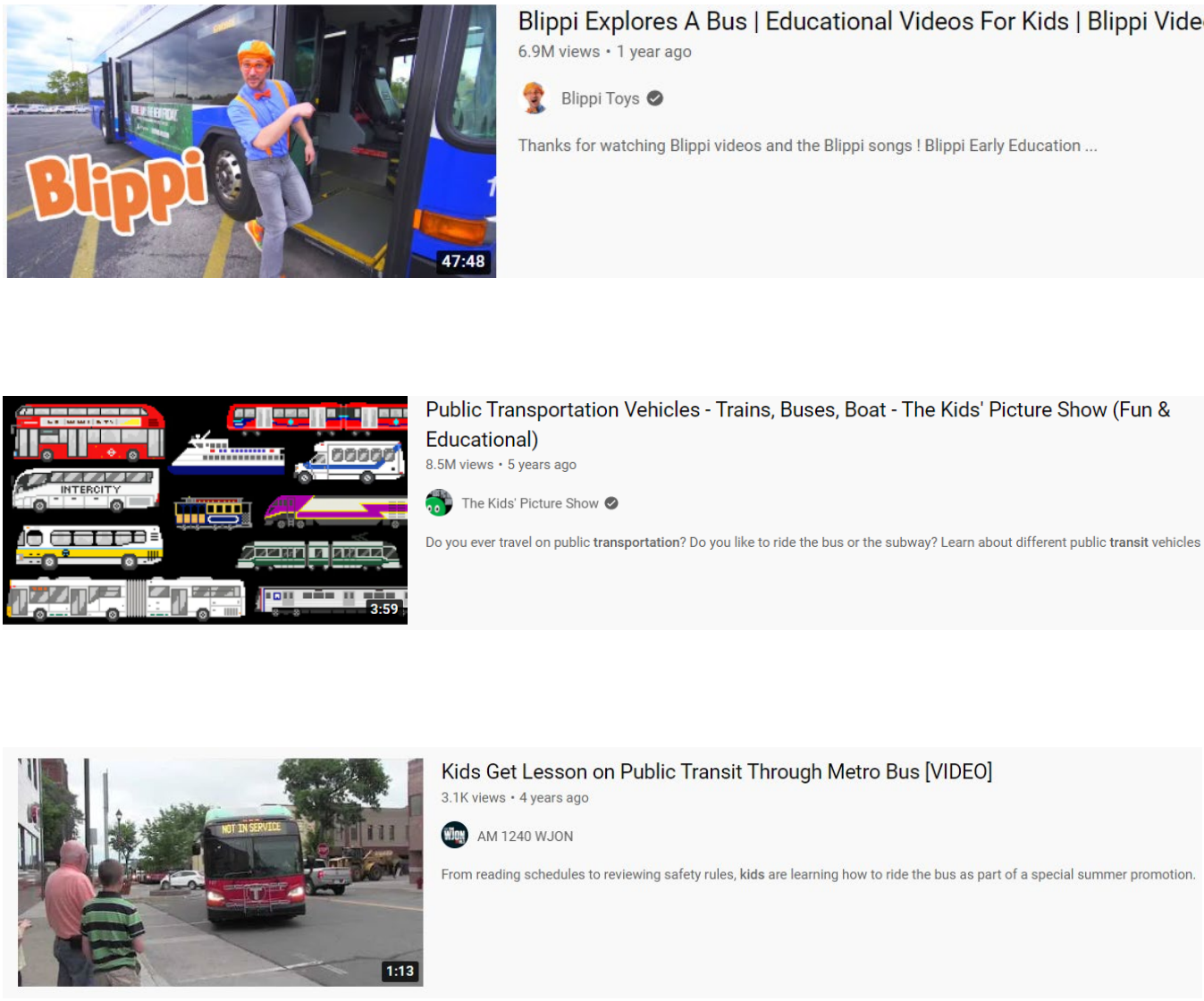

Figure 7. Sample of transit educational videos on YouTube.

Educational programs, such as St. Cloud, Minnesota's summer program,[11] also use videos. St. Cloud transit agency leaders distribute free passes to youth 17 or younger and offer training on how to ride transit.

[11] MN; "Learn to Ride - Free Summer Youth Program" (St. Cloud Transit Commission Metro Bus, n.d.), https://ridemetrobus.com/ugofree/.

Other transit agencies have various activities (paused for COVID-19) to attract children's and young people's attention and create better-educated riders. Most of the following information came from transit agency websites and marketing departments. Confirmatory material came from the work of other researchers.[12]

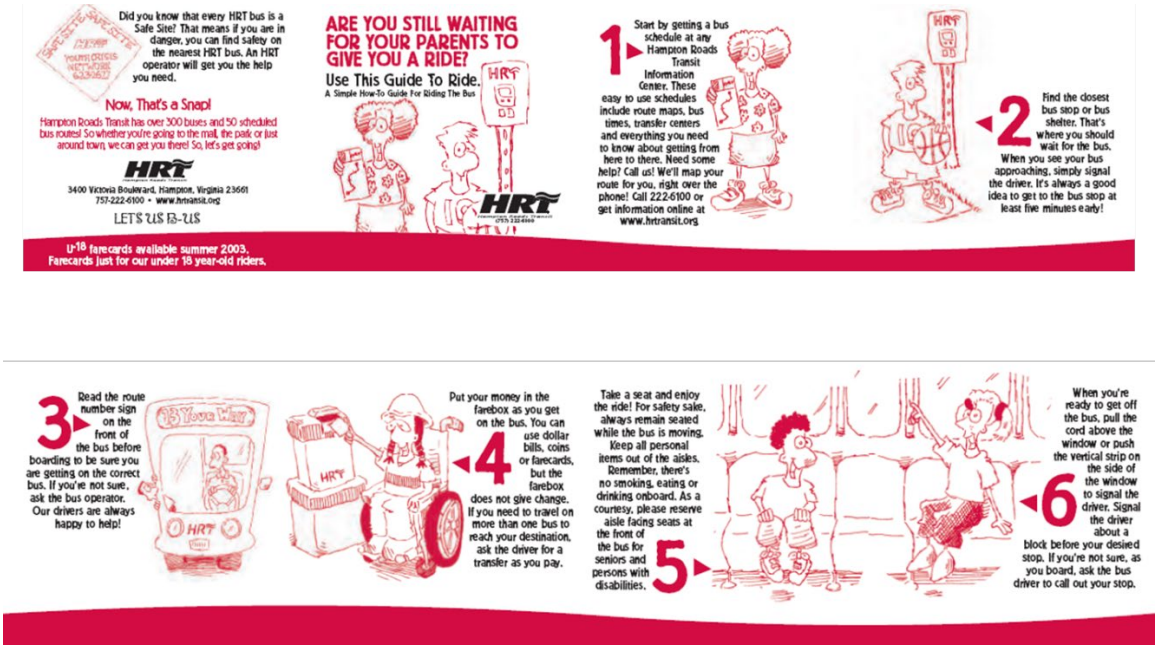

Figure 8. Hampton Roads transit educational material.

Marketing personnel at Valley Metro in Phoenix, Arizona, have used a coloring book as a teaching tool for decades and recently added a YouTube video.[13] Westchester,

[12] Mischa Wanek-Libman, "A List of Transit Themed Activities for Working Parents and Bored Kids, *Mass Transit*, April 8, 2020; DART, "On the GO! Transit Education," 2021, https://www.dart.org/transiteducation/curriculum.asp; AM 1240 WJON, "Kids Get Lesson on Public Transit through Metro Bus"; Valley Metro, "Valley Metro Fun," 2021, https://www.valleymetro.org/transit-education/valley-metro-fun; Valley Metro, "Valley Metro Is My Ride," 2014.

[13] Ibid.

New York, transit authorities created a 40-minute program focused on rider skills, safety, and the environmental benefits of transit. See Figure 9.

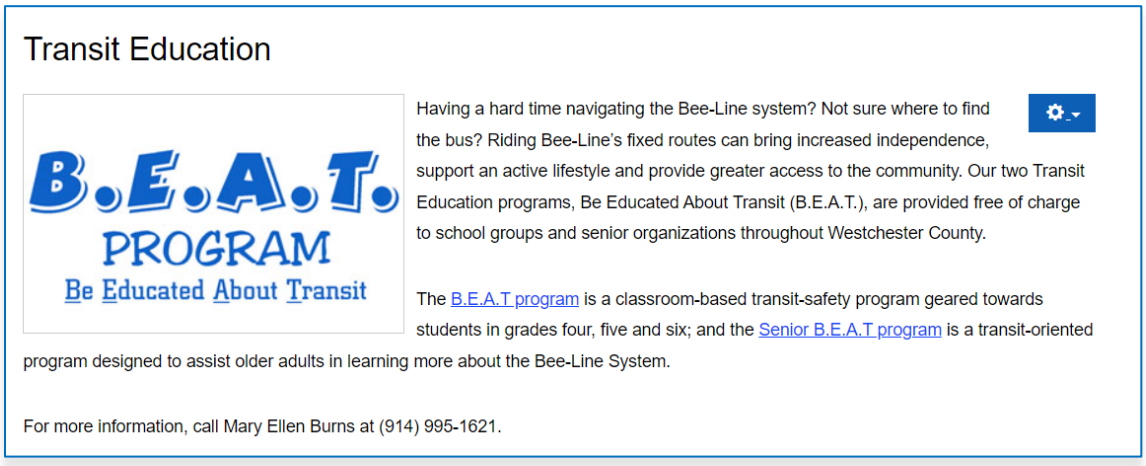

Figure 9. Bee-Line Transit (Westchester County, New York) safety program.

Types of Materials Currently Utilized

Emerging from the review of the identified programs is an array of the types of materials used for current programs. They include videos, audio recordings, activity and coloring books, comic books, scripts for interactive plays, brochures, board games, learner kits, safety posters., bookmarks, cardboard bus banks and curriculum guides.

Although the identified materials are good resources, they primarily target young children, and there is limited content for young adults. Operation Lifesaver is the most frequently used resource among schools within a set distance of a heavy rail line and only addresses safety issues around a rail line. The identified tools and work focus mainly on marketing current services and basic how-to-ride topics; very little material contributes to the overall decision-making process that could lead to ridership loyalty. The majority of

materials are one-time, one-use efforts and are insufficient to compete with the extensive array of materials about cars and driving that are prolific in the media, classrooms, and society.

CHAPTER 3

LITERATURE REVIEW

The existing scholarly literature on transit focuses primarily on ridership, concentrating on operational aspects of service and allied infrastructure. Researchers have conducted data-driven, quantitative analyses of historical trends and, in some cases, suggest future conditions. There are few examples of strategies to influence the behavioral aspects of individuals' choice of transportation. Little content emerged as part of a comprehensive educational approach.

Historical Perspective of Baselining Transit Ridership and Growth Opportunities

The Transportation Research Board, the educational component of the National Academies of Sciences, Engineering, and Medicine, includes the Federal Transit Administration-sponsored Transit Cooperation Research Program. The passage of the Intermodal Surface Transportation Efficiency Act in 1991 led to the Program's founding. Collectively, leaders of the Transportation Research Board and the Transit Development Corporation, an educational arm of the American Public Transportation Association (APTA), recognized a need to solve many problems associated with the successful implementation of public transportation.

One of the collaboration's early projects[14] laid a foundation for the state of the transit market. The study author outlined transit demographics, including sex, race/ethnicity, vehicle ownership, age, education, household income, immigration status,

[14] Sandra Rosenbloom, *Transit Markets of the Future: The Challenge of Change*, Transit Cooperative Research Program, 1998.

and years in the United States. Providing valuable information on likely transit users, the deliverable showed that ridership was highly work-focused, with strong participation by individuals aged seventeen to nineteen, women, minorities, and immigrants in the United States for fewer than ten years. Although the United States Census Bureau data presented in the study was similar, notable differences included more college-educated riders and immigrants independent of time in the country. An important consideration is that most analyses cited in the work were related to work trips and primarily represented the peak period usage for most systems, corresponding to roadway peak traffic periods.

Rosenbloom[15] conducted a qualitative assessment of different societal trends and how they might impact ridership in each of the market segments. The researcher looked at trends such as work-at-home, women's employment and service sector growth, suburbanization and different household makeups, population and employment density, federal funding, transportation control measures, service to people with disabilities, changes in household responsibilities, and perceptions of crime. Table 2 shows the overall effect of societal trends on transit ridership. (Note that environmental considerations were not a specific part of the study.)

[15] Rosenbloom, *Transit Markers*.

Table 2. Overall effect of societal trends on transit ridership.[16]

Major societal trends	Positive		Negative	
	Increase of absolute ridership	**Increase in market share**	**Decrease in absolute ridership**	**Decrease in market war**
Economic				
Industrial restructuring		x	x	
Flexible labor forces			x	x
Work-at-home/telecommuting			x	x
Women's increasing labor force participation	x			x
Growth of service sector employment	x			x
Demographic				
Aging population	x			x
Single-adult households	x			x
Increased suburbanization			x	x
Internal migration			x	x
External migration	x		x	x
Land use				
Decreasing population density	x			x
Decreasing employment density			x	x
Increasing downtown employment density	x	x		
Increasing density in older suburbs	x	x		
Social				
Family support relationships			x	x
Household responsibilities			x	x
Perception of crime			x	x
Transportation policy				
Decreasing federal funding			x	x
Relaxation of transportation control mandates			x	x
Service to people with disabilities	x	x		
Division of highway funding	x	x		

[16] Rosenbloom, *Transit Markets*.

Rosenbloom[17] looked at concepts to increase ridership, including faster, more direct service; more convenient, cheaper, and support options like guaranteed-ride-home; park-and-ride facilities; concierge services; marketing; and joint development. The researcher then assessed the options for the likelihood of increasing ridership. Only two new traveler markets with moderate impact on ridership emerged: school children and non-work trip-makers. The disaggregation of the transit rider market was a new concept at the time of the study, as was the idea of creating options to fit the different markets. The results suggested more data-driven assessments of riders and non-riders, with the idea of creating services that suit each market.

A survey of transit agencies that successfully increased ridership in the 1990s[18] showed that mainly service-related, internal performance factors helped maintain and attract riders. External factors, such as population growth and traffic congestion, were not specific considerations in this study.

Two internal factors, marketing and informational efforts, as well as the external factors of partnership and community collaborations outside of the provision of service, are addressed in the proposed study. Marketing primarily entailed traditional advertising, although a few transit agency campaigns addressed segmented markets. The ridership impact was subjectively ranked, and reports of the specific outreach programs indicated they were somewhat to very effective.

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[17] Rosenbloom, *Transit Markers*.

[18] Daniel Hess et al., "Increasing Transit Ridership: A Survey of Successful Transit Systems in the 1990s," *Journal of Public Transportation* 5, no. 3 (2002): 33–66, https://doi.org/10.5038/2375-0901.5.3.3.

The reported partnerships (employer, university, local government, and social services) addressed targeted needs. Only a few studies indicated that the partners provided or facilitated additional funding. The studies occurred early in the federal Welfare-to-Work programs, so many programs benefitted from new workers' transportation needs. External factors—such as employment growth, cost of driving, cost of parking, and congestion—contributed to ridership growth but were outside the transit agencies' control. Rising parking costs were more impactful than many internal changes, including service increases or fare reductions.

In their compilation of publications citing youth and public transportation, Reed and Marchbank[19] found several sources that mentioned education in schools as a gap. The researchers recommended that transit authorities engage young people to educate other young people. In addition, Reed and Marchbank suggested developing curriculum in partnership with young people so the messages resonate with them.

Demand and Access as Influencers

In a study of work trips, Mojdeh Azad et al.[20] examined the trends for using public transport by bus. The results showed declining rates through 2019, largely due to the increase in employees working from home. In the American Community Survey,[21]

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[19] Kathleen Reed and Jennifer Marchbank, "Youth and Public Transit: A Knowledge Synthesis of Recent Publications," December 2021.

[20] Mojdeh Azad et al., "Walk-to-Transit Demand Estimation Methods Applied at the Parcel Level to Improve Pedestrian Infrastructure Investment," *Journal of Transport Geography* 92 (2021), https://doi.org/10.1016/j.jtrangeo.2021.103019.

[21] "American Community Survey," 2019, https://data.census.gov/cedsci/table?q=atlanta census block group demographics&tid=ACSDP5Y2019.DP05.

the work-from-home percentage grew to 5.72 percent in 2019, with transit falling to 4.96 percent after a long growth period, a reduction similar to the 2010 level of 4.94 percent.

Researchers have conducted a variety of analyses and developed indices to measure the accessibility of transit, introducing the idea that transit does matter in transportation planning.[22] This accessibility concept addresses modes other than the automobile popularized in other measures beyond the public-sector planning framework, including Walk Score and Transit Score (See Figure 10).[23] Also applicable to the real estate market, Walk Score and Transit Score have led to pedestrian amenities, transit accessibility, and increased property values. The measures are primarily quantitative and focused on distances; the focus on the quality of walking environments is minimal.

[22] Todd Litman, "From Mobility to Accessibility Based Planning: Implications for Public Transit" (paper, Institute of Transportation Engineers Annual Meeting, September 26, 2021).

[23] K. Meghan Wieters et al., "Walk Score® Data for Planning & Research," *Journal of Transport Geography* 6, no. 1 (2015): 110–22; Walk Score®, "Transit Score Supported Cities," n.d., https://www.walkscore.com/transit-score-methodology.shtml.

Transit Score®	Description
90–100	**Rider's Paradise** World-class public transportation.
70–89	**Excellent Transit** Transit is convenient for most trips.
50–69	**Good Transit** Many nearby public transportation options.
25–49	**Some Transit** A few nearby public transportation options.
0–24	**Minimal Transit** It is possible to get on a bus.

Figure 10. Transit score definitions.

Figure 11 shows the application of the transit score at the regional level. Local and commuter routes are included in the calculation and depiction of the transit score. Note green is a sign of abundance and red depicts the absence of transit connectivity.

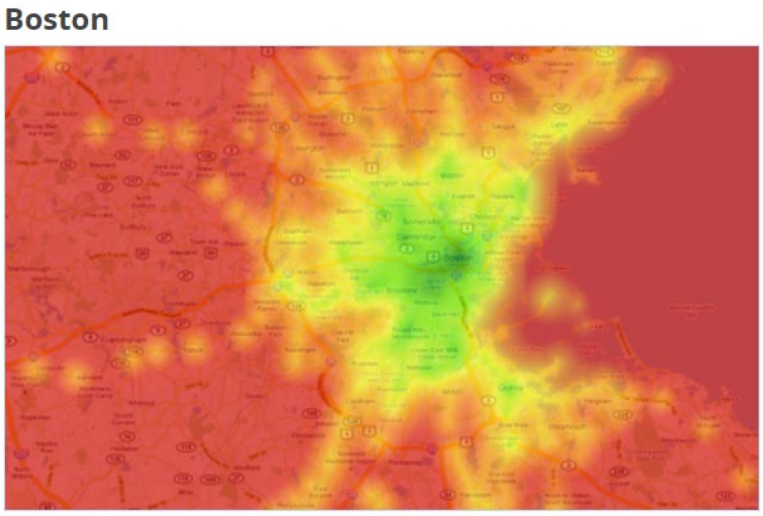

Figure 11. Sample transit score – Boston.

Research has presented several important findings. Even before COVID-19, a trend for working from home had affected the work commute demand. With much of the planning based on work trips, growing the ridership necessitates a shift to build demand for other types of trips.

Urban Design and Community

In 2009, APTA published recommended practices[24] addressing public and private investment in transit stops and stations to facilitate additional ridership. The practices included goals for urban design focused on improving transit and the built environment that supports transit usage. APTA identified numerous factors specific to land use, infrastructure, and trip-making to create more prospects for transit use. Although there is growth in working from home, transit-oriented development makes the incorporation of transit for multiple trip types more viable.

The Livable Transit Corridors Transit Cooperative Research Program report[25] provided a framework for community leaders to explore, define, and improve livability in their local corridors to increase transit ridership. The report indicated the importance of urban design, infrastructure, and streetscapes to improve transit accessibility. The recommended collaborative approach included art and culture, focusing on health, safety, and walkability.

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[24] APTA Standards Development Program, "Defining Transit Areas of Influence," December 2009, https://www.apta.com/wp-content/uploads/Standards_Documents/APTA-SUDS-UD-RP-001-09.pdf.

[25] Christopher E. Ferrell et al., *Livable Transit Corridors: Methods, Metrics, and Strategies*. Washington, DC: National Academies Press, 2016, https://doi.org/10.17226/23630.

Attitudes, Perceptions, and Loyalty

A consortium of Canadian government, transit system, and transport association representatives partnered to develop a ridership growth plan[26] based on using a portion of gasoline taxes to fund public transport. The guide presented various strategies to build on other sustainability goals, including growth management, transit-friendly urban environments, service improvements, service expansion, fare programs, and marketing and education. Different educational campaigns apply to different groups, such as the general public, youth, new immigrants, specialized users, and transit employees. Although the campaign was more comprehensive than others, it was not cohesive, comprehensive, or lifelong programs. However, the growth plan included multiple metrics and required annual reporting of the use of gas tax.

In a fact-finding study,[27] the Province of Ontario et al. selected five markets to explore millennial attitudes about mobility and opportunities to promote transit. The keys to usage centered around cost, convenience, and a desire for exercise. Respondents viewed driving as less hassle than transit, but transit was sometimes the mode of choice, allowing riders to multitask and stay connected. The respondents identified a lack of personal space as a factor in not choosing transit. However, they liked feeling more connected to their community, which made transit more desirable. They were also open to multimodal trips, with 69 percent making trips in this manner at least a few times weekly. Surveys have included various questions with numerous response choices that

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[26] Province of Ontario et al., "A Guide to Preparing a Transit Ridership Growth Plan," June 2005.

[27] Neela Sakaria and Natalie Stehfest, "Millennials and Mobility: Understanding the Millennial Mindset and New Opportunities for Transit Providers" (Washington, DC: National Academies Press, 2013), https://doi.org/10.17226/22500.

could help inform the research related to programmatic educational opportunities to develop transit loyalty. An interesting finding was that millennials were concerned about their experience, including service, amenities, and lifestyle choices.

A 2005 report focused on teen attitudes and perceptions about transit[28] in Florida. Focus groups with teens and parents enabled the exploration of mobility, and thematic outcomes contributed to the production and delivery of marketing campaigns. Brown et al.[29] also surveyed transit agency personnel and identified three types of programs used for marketing: education, reduced fares, and transit passes. Among the challenges noted were the negative social image of transit and keeping the programs budgeted each year. All the recommendations pertained to messaging and service. Although the report provided examples of programs aimed at teens, no agencies had sustained programs. Two themes emerged: teens perceive transit as "not cool," and obtaining a car is perceived as a rite of passage. Notably, the cost of car ownership has risen alongside housing costs. Transit system leaders and marketing personnel need to address these housing and transportation elements to develop transit loyalty among young riders.

Brown et al.[30] explored the concept of persistent ridership or loyalty to transit beginning in youth. National Household Travel Survey data indicated more transit use

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[28] Alisdair Cain, Peter Hamer, and Jennifer Sibley-Perone, "Teenage Attitudes and Perceptions Regarding Transit Use" (U.S. Department of Transportation, August 2005). https://rosap.ntl.bts.gov/view/dot/63126

[29] Barbara B. Brown et al., "Environmental, Behavioral, and Psychological Predictors of Transit Ridership: Evidence from a Community Intervention," *Journal of Environmental Psychology* 46 (2016): 188–96, https://doi.org/10.1016/j.jenvp.2016.04.010.

[30] Brown, "A Taste for Transit?"

among millennials than other age cohorts. Further, location changes in residence and work reduced the likelihood of commute patterns continuing.

Public transit is less costly than car ownership, and young people may be making ridership choices based on affordability. Other factors in millennials' increased use of transit include being more environmentally conscious, choosing an urban lifestyle, and using technology while traveling. However, historically, patterns change over time. Figure 12 shows the decline in ridership as the population ages.

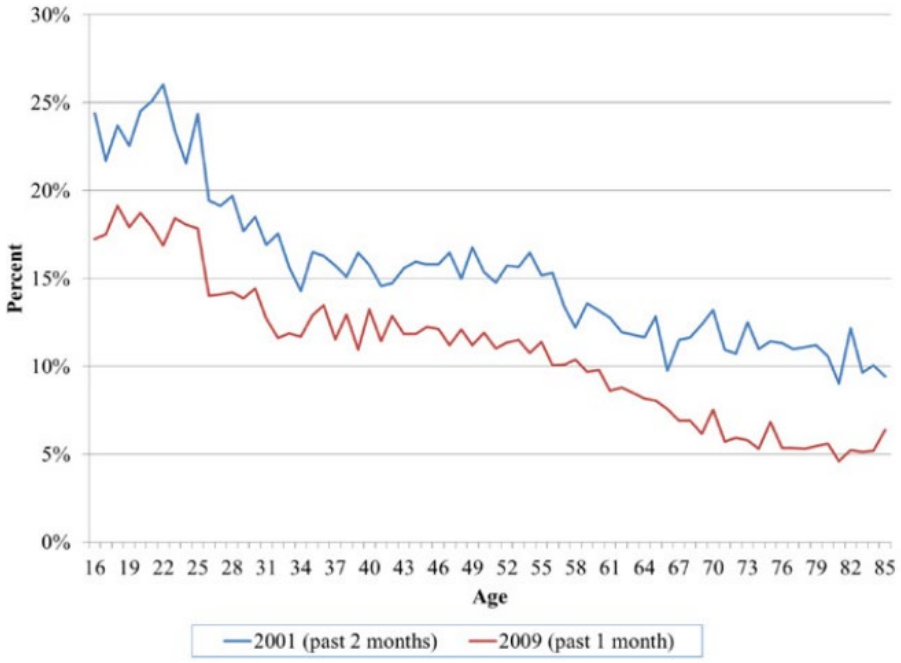

Figure 12. Percentage using transit over one to two months in 2001 and 2009.[31]

Lifestyle, demographics, and location affect ridership, not age. Alisdair Cain et al.[32] identified the need for efforts to motivate increased transit use and service to keep

[31] Cain, "Teenage Mobility."
[32] Ibid.

millennials using transit over time. The key recommendation was improved transit service.

An individual's transit mode choice is complex and influenced by many factors. Making public transport a competitive option requires transit agency personnel and others who support transit to understand the myriad determinants. Fu[33] looked at attitude and behavior, perceived value, corporate image of transit, perceived service quality, satisfaction, and complaints to create a path to loyalty. The findings centered around addressing complaints and marketing messages.

Loyalty developed using incentives over time was the basis for a study[34] to increase public transport usage in the European Union to address climate change and health issues. The study focused on new arrivals to the community based on free transit passes and the time allotted for their use. The research provided useful insights into encouraging the formation of habits (or loyalty) through the value of the incentive and extended time to use the pass.

Changing individual behavior is difficult. One study[35] addressing policies to reduce obesity and encourage smarter choices specific to automobile use provided useful insights. Individuals make choices when visual or environmental cues trigger a behavior. A disrupted habit could lead to changed behavior and more sustained success. In particular, early interventions could be means to change the conversation and conditions,

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[33] Xuemei Fu, "What Should We Do to Enhance Your Loyalty If You Are (Dis)Satisfied with Public Transit Service?," *Travel Behaviour and Society* 26 (2022): 28–40, https://doi.org/10.1016/j.tbs.2021.09.002.

[34] Christina Gravert and Linus Olsson Collentine, "When Nudges Aren't Enough: Norms, Incentives and Habit Formation in Public Transport Usage," *Journal of Economic Behavior & Organization* 190 (2021): 1–14, https://doi.org/10.1016/J.JEBO.2021.07.012.

[35] Fu, "What Should We Do?"

which may break automatic reactions, such as always choosing to drive a car versus walking to transit. An event can be a disrupter. The study showed that moving to a new location could be a prime time to effect a behavioral change related to transit use for someone who usually drives a car. In such circumstances, introducing an incentive for the behavior could be more successful. Repetition and reinforcement through an information campaign or extending the time available for the free pass may result in a new habit. Specific to the author's research topic, an upstream intervention about locational choice may be helpful. For example, selecting housing in close proximity to an active transit line improves the likelihood of choosing to use transit.

The limited research on transit loyalty shows that transit agencies have primarily employed marketing to increase ridership. A study[36] involved collecting data from approximately 250 individuals on up to six scenarios. The variables studied were travel cost, travel time, wait and transfer time, crowding, late service, and type of transit (bus rapid transit and subway), with models built to show their impact on loyalty.

Van Lierop et al.[37] defined transit loyalty as an individual's use of transit and willingness to recommend it to others. The researchers referred to findings showing that although transit use decreases with age, cohorts using transit as youth show less of a decrease in transit use over time than other age cohorts. Among the various perspectives, a significant focus on service attributes tied to satisfaction and loyalty indicated categories such as onboard experience, customer service, service delivery, waiting

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[36] Aitor Imaz et al., "Investigating the Factors Affecting Transit User Loyalty," *Public Transport* 7, no. 1 (2015): 39–60, https://doi.org/10.1007/s12469-014-0088-x.

[37] Dea van Lierop et al., "What Influences Satisfaction and Loyalty in Public Transport? A Review of the Literature," *Transport Reviews* 38, no. 1 (2018): 52–72, https://doi.org/10.1080/01441647.2017.1298683.

conditions, quality of transfers, and image. Van Lierop et al. presented each category's details and related opportunities for crafting a loyalty framework—in other words, a way to engage riders over time. In their recommendations for future research, the authors noted that "loyalty is the result of a longer-term and trusting relationship between the user and the agency."[38]

Davis and Baxandall[39] noted in the *National Household Travel Survey*, "The average young person took 25 more trips and traveled 117 more miles on alternative transportation (including biking, transit and walking) in 2009 than in 2001." In the same time period, sixteen- to thirty-four-year-olds increased their use of public transit by 40 percent[40] and those without driver's licenses increase from 21 to 26 percent.[41]

Ridership

Based on review of U.S. ridership data published by APTA and operational data from the National Transit Database published by the Federal Transit Administration, Stanley and Hyman[42] assessed 28 of the top 31 transit systems demonstrating significant ridership increases. The results showed that a single effort is rarely effective, and successful systems incorporate multiple strategies. The key categories found were service changes, fare programs, a shift to planning for customer experience, and partnerships.

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[38] van Lierop, "What Influences?"

[39] Benjamin Davis and Phineas Baxandall, *National Household Travel Survey*. Washington, DC: U.S. Department of Transportation Federal Highway Administration, 2012, https://www.yumpu.com/en/document/read/5104552/national-household-travel-survey-nhts-home-page.

[40] Ibid, 10.

[41] Ibid, 11.

[42] Robert G. Stanley and Robert Hyman, *Evaluation of Recent Ridership Increases – TCRP RRD 69*, *Evaluation of Recent Ridership Increases*, 2004, https://doi.org/10.17226/23320.

Marketing efforts emerged as a minimal factor. Only one transit system (Laketran in Ohio) indicated "extensive community involvement programs,"[43] with the others implementing traditional marketing campaigns.

Starcic[44] examined how different transit agency leaders addressed the need to increase ridership. The programs specific to education focused on the use of the system. The researchers noted, "We literally have to train generations of individuals on how to use public transit."[45] There was an identified need for back-to-back marketing campaigns and creating system awareness. Marketing examples included TV commercials of a character getting around on transit and more visible bus stop signs.

In the paper "Explaining Transit Ridership," Taylor and Fink[46] acknowledged the complexity of the ridership issue but found that ridership is of great importance to the transit agencies and those who direct public investments in the systems. The researchers identified auto ownership and parking availability as the most consistent impacts on ridership changes from an external perspective. The internal variable of the most significance was service, and quality vs. quantity had the greatest impact. Public policy may influence many factors that are external to the transit agencies.

Higashide[47] identified seven key factors for attracting transit riders and discussed each in detail. The book focused significantly on meeting each identified need, such as

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[43] Ibid, 15.

[44] Janna Starcic, "How to Fill Those Empty Seats," *METRO Magazine* 99 no. 1 (2003).

[45] Ibid, 2.

[46] Brian D. Taylor and Camille N. Y. Fink, "Explaining Transit Ridership: What Has the Evidence Shown?," *Transportation Letters* 5, no. 1 (2013): 15–26, https://doi.org/10.1179/1942786712Z.0000000003.

[47] Steven Higashide, *Better Buses, Better Cities: How to Plan, Run and Win the Fight for Effective Transit* (Washington, DC: Island Press, 2020).

services that go where people want to travel; run frequently; are reasonably fast, convenient, comfortable, and affordable; and feel safe. The author proposed viewing all trip types as candidate trips for and all people as potential riders, even if only some of the time.

Indicating the need for transit-supportive policies and infrastructure, Higashide cited the tragedy of a mother in Cobb County, Georgia, who exited the bus with her children and attempted to cross the street to their apartment when a car struck and killed one of the children. Although an extreme example, the lack of a midblock crossing associated with an active bus stop indicates the disconnect between transit service and infrastructure. Higashide provided examples of good infrastructure partnerships with local government agencies, noting they were not the norm.

Higashide discussed the federal funding bias toward roads, heavily supported by the automotive and fuel lobbies, along with the historical impacts of roadbuilding on communities, health, and the environment. Available highway funding is typically four to five times as much as the money allotted for transit. Although some policies enable state leaders to divert highway dollars to particular transit and transit-supportive infrastructure, these policies comprise only a fraction of the funding.

An in-depth study on changing demographics and transit[48] suggested that Millennials' and younger people's views and behaviors could facilitate more opportunities for transit to succeed in building ridership. For example, individuals in the two age groups prefer to live in the city, are less car-dependent, and are open to sharing a

[48] Matthew Coogan et al., *Understanding Changes in Demographics, Preferences, and Markets for Public Transportation* (Washington, DC: The National Academies Press, 2018), https://doi.org/10.17226/25160.

vehicle. Coogan et al. developed travel demand models and concluded that service level was more important to growing ridership than a pro-transit population. The researchers developed an attitudinal model to address other preferences (such as housing type) to explain mode choice. However, Coogan et al. did not propose interventions to affect decision-making regarding transit directly or other life choices that make transit a viable option.

In two recently published studies,[49] researchers took an in-depth look at recent ridership trends, causes, and responses. Data were pre-pandemic and covered the period from 2012 to 2018. The first set of analyses covered more than 200 U.S. transit agencies. Case studies indicated that agencies focused on better service options (e.g., bus rapid transit and dedicated lanes), transit shelters, fare systems, electric buses, new and improved bus networks, and other system improvements. In the second study which built upon the earlier work, the researchers discussed new and emerging internal and external factors influencing ridership. They mathematically modeled several service improvement-related scenarios to assess the potential impact.

[49] Kari Watkins et al., *Recent Decline in Public Transportation Ridership: Analysis, Causes, and Responses*, *Causes, and Responses* (Washington, DC: National Academies Press, 2021), https://doi.org/10.17226/26320.

	Internal	External
Traditional	• Service quantity • Fares • Speed and reliability • Service concentration • Access to transit • Security • Service quality	• Density • Population • Employment • Income • Gas prices • Commuting policies • Car ownership • Demographics
Emerging	• Restructuring transit networks • Demand response, flex route services, and microtransit pilots and partnerships • New fare media and fare integration • Real-time information • Maintenance issues • Dedicated transit right-of-way • School and employer partnerships • Fare discounts or elimination	• Gentrification • Aging population • Millennials • Telecommuters • Delivery services • Congestion and parking pricing • Shared mobility (ride-hailing, bikesharing, car-sharing, scooters)

Figure 13. Four categories of factors and strategies affecting transit ridership.[50]

Like many others, this figure and the previously referenced study resources are valuable to inform a program of education and outreach over a lifetime to drive ridership loyalty.

Incorporating Public Policy

In addition to the mobility side of developing transit loyalty, there are a variety of policy implications. Identified and addressed appropriately, policy implementation can contribute to the likelihood of success in achieving the desired outcomes and increases in transit ridership. These policies can affect or effect infrastructure, zoning, and other factors impacting transit. Policy control may be by transit agencies or the jurisdictions

[50] Watkins et al., *Recent Decline*.

within which they operate. Below are some examples that demonstrate some external factors that influence those policies.

Social Justice/Spatial Justice and Infrastructure

In the book *Justice: What's the Right Thing to Do?*, Sandel[51] developed and explored various forms of justice regarding opportunities and outcomes, from ancient philosophers to modern discourse. Among the perspectives were many -isms that could easily be filters for how leaders make infrastructure decisions and set public policy. Historically, sidewalks were less regularly constructed in lower-income neighborhoods and often reflect racial bias.

Nazari Adli et al.[52] developed the concept of walking accessibility to distinguish the user experience from the provision of infrastructure. Through a social justice lens, the paper addressed the social impacts of rail stations that are less accessible to economically or socially disadvantaged individuals. The researchers' focus on social justice provided another perspective that will help inform the proposed study's public policy and the elements necessary to understand to ensure the programmatic approach's success.

Brasuell referenced a Harvard study in a 2015 article in *The New York Times*, summarized on Planetizen as "The Key to Escaping Poverty: Transportation."[53] The reporter who did the follow-up work focused on the lack of reliable and efficient

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[51] Michael J. Sandel, *Justice: What's the Right Thing to Do* (Cambridge, MA: Harvard University Press, 2009).

[52] Saeid Nazari Adli, Subeh Chowdhury, and Yoran Shiftan, "Evaluating Spatial Justice in Rail Transit: Access to Terminals by Foot," *Journal of Transportation Engineering, Part A: Systems* 146, no. 9 (2020), https://doi.org/10.1061/jtepbs.0000419.

[53] James Brasuell, "The Key to Escaping Poverty: Transportation," *Planetizen*, May 11, 2015.

transportation as a barrier. The study supported transportation and social mobility as being one of the significant impacts on economic mobility.

Infrastructure and Partnership Opportunities

APTA[54] leaders commissioned and approved a recommended practice related to partnerships, recognizing that transit agencies do not generally control land use and mostly operate on rights-of-way they do not own. Certain funding streams, decision-making, and controls are also elements frequently led by others such as departments of transportation. The APTA report presents numerous examples of these partnerships, which cover zonings (including TODs), signal improvements, community engagement, short-term incentives, expedited plan review and permits, transit-supportive infrastructure gap programs (site-specific), and encouraging transit developers to meet environmental and sustainability goals. The authors proposed a longer-term commitment to enhancing the pedestrian environment to support transit (e.g., VIA Metropolitan Transit in San Antonio).

The saying, "What gets measured gets managed"[55] applies to the transit world, where the only assets measured are those owned by a transit agency.[56] Sometimes, people measure what is easy[57] and not what matters. However, in the proposed study, what is easy and what is difficult to measure both matter. What if, in addition to the transit assets

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[54] APTA, "Transit Agency Partnerships to Improve Urban Design and Enhance Service Effectiveness," September 2012, https://www.apta.com/wp-content/uploads/Standards_Documents/APTA-SUDS-UD-RP-006-12.pdf.

[55] Simon Caulkin, "The Rule Is Simple: Be Careful What You Measure," *The Guardian*, February 9, 2008.

[56] APTA, "2018 Public Transportation Fact Book," 2018.

[57] Valentine F. Ridgway, "Dysfunctional Consequences of Performance Measurements," *Administrative Science Quarterly* 1, no. 2 (2016): 240–47.

cataloged in transit asset management systems, the infrastructure to support transit received similar measurement and cataloging?

Various approaches are available to make transit more desirable, but quality sidewalks with a pleasant walking environment[58] often top the list. A key implementation policy that is needed is having a stable, reliable funding source and a coordinated plan between the controlling jurisdiction and the transit agency. Transit agencies need to influence these policies and contribute where they can but the main control is with the jurisdiction.

Many transit agency-controlled factors could influence potential transit riders. Among these factors are the type of transit, areas of service, and quality of service; the condition of the transport vehicle; the quality of the staff performance; and other functional elements. Individual influences include beliefs or societal norms, such as concern for the environment, degree of comfort with technology, and perspectives on health. Finally, external policies and actions may contribute to the choices people make. Figure 14 is the author's summary of the flow and categorization of these factors and information gathered through literature review and research. Internal factors are what the transit agency can typically control. External factors are people-centric factors that transit agencies can influence but not control. Policies can be both internal and external depending on the type of policy and the source of funding.

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[58] Mintesnot Woldeamanuel and Andrew Kent, "Measuring Walk Access to Transit in Terms of Sidewalk Availability, Quality, and Connectivity," *Journal of Urban Planning and Development* 142, no. 2 (2016), https://doi.org/10.1061/(asce)up.1943-5444.0000296.

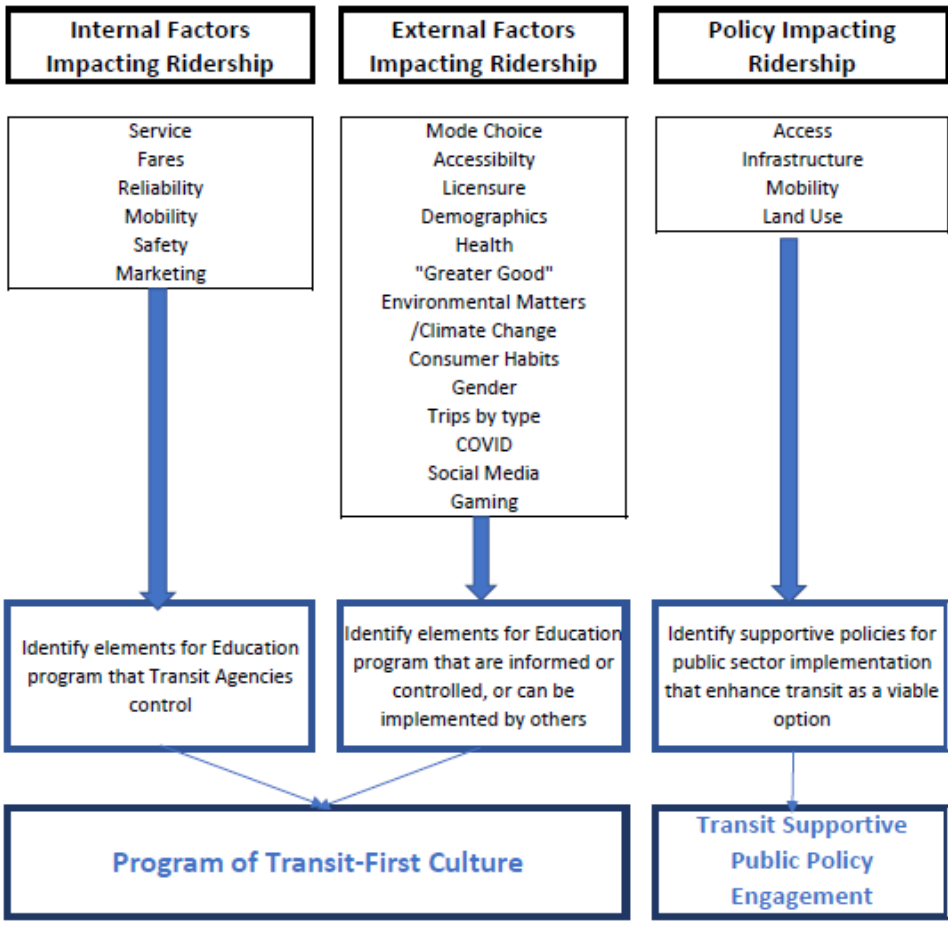

Figure 14. Ridership impact factors.

Mode Choice

The literature presented an analysis of ridership through a variety of lenses, including mode choice and travel behavior.[59] At a high level, researchers have used

[59] Maya Abou-Zeid and Moshe Ben-Akiva, "Travel Mode Switching: Comparison of Findings from Two Public Transportation Experiments," *Transport Policy* 24, no. 2012 (2012): 48–59, https://doi.org/10.1016/j.tranpol.2012.07.013; K. R. Hyun et al., "Individual Barriers, Requirements and Attitudes toward Mode Choice among Low Income Adults in Dallas, Texas," *Advances in Transportation Studies* 56 (2022): 107–27, https://doi.org/10.53136/97912599479018; Shichao Sun and Zhengyu Duan, "Modeling Passengers' Loyalty to Public Transit in a Two-Dimensional Framework: A Case Study in Xiamen, China," *Transportation Research Part A: Policy and Practice* 124, no. April (2019): 295–309, https://doi.org/10.1016/j.tra.2019.04.007; Brown et al.,

modeling based on past behavior to predict future actions. There is no incorporation of education to influence mode choice. Further, with the many changes in travel during and since COVID-19, particularly work trips, modeling travel behavior requires a reimagining to reflect new activities and work patterns.

Accessibility (including measures like Walk Score,[60] Transit Score,[61] and World Air Quality Index,[62] mobility, and licensure are closely related when individuals make travel decisions.[63] Accessibility focuses on the physical environment in concert with the choices available. Mobility and licensure relate more to the modes available to the traveler, whereas safety and reliability focus on commuters' confidence in choosing that mode.

Health and Gender

There is a growing body of literature related to the health impacts of different modes of transportation and their environmental impacts.[64] Consumer choices associated

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"Environmental, Behavioral, and Psychological Predictors of Transit Ridership: Evidence from a Community Intervention"; Jing Zhu and Yingling Fan, "Daily Travel Behavior and Emotional Well-Being: Effects of Trip Mode, Duration, Purpose, and Companionship," *Transportation Research Part A: Policy and Practice* 118 (2018), https://doi.org/10.1016/j.tra.2018.09.019.

[60] "Transit Score Supported Cities," Walk Score®, n.d., https://www.walkscore.com/transit-score-methodology.shtml.

[61] Ibid.

[62] Air Quality Index, (WAQI), "Air Pollution in the World: Frequently Asked Questions." n.d., https://aqicn.org/faq/.

[63] Wieters et al., "Walk Score® Data for Planning & Research," *Journal of Transport Geography* 6, no. 1 (2015): 110–22; "Transit Score Supported Cities," n.d.

[64] Melissa Bopp, Vikash V. Gayah, and Matthew E. Campbell, "Examining the Link between Public Transit Use and Active Commuting," *International Journal of Environmental Research and Public Health* 12, no. 4 (2015), https://doi.org/10.3390/ijerph120404256; Christoph Buck et al., "Objective Measures of the Built Environment and Physical Activity in Children: From Walkability to Moveability," *Journal of Urban Health* 92, no. 1 (2015), https://doi.org/10.1007/s11524-014-9915-2; Centers for Disease Control and Prevention, "CDC Recommendations for

with health and the environment are becoming more common in transportation choice conversation.

Gender (safety and security, other considerations) as it informs decision-making around transit is a well-studied topic.[65] Understanding gender differences informs transit agency leaders as they make infrastructure and programmatic investments. There is an extensive body of knowledge developed by the Transportation Research Board committee Women and Gender in Transportation (AME[20]), available through their website and multiple conference proceedings (https://womenandgender.wixsite.com/ame20). The author is past chair of this committee and conference co-chair for multiple conferences.

With the advent of transit-oriented developments and other community-building efforts, there has been an opportunity to influence behavior through ease of access to

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Improving Health through Transportation Policy," April 20, 2010, https://stacks.cdc.gov/view/cdc/24835; Stefan Gössling, Jessica Nicolosi, and Todd Litman, "The Health Cost of Transport in Cities," *Current Environmental Health Reports*, 2021, https://doi.org/10.1007/s40572-021-00308-6; Wendy Heaps/Centers for Disease Control and Prevention, "Health Impact in Five Years: Integrating Health into Mass Transit and Safe Routes to School," 2019; Drew Pavlick et al., "Human Health and the Transportation Infrastructure," *Journal of Human Resource and Sustainability Studies* 8, no. 3 (2020), https://doi.org/10.4236/jhrss.2020.83013; Trevor Hancock, "Comment: Public Transit Is Good for Public Health," *Times Colonist*, March 11, 2015, https://www.timescolonist.com/opinion/comment-public-transit-is-good-for-public-health-4620065.

[65] Meghna Khanna, "Mind the Gender Gap," *Planning Magazine*, 2020, https://planning.org/planning/2020/feb/mind-the-gender-gap/; Yingling Fan, Andrew Guthrie, and David Levinson, "Waiting Time Perceptions at Transit Stops and Stations: Effects of Basic Amenities, Gender, and Security," *Transportation Research Part A: Policy and Practice* 88 (June 1, 2016): 251–64, https://doi.org/10.1016/j.tra.2016.04.012; Sherry Ryan, "American Planning Association Planning Advisory Service: Creating Great Communities for All Integrating Gender Mainstreaming into U.S. Planning Practice," *PAS Memo*, no. December (2019); Clare Foran, "How to Design a City for Women," *The Atlantic CITYLAB*, 2013.

transit. Transit organizations, through their websites, Facebook, Instagram, LinkedIn, and other platforms communicate with the public. The tools are a means to communicate general and service-related information or marketing. Individuals, and groups such as New Urbanist Memes for Transit Oriented Teens[66] (NUMTOTs) use social media to communicate about their personal perspectives on transit. NUMTOTs started in 2017[67] with a single Facebook post and organically grew with 62,000 members in 2018, and now boasts almost 230,000 members. Posts include "a lot of appreciation for transit."

Building Transit Loyalty

The significant lack of literature on transit education and ridership adversely affects the success of building a culture of transit loyalty, necessitating a programmatic approach. Researchers have focused on service planning, operations, fare options, and other ways to serve riders. Discussions of marketing campaigns around those subjects are limited to educational campaigns, with none identified that are longer term, integrated into various curricula, or focused on building lifelong, loyal riders. Studies related directly to changes (in most cases, losses) in ridership show what has not worked, with any recommendations, if any, focused on the types of outreach already in use.

Research addressing the foundation of the idea of incorporating transit education in schools[68] began almost two decades ago. In a project for the Federal Transit

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[66] "New Urbanist Memes for Transit-Oriented Teens," n.d.

[67] Laura Bliss, "The 'Transit-Oriented Teens' Are Coming to Save Your City," *CityLab Culture* (blog), March 30, 2018, https://www.bloomberg.com/news/articles/2018-03-30/new-urbanist-memes-for-transit-oriented-teens-will-save-the-city.

[68] Marsha Anderson, "Introducing Children to Mass Transit," 2005, 1–61.

Administration, the idea was introduced that providing educational material to third-grade students through a video game could have an impact on transit ridership.

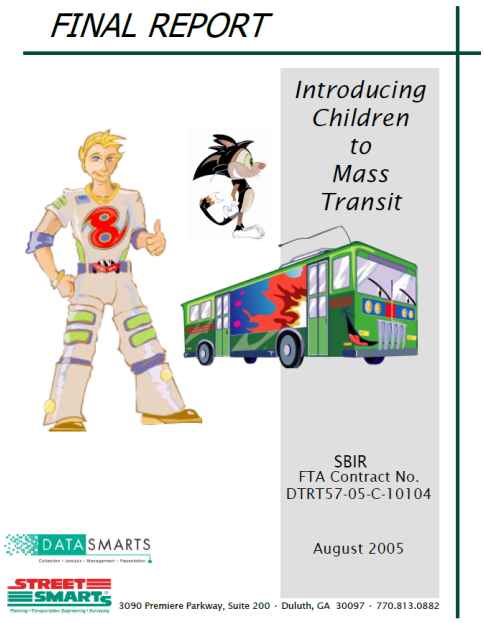

Figure 15. Video game concept for third-grade students.

The researcher used the Academic Knowledge and Skills requirements based on the Gwinnett County (Georgia) Public Schools curriculum to develop the concepts about transit and examples used as tasks in the game. With a core topic of transit use, the game would have provided numerous opportunities to base elements of the game on different subjects, such as mathematics (making change and telling time) and geography (reading maps), to stimulate youth interest in transit and transportation. Although never fully developed, the video game idea led to an idea of education that continues to have merit. Most school systems have some form of Academic Knowledge and Skills for all grade levels and all subjects. In Texas, for example, they are called Texas Essential Knowledge

and Skills (TEKS). In the research conducted, educators contributed ideas for a potential way to make curricula of value and have it accepted by high schools.

The proposed case studies were unique in finding what and how transit agencies should communicate to broaden the transportation choices used by youth, not just teach them basic skills of how to use a transit system. There is a need for accurate service, location, time and other information to be disseminated but many other attributes of transit need to be shared for the individual to choose a preferred mode of transportation. Young people are presented with a great deal of information about driving but there is no equivalent for other modes of transportation. Providing balance among modes is necessary when preparing youth for their independent futures.

High school students are subject to peer persuasion, media pressure, and parental encouragement to acquire their driver's licenses long before they need to make transportation decisions. Driver education is available in many schools, making learning about driving and how to drive more convenient. Despite the presence of mass transit in many communities, transportation choices were limited until the 2000s. Now, with a plethora of mobility options, it is appropriate to provide a more comprehensive approach to educating and informing teenagers about their choices and tradeoffs.

Transit agency administrators can draw inspiration from other transportation-related educational programs successfully employed in schools. These programs included safety courses for bicycle helmets in the late 1980s and seat belts in the early 1990s, with policy, funding, and curriculum from the National Highway Traffic Safety Administration.

Further indication of the merit of the proposed study is the adoption of science, technology, engineering, and mathematics (STEM) and science, technology, engineering, arts, and mathematics (STEAM) curricula in high schools. STEM emerged as a new paradigm in the early 2000s to make U.S. students more globally competitive. Many district administrators later added arts to the curriculum (i.e., STEAM). These programs frequently present as project-based learning experiences combining multiple concepts to meet learning objectives. Further, the adoption of STEM and STEAM programs showed the creation and broad adoption of a new way of teaching in a relatively short time.

The literature search returned a limited selection of materials publicly available through transit agencies[69] and related organizations, as well as web-based sources such as YouTube.[70] Some researchers[71] have examined the issues around transit ridership primarily focused on improving operations and short-term marketing to increase ridership. Although these are valid matters to address, their exploration is insufficient to address ridership and sustainable growth fully.

A search occurred to identify smaller transit agencies that offer outreach programs. The programs listed are a small sample of those discovered and did not receive

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[69] King County Metro, "Transit in Motion Toolkit," 2017.

[70] Valley Metro, "Valley Metro Is My Ride," 2014, https://youtu.be/_HGt6nlqvMY; MN, "Kids Get Lesson on Public Transit through Metro Bus"; DART, "On the GO! Transit Education," Transit Education, 2021, https://www.dart.org/transiteducation/curriculum.asp; "Blippi _ Educational Videos for Kids," n.d., https://www.youtube.com/@Blippi/featured.

[71] Watkins, *Analysis of Recent*; Jill Hough and Susan Handy, "Public Transportation Ridership Patterns: Past, Present, and Possible Future Trends," 2022: 155–70, https://doi.org/10.1007/978-3-030-92821-6_8; Watkins et al., "Declines in Transit Ridership: Analysis of Recent Trends"; Coogan et al., *Understanding Changes*; Gabriela Beirão and J. A. Sarsfield Cabral, "Understanding Attitudes towards Public Transport and Private Car: A Qualitative Study," *Transport Policy* 14, no. 6 (2007): 478–89, https://doi.org/10.1016/j.tranpol.2007.04.009.

detailed study. However, their focus areas and content of these programs were similar to larger agencies.

- Lane Transit District (Eugene, Oregon): General education about public transportation and safety
- Greater Lafayette Public Transportation Corp (CityBus; Lafayette, Indiana): General education for the local community about public transportation
- Chapel Hill Transit (Chapel Hill, North Carolina): Education focused on transit awareness and safety primarily for schools and youth groups
- Capital Area Transit System (Baton Rouge, Louisiana): Educational programs and materials for schools and community groups to raise awareness about public transportation.

The fundamental principle in Maslow's hierarchy[72] is that humans must meet essential physiological needs to stay alive. Foundational needs include food, water, shelter, and basic bodily functions. Maslow proposed that individuals are not motivated to seek higher goals until they have met a prior level's needs. After achieving the elementary components of the hierarchy, individuals pursue the next level of needs: safety. Although Malow's perspective on safety was primarily physical, the stage could also include a sense of security.

[72] Christopher Aanstoos, "Maslow's Hierarchy of Needs," *Salem Press Encyclopedia of Health*, Hackensack, NJ: Salem Press, 2023; Abraham Maslow, "A Theory of Human Motivation," *Psychological Review* 50 (1943): 370–96.

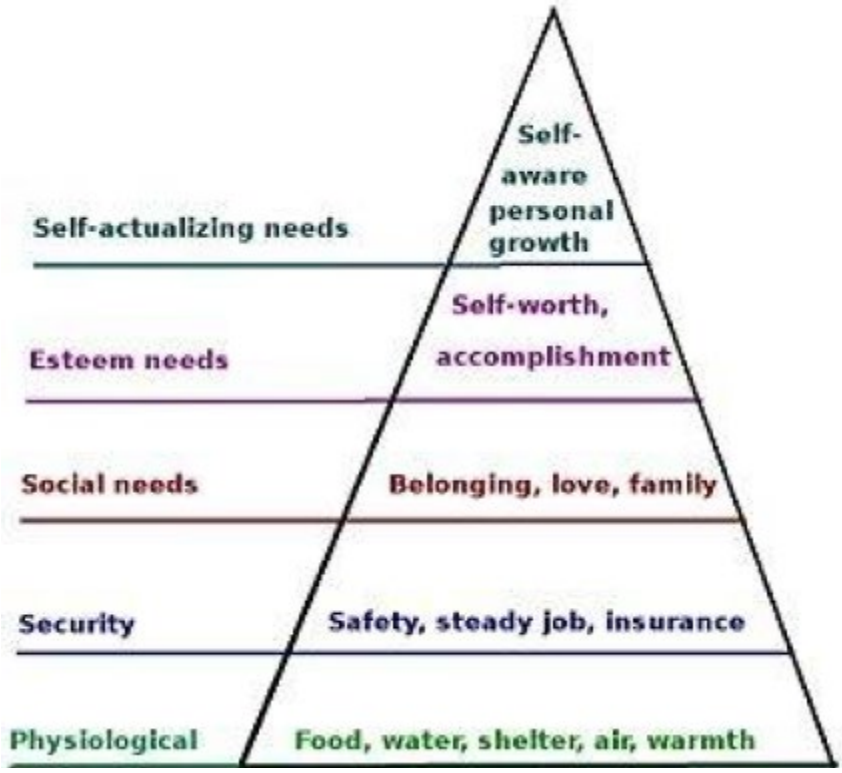

Figure 16. Sample of the pyramid created from Maslow's (1943) hierarchy of needs.[73]

The first two levels of Maslow's hierarchy of needs are self-centric, incorporating strong Instinct. Hunger and thirst are primary needs addressed by instinct. If individuals are hungry, they search for food; when they find it, they eat the food to satisfy their hunger. If individuals feel unsafe, they may go somewhere well-lit amid people with whom they feel secure. Choices made to fulfill these needs are natural and inwardly driven. In building a transit program or a campaign, agency leaders and designers should refer to Maslow's hierarchy to identify unfulfilled needs as an opportunity to present a solution. Content aligned with Maslow's hierarchy of needs could appeal to youth, wherever they are on the hierarchy.

[73] Aanstoos, "Maslow's Hierarchy."

Transit agency heads could draw upon research to inspire behavioral change and create a more transit-friendly population at significant points in people's lives, such as high school graduation and the shift to independence. Education to inspire youth to embrace transit needs should occur in consideration of the hierarchy of needs. Transportation is a consideration in the second or third stage, after physical and most or all safety needs are met.

The are various ways to view safety and security. The first is being safe from harm, which could apply to personal violence, crashes, extreme weather, loss of job, loss of health, and others. Although some individuals report driving an automobile because they feel safe inside the car, they have likely not compared auto accident rates to buses or trains. They may have not overlooked the number of distractions they face or create when driving. There are also statistics about the risk of violence or theft in the parking garage or lot versus at the bus stop or train station. Figure 17 shows the death rates for passenger vehicles, buses, railroads, and planes.[74]

[74] National Safety Council, "Deaths by Transportation Mode," 2023, https://injuryfacts.nsc.org/home-and-community/safety-topics/deaths-by-transportation-mode/.

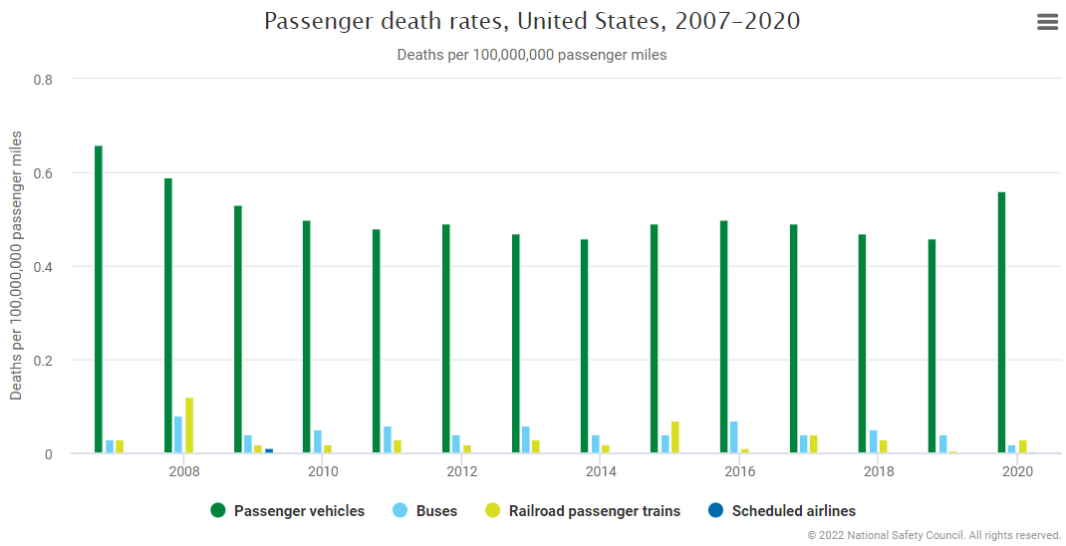

Figure 17. Passenger death rates in the United States, 2007–2020.

Educational materials to change behavior need to appeal to individuals where they are on the hierarchy. In the Esteem level, there is a strong focus on the greater good. Therefore, campaigns should address how transit contributes to societal well-being. According to Cervero[75] some of the relevant topics are as follows:

- Cars create significant pollution, which contributes to health issues like asthma. Transit is part of the endeavor to improve air quality.
- The automobile fleet will take longer to convert to environmentally friendly fuel sources, and public transport is making significant strides in eliminating the use of fossil fuel.
- Transit provides greater opportunity for social inclusion for work, school, and health care, among others.

[75] Robert Cervero, *Transforming Cities with Transit: Transit and Land-Use Integration for Sustainable Urban Development*, *Choice Reviews Online*, vol. 51, 2013, https://doi.org/10.5860/choice.51-1607.

- Road construction and closures cause significant disruption, often impacting whole communities.
- Traffic congestion results in lost time for friends, family, work, and personal purposes, thereby impacting quality of life.
- Sustainability and resiliency are central to the greater good, and transit aligns with both.

Messages derived from the themes above may not resonate with everyone at the safety and security level. Transit agency marketing personnel or educators should instead design educational material to appeal to people at the third, fourth, or fifth levels. The lower levels focus on functioning; the higher levels represent a shift to purpose and emotion.

A study conducted for the Georgia Department of Transportation[76] included an interesting use of the hierarchy of needs. The research is a transportation-focused application of Maslow's Theory related to investments in infrastructure at the local and state levels, The authors' perspectives certainly have elements that parallel a transit message. See Figure 18.

[76] Adjo Amekudzi-Kenned et al., "Transportation Systems Health" (Georgia Department of Transportation, 2015).

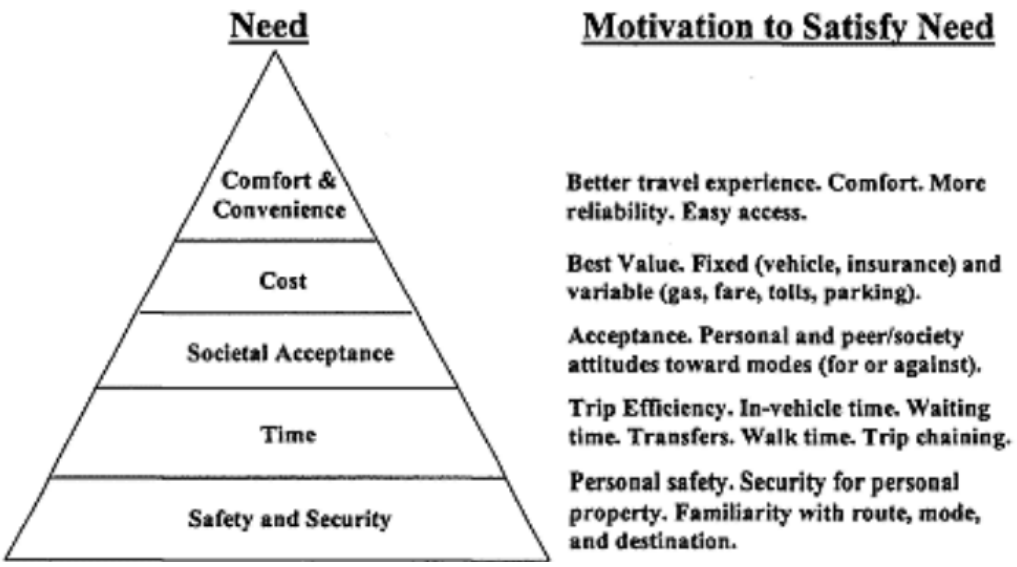

Figure 18. Transportation system user hierarchy of needs.

With respect to transit, trip purpose may supersede mode preference. For example, a trip to the home improvement store to buy lumber is likely inappropriate for the use of public transit. However, individuals' needs and motivations help to inform education designed to influence youth to choose transit for some of their trips.

Trends to Consider for Curriculum Development

Because educational curriculum is appropriate to increase transit ridership, it is important to look at trends that might impact what to teach and how to teach it. This section presents examples of trends, including climate change and sustainability, SMART cities, and social media. Recommendations from this study will be taken into consideration when recommendations are made in a later chapter.

Climate Change and Sustainability

Trends. Climate change discussions permeate daily life, with the messaging common among youth. Young people appear in public service messages, talking about the impact of current decisions on their futures and pleading for action to change the

trajectory of climate change. Some youth suffer from "climate anxiety"[77] due to the predicted dramatic outcomes.

The young audience sees a range of solutions to climate change that could also address some aspects of sustainability. These solutions seem simple and impactful and include growing a green economy (electric, solar, wind), expanding the use of e-technology (bikes, charging stations, cargo bikes, scooters), and free public transit. Millennials, Gen Y, and Gen Z expect brands' and companies' efforts to be rooted in greater purpose and ethical sourcing and not strictly driven by profit. Sustainability[78] is much more than addressing issues associated with climate change, including other aspects of the daily environment, including housing, food, jobs, leadership, and commitment.

Effects on Transit. Transit systems carry many people in a smaller footprint and are generally more fuel-efficient per passenger. Their impact on combating climate change is growing as the systems become more ecofriendly and fuel efficient. Through two major pieces of legislation, the federal government[79] has provided hundreds of millions of dollars to support transit vehicles' conversion to electric and other clean fuels.

The looks and amenities of new transit fleets are appealing to youth. Vehicles powered by electric, hydrogen, or compressed natural gas are more environmentally friendly than traditional diesel fleets. Transit could be promoted more effectively to

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[77] Petra Hurtado et al., "2023 Trend Report for Planners" (American Planning Association and Lincoln Institute of Land Policy, 2023).

[78] "Envision: Sustainable Infrastructure Framework Version 3" (Institute for Sustainable Infrastructure, 2018).

[79] 117th Congress, "Infrastructure Investment and Jobs Act" (117th Congress, August 16, 2022); 117th Congress, "Inflation Reduction Act" (117th Congress, August 16, 2022).

youths' sensibilities, incorporating human or electric-powered options for the first and last mile of multimodal trips.

Typical trips the target audience makes include school, recreation, work, health care, and shopping. As young people grow into independent decision-makers, transit agencies have the opportunity to educate them to become regular riders, with one focal point being the environmental benefits. The emphasis should not be on every trip but on teaching them to evaluate which trips are transit-compatible whenever they need to travel. As individuals mature, transit considerations should become a component of housing (where to live) and job (places of employment) decisions.

SMART Cities

Trends. Urban planners have embraced contemporary transportation technology, beginning with in-underground loops to detect traffic and send a message to a nearby traffic signal. Although public infrastructure varies by community, technologies may include radar detection of the presence and speed of vehicles, cameras to observe traffic and enforce traffic rules, variable message signs, and connected vehicle technology for vehicles to communicate with the roadside infrastructure.

The acronym SMART—Self-Monitoring, Analysis and Reporting Technology—describes the distinction of this newer, more advanced technology and the value of advanced technologies and trends. This advancement is important because such technology enables systems to learn and improve with minimal to no manual human intervention.

In addition to public infrastructure, many forms of wearable technology have useful attributes, such as Apple Watches, Fitbits, and health rings. Sophisticated SMART cities can use data from such devices for additional intelligence or direct communication.

Automated intelligence and artificial intelligence (AI) are components of everyday life and supportive technology. Automated intelligence entails using a programable device to replicate, replace, or enhance a human activity or task. The more advanced AI uses technology to process large amounts of seamlessly collected data and learns (machine learning) as it goes. AI can include speech and image recognition and data processing to make decisions and change processes or systems. AI's full capabilities have not yet been realized, but the technology shows promise in supporting more robust and timely decision-making.

Effects on Transit. SMART cities directly and indirectly impact the transit agency, current and potential riders, and the public. Some transit vehicles and traffic signals "talk" to each other through traffic signal priority (TSP) technology. A bus operates most efficiently when it makes fewer stops, both transit stops and traffic-related. TSP allows bus drivers to communicate when they are approaching a traffic signal, and the signal stays green to allow the bus to pass through the intersection. This technology helps keep buses on schedule, which is appealing to riders. Without TSP, the bus would stop for the red signal and again at the bus stop, which adds time and makes the ride feel less efficient to passengers. Fewer stops and starts also contribute positively to the environmental friendliness of the trip. More advanced forms of transit, such as bus rapid transit, take advantage of SMART technology and applications, including station-feeding

message boards to announce vehicle arrival times or locations of all vehicles in the system.

Using big data and machine learning will support agency administrators' ability to redefine bus networks in a timelier fashion. Currently, these activities are primarily manual, tedious exercises using farebox data and sometimes passenger surveys. They have not typically incorporated operating conditions, land use or other information that would be useful to providing better service. Developers could analyze SMART city application data from traffic management systems related to traffic flow and congestion to help define routes. More automated processing of land use and population data could inform the planning tools of population densities, job centers, and other locations with the need for transit service. Anonymized cell phone data could provide useful insights as well.

Currently, it takes years to collect data, analyze them, and vet potential network redesigns. SMART tool advancement means the possibility of more timely adjustments, management, communication of those change, and post-change assessments of effectiveness. Some traffic signal systems can adapt to changing traffic flow conditions without human intervention. Some of these adaptive and SMART tools can be applied to transit planning and operation as transit vehicles become equipped with more technology.

If granted by an individual with a cell phone or wearable technology, Access to riders' personal information could enable improved on-demand transit services or seamless coordination with scheduled services. Wearable technology with geolocation information might interact with a transit application directly or in the background. Future

applications will be able to address public transportation in the form of dynamically changing routes, schedules, and services.[80]

Social Media

Trends. The intent and use of social media is to inform and influence behavior. Frequently incorporated into information and marketing campaigns, social media received extensive use to address concerns about health and rider safety during the COVID-19 pandemic.[81]

Current practice is to provide information that is more focused on the near term and supporting marketing campaigns. Although all forms of social media will continue to evolve, interactive media is perhaps the most durable.[82] There is a proliferation of platforms and specialties. Some examples follow.

- Instagram Reels and TikTok: short videos
- Facebook and Instagram: live videos
- Twitter (now X) and Threads: ask and answer questions

Content and messaging are only a portion of social media's value. Social media monetization is more significantly attached to data mining and using or selling the intelligence gained. Taking advantage of AI, transit agency personnel could learn much

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[80] Amos Haggiag, "How Artificial Intelligence Will Transform Mass Transportation," *Mass Transit Magazine*, May 2019.

[81] Federal Transit Administration, "America's Open and Transit's Open," August 2021; Qian Ye et al., "Impact of Social Media on Travel Behaviors during the COVID-19 Pandemic: Evidence from New York City," *Transportation Research Record: Journal of the Transportation Research Board*, 2021, 036119812110338, https://doi.org/10.1177/03611981211033857.

[82] Subasish Das et al., *Uses of Social Media in Public Transportation*, *Uses of Social Media in Public Transportation*, 2022, https://doi.org/10.17226/26451.

about patrons and non-patrons, which would be useful for various informational purposes.

Influencers are individuals with a high number of followers who, as the name implies, can bring attention to products, causes, or services aligned with their brand—in other words, things they choose to promote. There are challenges with anything technology-based, as individuals who use these tools for harm could create bots and unreliable data. A means to replicate human behavior, bots (a shortened form of *robots*) are frequently used to negate positive outcomes on social media. Content creation formats (e.g., vlogging, writing education and skill building, and gaming) continue to grow as the digital marketplace expands.

Effects on Transit. Hurtado[83] provided specific examples of social media used to promote transit in a report for the American Planning Association and Lincoln Institute of Land Policy. TikTok influencer Paul Stout ("Talking Cities") shows ways to use transit as he teaches urban planning concepts. Instagram reels, YouTube shorts, Nextdoor posts, and Reddit threads are other social media tools with a unique style and place for education around public transit.

In a detailed survey of how public transportation providers are using social media,[84] researchers found five main areas of application: time-sensitive information (e.g., train delays), public information (e.g., fare changes), public engagement (e.g., opinion about a service change), promotions (e.g., incentives to increase ridership), and promoting organizational goals (e.g., hiring more bus drivers).

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[83] Hurtado, "2023 Trend Report."

[84] Subasish Das et al., *Uses of Social Media in Public Transportation: A Synthesis of Transit Practices*, 2022, https://doi.org/10.17226/26451.

Other methods of reaching youth about transit include transit apps (most agencies have their own, and there are more generic trip-planning apps like Google Maps), YouTube, Instagram ads, advertising near bus stops, and youth-oriented radio.[85] Although not presently used for attracting potential riders to public transit, a research tool called Desirable Streets[86] has some exciting possibilities. As individuals use the app to identify alternative walking paths, transit authorities and city planners gain input on how far people are willing to walk to have a more pleasant experience. A future application of Desirable Streets could be showing someone considering a transit trip the most pleasant way to get to the stop or station.

Transit agency marketers can collect significant data from their social media followers and find ways to monetize the data to benefit their service or ancillary programs. Although data mining requires care to prevent transit desertion, it does have possibilities.

Significant studies and publications about a wide variety of transit topics exist. However, no substantial literature focused on creating a systematic educational approach to incorporate transit as a regular mode of transportation in an individual's decision-making process. The literature review demonstrates several important elements which point to the void and support the opportunity for change. The literature shows the focus on operations and service to drive ridership, along with marketing campaigns that may provide short term behavioral changes. Urban design and infrastructure are noted as

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[85] Kathleen litera and Jennifer Marchbank, "Youth and Public Transit: A Knowledge Synthesis of Recent Publications," December 2021.

[86] MIT, "Desirable Streets: Where Do People Prefer to Walk?" MIT Senseable City Lab, 2021, https://senseable.mit.edu/desirable-streets/.

necessary support components that have not always been balanced among communities. Very limited educational outreach has been noted but the literature does indicate that at times of significant life change, behavioral changes are most likely to stick which supports providing education during the high school years as graduation is that major change moment.

The study that was conducted drew from this background and was a means to determine whether such an educational approach has merit.

CHAPTER 4

METHODOLOGY

A qualitative case study approach is appropriate to gather rich responses from subject matter experts related to using educational content to support and grow transit ridership, thus answering the research questions. Transit agency administrators have traditionally conducted short-term marketing campaigns occasionally complemented by rider training. Only a few leaders have conducted or are conducting limited educational activities. To address the minimal content in the literature, this qualitative study enabled expert input to advance the framework for curricular support of transit.

The study also included outreach to the leaders of various public agencies and quasi-governmental bodies (such as PIDs) to identify partnerships or policies and the gaps necessary to fill to support increased transit usage.

Interviews

The case study approach was appropriate to answer the research questions. The purpose of participant interviews was to identify existing programs, content, and experiences to inform the selection of meaningful subject areas for the envisioned educational curriculum centered around transit.

Merriam[87] provided in-depth guidance on conducting effective, people-oriented interviews; the skills needed to be a good observer; and how to glean knowledge from documents. The author recommended having a plan but remaining flexible as the

[87] Sharan Merriam and Elizabeth Tisdell, *Qualitative Research: A Guide to Design and Implementation* (Hoboken, NJ: Jossey-Bass, 2016).

research proceeds. There should be a focus on combining and interpreting what the interviewees say with what the interviewer has read and seen. The study approach could evolve as researchers learn more about the data gathered in the collection process.

Merriam[88] made several important observations about using a case study design to study education. A case study approach is appropriate to test a theory or idea and generally results in an "intensive, holistic description and analysis"[89] of the subject matter. The author identified three fundamental components of the case study approach: observation, interview, and document analysis.

Merriam's framework[90] for qualitative research provides the best structure for defining, studying, and answering the proposed study's questions. Generated ideas or learned concepts occurring during the interviews, data collection, and early data analysis may suggest a change in the questions or prompts used in the interview, which is acceptable in the framework. The data collection process involved extensive multimedia literature searches, participant interviews, and observation, as discussed in later chapters.

The proposed study's sample included individuals from various sectors of the transit industry, including transit agencies or authorities and industry support or advocacy organizations. Interviews with participating educators provided an exploration of the subject areas and structure of content as well as ideas for gaining acceptance in the school systems.

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[88] Sharan Merriam, "The Case Study in Educational Research: A Review of Selected LIterature," *The Journal of Educational Thought (JET)/Revue de La Pensée Éducative* 19, no. 3 (December 1985): 204–17.

[89] Ibid, 206.

[90] Merriam, *Qualitative Research*.

Transit personnel came from diverse agencies based on size, mode and geographic diversity. Agencies considered for inclusion were based on the most recent National Transit Database[91] and responses to requests for participation. The agencies that agreed to participate are Dallas Area Rapid Transit, Los Angeles Metro, VIA Transit, Alameda County Transportation Commission, CAPMetro, Washington Metro, and Jacksonville Transit.

Interview invitees varied within and between agencies. Agencies with programs (current or past) may have personnel involved with development, deployment, and evaluation. These individuals received an invitation to participate.

Most identified programs are short-term (one hour up to a full day) and combine on-request and organization-promoted content. The departments responsible for current activities or who would conduct programs include marketing, community relations, sustainability, and transit police. Some transit agency leaders (mainly in California) have created youth councils to increase youth's transit involvement. Reviewing these agencies, agendas, activities, and published materials will be a part of data collection in the proposed study. Including organizations that do not have programs is vital.

Invited industry leaders represented Office of Research, Demonstration, and Innovation at the Federal Transit Administration, and leadership from APTA and local government transit oversight organizations. Another industry perspective that was pursued is from Transportation Research Board Public Transit committee members representing academia, industry, and government.

[91] "National Transit Database Transit Agency Profiles" (Federal Transit Administrator, 2022), https://www.transit.dot.gov/ntd/transit-agency-profiles.

Participant recruitment occurred through professional networks and direct organizational contacts. In my professional role, I have been in contact with many of the organizations and individuals mentioned and will rely on those relationships to assist with recruitment. The proposed methodology allowed for both in-person and virtual interviews based on the participants' preference. All participants preferred virtual interviews.

Qualitative methodology includes no quantifiable measures of significance or correctness. Researchers have supported the quality of case study interview research but require demonstration that data included are *credible*, *thorough*, *valid*, *representative*, *reliable*, and *trustworthy,* as enumerated by Roulston,[92]. The next chapter describes in detail how this was accomplished using recording tools, transcripts, spreadsheets and participant verification for this study.

Kvale[93] suggested the best practices of obtaining rich answers from respondents, using short questions and long answers, performing follow-up during interviews, and conducting mid-interview interpretation and verification. This practice was employed during the interviews.

For the proposed case study, it was necessary to determine the correct questions to ask and the right people to interview. Using neutral language in the interview will increase the likelihood of study validity. Yazan[94] described Merriam's qualitative research style as constructionist, with the data provided by conversational interactions

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[92] Kathryn Roulston, "Considering Quality in Qualitative Interviewing," *Qualitative Research* 10, no. 2 (2010): 199–228, https://doi.org/10.1177/1468794109356739.

[93] Steinar Kvale, *Interviews: An Introduction to Qualitative Research Interviewing*, 1996.

[94] Bedrettin Yazan, "Three Approaches to Case Study Methods in Education: Yin, Merriam, and Stake," *The Qualitative Report* 20, no. 2 (2016): 134–52, https://doi.org/10.46743/2160-3715/2015.2102.

supplemented with other artifacts, such as documents. The sampling and recruitment strategies support having the right people in the interview. The interview guide submitted for Institutional Review Board (IRB) evaluation (incorporated in Appendix A and B in an updated form) includes the interview questions. The burden is on the researcher to properly administer and conduct the thematic analysis, demonstrating accuracy in the data representation.

Beyond ensuring due diligence during the data collection process, a researcher should ask respondents to validate the interview and ensure the accurate recording of questions and responses. A way to increase the credibility of the findings is triangulation, which involves using multiple data sources, investigators, or theories Yin[95] and Merriam and Tisdell[96] supported the use of multiple sources of data stressed the need for transparency and reflexivity (i.e., understanding a researcher's perspective and potential bias).

Miles, Huberman, and Saldaña[97] addressed the "goodness of analysis,"[98] which allows investigators to confirm the data, determine their dependability and credibility, and evaluate if the findings are potentially transferable. Creswell[99] also suggests building themes from multiple perspectives.

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[95] Robert Yin, *Case Study Research: Design and Methods*, 5th ed. (Thousand Oaks, CA: SAGE Publications, 2014).

[96] Merriam and Tisdell, *Qualitative Research*.

[97] Matthew B. Miles, A. M. Huberman, and Johnny Saldaña, *Qualitative Data Analysis: A Methods Sourcebook.*, 4th ed. (Thousand Oaks, CA: SAGE Publications, 2020).

[98] Ibid, 50.

[99] John W. Creswell, *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*, 4th ed. (Thousand Oaks, CA: SAGE Publications, 2014).

The literature showed the importance of triangulation in a case study[100] via the assessment of single-source research studies. Finding many flaws in studies with a single source, Smith concluded that using multiple sources increases research credibility. Briefly, the methodology employed by the author of this study was to conduct numerous interviews, categorize and compare responses looking for themes as well as any contrary inputs. The next chapter will detail the specific way in which this done and the resultant findings.

Social Media

Crowdsourcing has also been used for research projects to obtain input from individuals or groups that are focused on a particular topic. There are numerous social media platforms where this could be done and the one selected was Facebook™ based on on-going participation of the author with a group that is dedicated to transit. The group is called NUMTOT (New Urbanist Memes for Transit-Oriented Teens)[101] and for this study, a question was posed on the site that aligned with this research. The details of this interaction are presented in Chapter 6.

Further social media research was done by searching for content on YouTube™ from transit Youth Councils and then analyzing the content using the transcription method also employed for live interviews. The results are also included in the Chapter 6.

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[100] Pearl R. Smith, "Collecting Sufficient Evidence When Conducting a Case Study," *Qualitative Report* 23, no. 5 (2018): 1043–48, https://doi.org/10.46743/2160-3715/2018.3188.

[101] "New Urbanist Memes for Transit-Oriented Teens."

CHAPTER 5

CASE STUDIES EXPLORATION

The purpose of this qualitative case study was to develop and adopt an educational framework needed to create transit loyalty in youth through a partnership of transit organizations and academic institutions. This chapter presents the case studies, including the participants' organizations and roles, the research framework, and the study's thoroughness and credibility. Chapter 5 presents the interview findings. Table 3 shows the transit organizations where the participants worked, indicating the diversity in size, geography, population coverage, and services provided by the participating authorities.

Table 3. Characteristics of the transit agencies interviewed.[102]

Agency	State	Service area in square Miles	Population	Services	VOMS (vehicles operated in maximum service)	Average weekday unlinked trips	Annual passenger miles traveled
Jackson-ville	Florida	1,366	1.2M	Monorail Ferry Commuter Bus Demand Responsive Bus	208	19.7K	34M

[102] "National Transit Database Transit Agency Profiles."

Agency	State	Service area in square Miles	Population	Services	VOMS (vehicles operated in maximum service)	Average weekday unlinked trips	Annual passenger miles traveled
Alameda	Northern California	364	1.59M	Bus Bus Rapid Transit Commuter bus Demand responsive	546	91.5K	105M
DART	Texas	698	2.5M	Light rail Commuter rail Streetcar Demand responsive Bus Van pool	800	131K	256M
VIA	Texas	1,200	1.9M	Bus On demand Van pool	873	77K	123M
LA Metro	Southern California	4,100	10.4M	Light rail Bus Rapid Transit Heavy rail Bus Demand responsive Van pool	2509	780K	998M
WMATA	Washington, DC, Maryland, and Virginia	1,349	5.1M	Heavy rail Bus Demand responsive	2807	497K	670M
CAPMetro	Austin	542	1.3M	Hybrid rail Commuter bus Bus Demand responsive Van pool	629	63K	108M

Other organizations with interview participants included the Atlanta Regional Commission, Federal Transit Administration, Atlanta Transit Link Authority, and APTA. The participants were individuals who had worked in or researched the transit industry and educators from the University of California, Davis, and Gwinnett County Public Schools who had developed and deployed new middle and high school curricula.

The participants gave their permission to record the interviews for accuracy and analysis. All interview recordings and transcripts were destroyed after study completion. The study did not involve attributing comments to individuals or organizations, supporting free expression and sharing by interviewees.

Appendices A and B are the interview guides for transit agency staff and subject matter experts who did not represent specific agencies. Appendix C contains the interview guide for educators with and without transit experience or knowledge. The interviewees often shifted topics organically as they shared their thoughts, knowledge, and experiences with education programs. In those cases, the questions were prompts to gain additional detail or explore particular concepts.

Upon interview completion, each transcript underwent analysis in the following order:

1. Highlighting and extraction of relevant comments
2. Insertion of relevant comments into a spreadsheet with an extra column for categorization
3. Category selection for each comment (i.e., speaker background, educational content, existing program, recommendation, funding, general comment, and other information)

4. Comment-sorting by category
5. Comment coalescing per category to derive themes and pertinent input

All the interviews contained valuable insights into ongoing programs, including those with educational elements and content, and recommendations for potential subjects for inclusion. Chapter 6 presents the findings from data analysis. Local authorities structure transit agencies and house programs based on their internal mandates. The agency participants had worked in different areas, including marketing, media and communications, operations, and capital programming. Several interviewees were organization executives.

CHAPTER 6

REVIEW OF INTERVIEWS AND COMMON THEMES

This chapter presents the participants' ideas for bringing transit education into the high school environment. The chapter includes information shared about current programs, educational content, funding, and the participants' general observations.

Existing Programs in Transit and Associated Organizations

Leaders from agencies, public or philanthropic support organizations, and partner businesses can lead programming. Program success requires conceptually supportive internal leadership and staff resources for execution. Local elected officials or appointed boards may also support programming with buy-in of outreach efforts. Most participants indicated the importance of mobility and its positive impact on short- and long-term quality of life.

The participants reported that some programs focused on children or children and their families, particularly the How to Ride programs. Teachers could also receive training because some schools supported pass programs. Training and guides showed teachers how to use the bus or train, sometimes with travel training or travel buddies.

Operation Lifesaver for heavy rail is the national rail safety program required by some geographical regions. However, any organization can access the program with much of the content available on the web. The participants reported that some agency leaders adapted the content to the light rail. In areas with mandatory Operation Rail, the program typically applied only to schools within one-half mile of rail. Therefore, the program did not apply to or provide access to all schools.

The different pass programs (K–12, high school only, colleges and universities, businesses, seniors) varied in implementation. Transit agencies occasionally absorbed the full cost of school-based programs; in other instances, there were fees collected on a per-school, per-pass, or similar basis. In all cases, the ridership data collected for federal reporting reflected the use of those with passes, providing valuable information for federal funding.

Some school systems lacked buses or had limited service areas; others had partnerships with local transit agencies for pass programs. In addition, a few agencies produced easy-to-follow route maps or booklets for getting to school or key destinations to support public transportation for school access. Schools or transit agencies sometimes provide training in getting on and off buses, bus conduct, and other basic ridership skills. Although actual pass use varied significantly, all program participants reported that passes attracted riders to the system. The participants reported that up to 50 percent of eligible individuals used their passes. Interviewees also noted that ridership ranged from occasional to multiple trips daily. Some pass-holders boarded without using their passes; therefore, the participants' estimates may have fallen below actual usage.

Sustainability was a popular topic, particularly among the high-school-aged group, and was the focus of many current activities. Earth Day was an important rallying point for many organizations and student-focused activities. Some schools had contests and competitions thematically centered around the environment. Following are a few of the activities cited by the participants:

- Art (e.g., drawings and photos) for calendars, bus art, wraps, posters, and other messages related to the curriculum

- Theme-based but not curriculum-based public service announcements in high school
- Curriculum- or theme-based essay contests

The participants discussed the various collaborations to promote and introduce different transit aspects (e.g., transit system usage to workforce development) to target audiences. Partners included Big Brothers Big Sisters, Easter Seals, Boys and Girls Clubs, and large corporations. The members of local chapters of national organizations also developed transportation-run programs or student clubs (e.g., WTS International [advancing women, advancing transportation], Institute of Transportation Engineers, American Society of Civil Engineers). Organizations were sometimes engaged in partnerships to support transit-specific content, such as design competitions for high school or college students. Some partnerships presented challenges due to legal, insurance, and copyright issues. For example, complications sometimes occurred with potential partners with facilities producing revenue from parking, such as sports teams. In addition, the leaders from some organizations sometimes hesitated to engage in an exploration of potential collaborations.

Transit promotion covered the following topics: getting to school; visiting friends; or going to concerts, museums, work, movies, malls, events, and shopping centers. The marketing material and social media addressed these concepts differently based on the organization. Field trips using transit or to visit transit often occurred for the lower grades. Sometimes, personnel brought transit to school campuses for teaching purposes.

Increasing workforce shortages was another significant topic among the participants. Workforce shortages occurred due to a significant percentage of transit

workers approaching or entering retirement and a lack of people with the skills to perform transit-related work. In some programs, high school students visited transit facilities to learn about employment opportunities. Guest speakers also visited schools to speak with students about their work and the wide variety of employment opportunities in transit organizations. A popular program included canine dogs and transit police visiting schools.

Some participants discussed workforce development, including courses taught by transit staff about various employment areas. Some content strongly aligned with the concepts in this research, including planning for a major station renovation project.[103] The content was a means of engaging students in a major capital project and the physical and social infrastructure components. The lesson plan and support documents presented the very specific academic standards that would be met in the school district where the course was taught. Examples are shown below.

- RST.9-10.4 - Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
- RH.9-10.4 - Determine the meaning of words and phrases as they are used in a text, including vocabulary describing political, social, or economic aspects of history/social studies.

APTA convened representatives from academia, partner organizations (such as Latinos in Transit), private companies (such as consulting firms and manufacturers), and numerous transit agencies to produce a focused guide for workforce development. It

[103] "Building a Station: Next Stop: A Better Blue Line" (LA Metro, n.d.).

included a compilation[104] of workforce activities and opportunities to provide a framework as well as sample content to stimulate interest in transit-related careers. The guide included examples of program materials overlapping with the content usable in the classroom for education. Some partnerships included summer programs,[105] internships, and after-school programs with transit themes and issues.

Most transit agencies focused on community engagement for general information and project-specific purposes, such as information-gathering or dissemination. The community engagement was an opportunity to encounter, gather input from, or present educational components to young people. Youth councils were an emerging strategy for gaining input and feedback from high school students throughout the geography of the establishing entity. Some youth councils focused on transit topics; others included geographically based content for cross-cutting topical input. In some existing councils, young people worked on meaningful projects and received acknowledgment for their contributions. For example, the members of one council identified and assisted with modernizing an online tool. In many councils, young people could access all departments and have their ideas solicited for many topics. Youth also gained hands-on educational experiences about the transit system and supporting organizations.

Other types of outreach were means of branding or strengthening educational messaging. Back-to-school orientation allowed for transmitting information to students via passive sharing (e.g., flyers or brochures) or active engagement at school events. Many interviewees in this study indicated that students often loved prizes; therefore,

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[104] "Transit Workforce Readiness Guide" (American Public Transit Association: APTA Workforce Development and Educational Services Department, March 2021).

[105] "Summer Transportation Institute" (Mineta Transportation Institute, 2023).

organizations gave away T-shirts, hats, knickknacks, and other items, often during contests and competitions. One school used a retired rail car donated for teaching and training. Social media was the most frequently used platform for sharing transit information on travel, opportunities, and conditions, usually outages or disruptions. Some media posts had an educational component.

All transit agencies in this study had the goal of increasing ridership and recovery after dramatic losses due to the COVID-19 pandemic. Many agency leaders' goals applied to reducing barriers to transportation access via public transit. One agency had the goal of creating lifelong riders. At another agency, a school superintendent reported chronic absenteeism dropping from more than 50 percent to 20 percent after pass provision. In another case, students reported having money to purchase food due to pass provisions. Therefore, meeting basic needs and providing opportunities for a better future were a part of the transit story.

Educational Content

The interviews included an inquiry into subjects where educators could incorporate transit into the content. Classic K–12 school experiences included math problems involving trains moving toward each other at designated speeds at a certain distance, with calculations for their meeting. These problems are fundamental examples of transit in the curriculum.

The interviewees described integrating material into the classroom with current methods as challenging and limited. However, the participants viewed many subject areas as eligible for transit-based content, suggesting that students may be likelier to accept such content if it relates to the existing curriculum. Table 4 presents a summary of the

suggestions by subject matter. For each subject, there are one or more topics to develop.

Chapter 6 addresses these subjects in an educational or pedagogical context.

Table 4. Suggested topics by subject matter.

Subject area	Potential topics
Science and environmental	Air quality and your personal contribution to pollution, various fuel sources and technologies, inputs and outputs, climate, physics of the vehicle operation (bus, train, etc.)
Sustainability	Beyond environmental, having options, community focus
Technology	Smart City challenges related to transit future and different technologies in use or new modes, autonomous vehicle operation, sensors, and AI; develop a way for your smartphone to make using transit more engaging; hold a hackathon to have students develop transit-related or supportive apps
Safety	Walk to school, school bus/public bus safety, Safe Routes to School; compare stats of transit vs. driving
Mathematics	Figuring out transit fares, service planning (costs and coverage), use census data to analyze community needs across various demographics and economic factors.
Economics or personal finance (life skills)	Compare total cost of using transit vs. driving (including personal time, door-to-door, and comparison over an extended period of time, e.g., one year). Life skills: balancing a checkbook, filling out a job application, looking for an apartment, learning to navigate the city. Introduce resource limitations of real-world situations and tradeoffs. Personal mobility.
Social studies	Tie between social services and transit; history of various forms of transit; discuss civility, societal changes, homelessness, and mental health issues; mobility and equity; supply and demand
Government	Organizational structure of transit from Federal government through local jurisdictions, governance structure of a transit authority, funding mechanisms. Based on a recent proposal, calculate the savings to taxpayers if federal employees prioritized the use of green transportation modes whenever possible.
Geography	Maps, routes, schedules, local travel experiences
Health and physical education	Travel training demonstrating walking or bicycling components and health benefits, safety by mode

Subject area	Potential topics
Communications	Rail control center and all associated communications, public communications
Field trips	To a transit facility or using public transportation to a destination
Art class	Coloring books, art around annual theme or transit use (to the fair, to the museum) for different target age groups
Foreign language	Translating all materials into a wide variety of languages to serve the increasingly diverse population; making transit more accessible to non-English speakers; making transit more welcoming to people from places with other customs, habits, and experiences
Digital media class	Making videos for social media (how to ride a bus, a day/week/month in the life of a young transit rider -to school, to work, to fun places, to visit family); animation of all steps in riding transit; create coloring books (age appropriate); podcasts; digital guides to destinations
Careers	Hundreds of different jobs in transit field can be presented; meet with different types of people working for agency; paid internships
Other subject areas	Urban planning, organizational design, and behavioral science.

Another perspective on educational content related to the potential adoption of proposed materials. The subject matter experts suggested several strategies, including running pilot programs, providing detailed proposals to the approving body, and substituting discrete lesson plans. Chapter 7 presents these suggestions in detail.

The Mineta Transportation Institute Summer High School[106] summer program includes an environmental exercise. As indicated by a sample of the resource materials in Figure 19,[107] transit was part of the study subject. A portion of the assignment was to examine resource materials and other modes to determine options for trip types. The

[106] "Summer Transportation Institute."

[107] MIT and APTA, "'How We Move' Cards" (Mineta Transportation Institute, n.d.), https://transweb.sjsu.edu/workforce-development/how-we-move-cards.

assignment also included calculations of pollution and other environmental considerations. Field trips and a tour of the central subway and the high-speed rail construction site were also part of the assignment. The field trips and tours included discussing transit systems, surface transportation, urban planning, public policy, and the local economy. Of the students asked about their interest in transportation careers[108] after the three-week program, more than 40 percent had very strong interest, and 25 percent had a strong interest.

[108] Alverina Eka Weinardy, "2023 Mineta Summer Transportation Institute" (Mineta Transportation Institute, November 2023), https://transweb.sjsu.edu/sites/default/files/2366-Weinardy-Transportation-Careers-High-School-Students.pdf.

Figure 19. Sample of "How We Move" cards.

The University Transportation Center (UTC) known as STRIDE (Southeastern Transportation Research, Innovation, Development and Education) developed an educational brochure called "Transportation Engineering & Design Activities Grades 5 to 12" which includes several excellent examples of content, including the incorporation of transit into the larger transportation and community conversation. One example is shown in Figure 20.

Step 3: Evaluate Your Current Street

Complete Streets Evaluation	Score (1-10)
Sidewalks: are on both sides of the street, width is comfortable for passing and walking with someone, raised or separated from the road, free from obstacles	
Safe Crossings: clearly marked crosswalks, lights to stop traffic for crossing, median for pedestrians to stop in the middle of large streets, crosswalks are frequent	
Facilities for People with Disabilities: ramps at corners, smooth and even pavement, accessible pedestrian walk signals (with audible messages or vibrating surfaces), tactile pavement (e.g., bumps at corner for visually impaired)	
Public Transit Facilities: public transit services are present, separate lanes for buses, bus stops, clean seating and shelter at bus stops	
Bicycle Facilities: protected bike lanes, bike racks, bikeshare stations	
Car Facilities: one lane of traffic in each direction, speed bumps, roundabouts, and bump outs to slow traffic, separation between the driving lane and sidewalks	
Amenities: trees, rain gardens, benches, art or other features to make the space inviting	
Your Assessment: Does this street feel safe to you? Is it safe for an 8 year old to cross the street or ride a bike without an adult?	
TOTAL POINTS (out of 80 points) Your TOTAL POINTS ÷ 80 × 100 = ____ %	

Figure 20. STRIDE Engineering Design Example

Funding

All participants described transit funding and how it related to educational programs. The participants also mentioned common funding streams for transit agencies, particularly federal ones, for operations and capital expenditures. Some states have

funding streams focused on transit for operations and capital improvements. However, research and education on funding streams is limited.

Agencies' and authorities' funding comes from various forms beyond federal and state government resources, such as state or local sales tax, property tax, farebox revenue, advertising revenue, income from agency-owned leasing property, transportation improvement districts, toll revenue, other locally defined fees, or private investments or partnerships. Each funding source has rules regarding the funds' use. Some sources have formula-based rules, whereas others provide discretionary funds based on availability and amount. The participants noted that each pass program agency had a funding structure with common elements or overlap; however, no two received funds similarly.

Pass programs may cost schools nothing, a flat amount, a flat fee per enrolled student, or a flat fee per pass. The agency participants in this study had varied perspectives on pass program costs. Some participants stated that school pass programs had negligible, mostly administrative, costs. Other participants reported pass programs with much higher costs due to additional vehicles and operators to accommodate the magnitude of trips from users attracted to the system. Some participants described the administrative costs as very high but considered the return on investment worth the expenditure.

All participants noted that drivers counted riders for annual ridership reporting, but the methods varied. Some drivers counted scanned passes, and others conducted manual rider counts. Several agency participants identified issues with students not using their passes or fare evading—even when the fare cost nothing—when operators

attempted to capture ridership data accurately. Although the operators always allowed students to ride, capturing ridership data was a way to increase federal program funding.

Agencies received some funding from school districts providing bus service. The participants reported that public transportation agencies sometimes provided financial advantages to the schools as a strategy to encourage transit ridership. At schools receiving financial advantages, leaders could reduce the costs of operating school bus networks and allocate funds to other purposes.

Educational programs generally lack funding or are underfunded. Operational budgets or grants provide the most funds for programs. School leaders cannot use federal funding for marketing but may access funds for some educational efforts. School districts generally provide funding to individual schools for busing students, regardless of whether students use the bus. If students can use public transport for little or no cost to the school, leaders can reallocate the dollars they receive for other purposes. Only one agency in this study received a grant from a private company to support a student pass program.

General Observations

A theme repeated by most participants was the burden placed on teachers who had to cover significant material with limited resources. Any teaching materials that relate directly to the curriculum would help teachers feel less burdened and easily create lesson plans. Behavioral changes require consistency. Because students watch and model family behavior, educating the whole family is necessary. School events are an opportunity to educate children and their families. Early programs for elementary students are another way to educate children. Older students could receive messages that transit can provide the freedom that cars cannot before and after they reach driving age.

Several participants discussed how driver licensure messages often cause individuals to equate licenses with freedom and adulthood without addressing other transportation modes. However, most participants noted that millennials and younger cohorts pursue driver licensure at lower rates, waiting until they are older. Transportation network companies like Lyft and Uber and shared mobility tools (e.g., bikes and scooters) account for numerous trips.

Many people in the target age group tend to focus on the environment and climate-based work. Therefore, younger people may find messages regarding the benefits of transit for the environment appealing. Figure 20 is a sample of a graphic for some of these conversations. Messages can present transit as a lifestyle choice that includes walking and numerous health and environmental benefits.

Utility companies may be good partners for conversations regarding the climate and alternative-fuel fleets. Transit promotion efforts could include linking community outreach programs and content. Some large companies have locations near public transit that attract the workforce, including high school and college students. Workforce needs and opportunities in the transit industry are another avenue for educating young adults on more than transit safety.

One agency focused on creating lifelong transit loyalty provided pass programs from infancy through college and into the workforce. Other agencies had limited versions of these pass programs while testing for creatively and cost-effectively growing pass programs. Although technology has become ubiquitous, many communities lack access to technology and have unaddressed needs. The participants expressed the desire to use technology to teach about and even gamify transit to make it fun for riders.

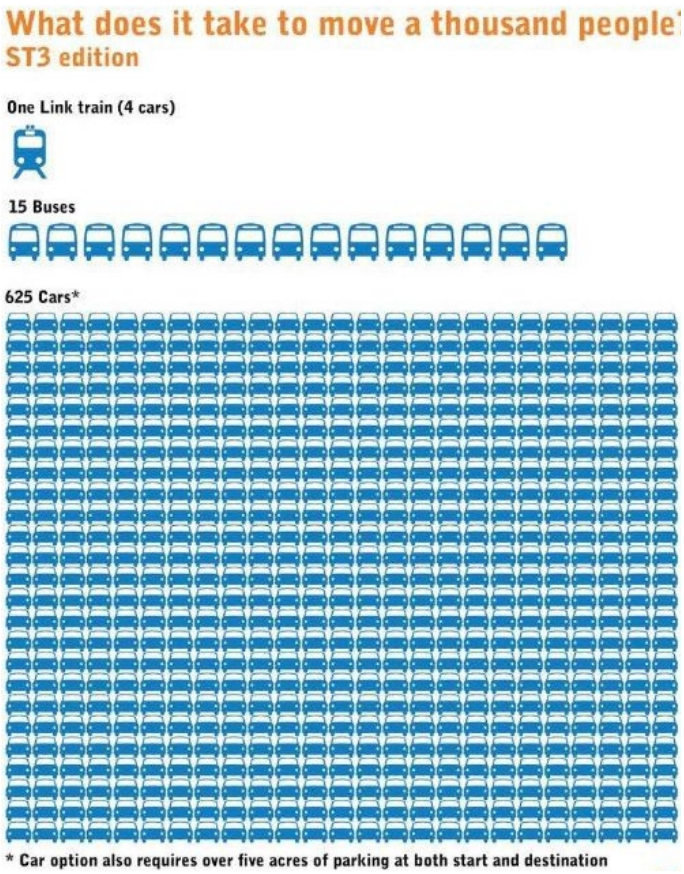

Figure 21. Sample graphic for incorporation into environmental or sustainability material.[109]

One agency focused on lifelong transit loyalty provided pass programs from infancy through college and into the workforce. Other agencies had limited versions undergoing testing for creatively and cost-effectively growing pass programs. Although technology has become ubiquitous, many communities lack access to technology and have unaddressed needs. The participants expressed the desire to use the technology to teach about and even gamify transit to make it fun for riders. One agency representative

[109] "Reddit Coolguides Community – Picture Based Reference Guides," 2021, https://www.reddit.com/r/coolguides/comments/tk3q9h/how_to_move_1000_people/.

noted that people live in a TikTok world where they must explain themselves in five minutes or less. Thus, social media has contributed to a shorter attention span.

Adolescents have also engaged in creating transit-focused content. Figure 21 is a screenshot of a video from Transit Center, a foundation to achieve a better future through abundant public transportation options. The video creation occurred in collaboration with teenagers in New York City.

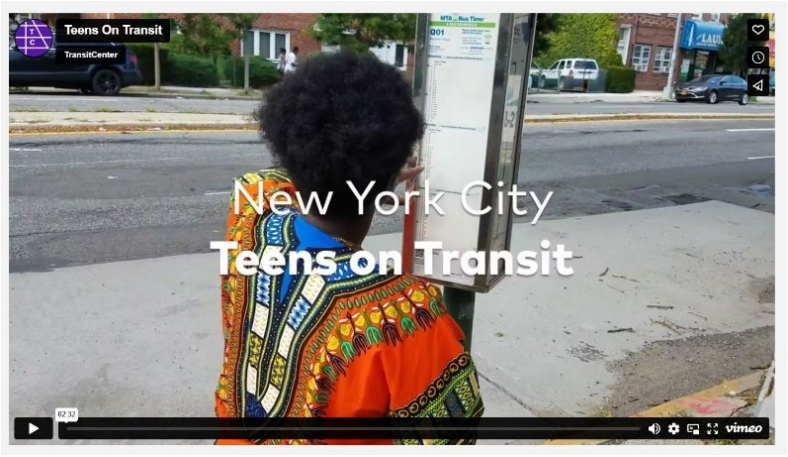

Figure 22. Sample video demonstrating teen engagement in messaging and content development.[110]

Young people could benefit from learning about or developing applications that provide real-time location information about buses and trains to encourage use. Agencies could present the following campaigns:

- Taking pictures of oneself studying in transit
- Showing oneself enjoying the trip in transit

[110] *New York City Teens on Transit*, 2017, https://transitcenter.org/teens-on-transit/.

- Using themes, such as ride with the person one loves on Valentine's Day, to post pictures
- Posting videos of traveling someplace fun or important

Giveaway promotional items or prizes could be a way to encourage virtual engagement; however, many participants may enjoy gaining views for their content. Campaigns could be part of class assignments or marketing efforts.

Several participants advised against using messages positioning the car versus transit, which could involve bias. The participants suggested examining all modes of transportation for elements such as cost, flexibility, responsibility, health, and environment. The participants also felt there was too much negative commentary in the public space about transit that causes parents to hesitate to allow their children to use public transit. Some participants believed many parents lacked the facts to counter the headlines.

Some locations studied had mandated driver's education, which was prevalent at many agencies. However, several participants questioned why driver's education was not mobility education that addressed all transportation modes. For example, the increasing use of bicycles and scooters for transportation and the associated safety issues may indicate the need for more comprehensive training in operation and safety. The participants also noted that riders often used bicycles and scooters to cover the first- or last-mile connections to and from transit.

Many individuals perceive public transit and the associated vehicles as dull, dirty, and unsafe. Therefore, agency leaders should make changes and move away from popular public perceptions of transit and vehicle appearance. Many young people find high-tech

and smart tech appealing. Bus rapid transit is an example of updated technology. Although the bus remains a rubber-tired vehicle on the street, the vehicle appears more high-tech, more like an upscale train; has stations, not just stops; and often has art displays. In addition, the bus has dedicated lanes for speedier trips. Several participants noted the need to focus on modal attributes and their contribution to success.

The participants also discussed the increased use of project-based or active learning in school systems. In some schools, active learning occurs with science, technology, engineering, and math (STEM) or science, technology, engineering, art, and math (STEAM). However, educators in other schools have used active learning for other subjects. Active learning may be useful for bringing broader transit content into the classroom. Active learning involves doing something and working in real-world conditions. The participants noted the effectiveness of asking provocative questions and having students research to find answers or create something. This learning method was also an effective means of fostering enthusiasm and passion for the subject matter.

Experiential learning could include riding the available systems to motivate behavioral change. Educators could issue the assignment more as a challenge and cover various metrics, particularly those that students can measure or calculate. In experiential learning, students could look at the impact of their carbon footprint and calculate alternatives for different behavioral choices. An example of an activity would be comparing the safety (i.e., chances of injury or death) while riding public transit versus in a car.

A participant recommendation was to create an assignment to travel without driving for a month in an area with transit. Students could keep diaries about trips, how

they accomplished the travel, the challenges they faced, and personal impressions. The interviewee believed such an assignment would have a greater impact than just teaching the concepts in a classroom. One program provided in-depth experience and involved engaging high school students in a project to modernize a rail station. The students inventoried conditions; engaged with the community; recommended improvements within a stated budget; incorporated safety; and suggested security features, neighborhood connectivity, bicycle accommodations, and art.

Other participants suggested addressing health impacts, such as obesity and asthma, using Centers for Disease Control and Prevention data, noting the impact of translating the broad statistics for individual and personal health outcomes. Health data could also contribute to discussions of other life choices, such as where to live to access transit. Education about transit could provide more information; however, students may gain limited transit experiences if they live in areas without a transit system. The lack of transit options could affect future choices.

The participants shared several examples of young people realizing they would lack access to educational opportunities at the high school, community, or college levels without public transit. One transit system was a participant in a grant-funded research project on how students benefitted from access to transit. The project found that students who used the pass program had measurably higher graduation rates (27 percent) than other students at the same school. One participant noted that people in the system read and completed their homework, gaining the time to pursue their college degrees by commuting via transit.

Many young people look to have their voices heard. The participants reported several approaches to support young people in contributing constructively to society, such as youth councils and leadership programs. One of the leadership programs included a hands-on project, travel in the students' regions via transit, and opportunities to develop and present matters to the organization's board. Thus, leadership programs could include content centered on transit. Some challenges with advancing educational content in schools included dealing with and gaining approval from school boards, varied academic requirements in school districts, limited transit agency resources to create the content, and no consistency in overlap of service areas and school program areas. Also, some politicians lacked information or understanding of the value proposition associated with investing in this type of educational approach.

There is no cohesive programmatic approach to addressing ridership issues due to the local allocation of the funds sent to transit agencies. Partnerships could be a way to support the future of transit. One participant noted that nonprofit staff and local community members sought to determine and address needs; however, private organizations had the ability for development and scale.

Relevant, Publicly Available, or Collected Commentary

The study included sources in addition to the expert interviews, such as the private Facebook group NUMTOT[111] and several youth council videos[112] on YouTube.

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[111] "New Urbanist Memes for Transit-Oriented Teens."

[112] San Francisco Municipal Transportation Agency. "SFMTA Youth Town Hall Presented by the Agency's Youth Transportation Advisory Board." September 18, 2021. Educational video, 1:39:54. https://www.youtube.com/watch?v=KBjms0yN22kw; Sunline, *Earth Day 2023*, 2023; *Metro Youth Council 2022*, 2023, https://www.youtube.com/watch?v=UJd1fZ6R-Bw; King County Metro, "Youth for

The purpose was to learn from people who represented the target audience without conducting interviews due to research restrictions.

NUMTOT was the Facebook page used to post this question: How would you educate or encourage high school students to become transit devotees? Following are the constructive responses related to educational opportunities:

- Student exchange program to a city with highly rated transit system
- Transit club
- A study of Robert Moses, Jane Jacobs, and the Big Dig
- Guest speakers like City Nerd (http://www.youtube.com/@CityNerd), RM Transit (https://www.youtube.com/@RMTransit), and Alan Fisher (https://www.youtube.com/@alanthefisher)
- Lessons about transit options on Google Maps

Transcripts of publicly posted videos from multiple youth council meetings and events underwent a similar analysis as the interviews with transit and education experts. The participants' suggestions included the following:

- Discussing transit in different subjects, such as budget, race and equity, system security, and planning.
- Educating peers to dispel the bias about public transportation to eliminate the negative stigma of public transit.
- Investing in children is investing in the future and the community's well-being.

Equitable Streets--Youth Perspectives on Transit," YouTube, July 1, 2021, Educational video, 6:54, https://www.youtube.com/watch?v=RPoS3rLgqNg&t=23s.

- Organizing a Transit Tuesday event focused on keeping the earth sustainable.
- Educating people that transit contributes to sustainability by researching and using hydrofuel cell technology and zero emissions.
- Holding a Sunday Streets event with tables for street teams to distribute materials about transit.

Youth Perspectives on Transit[113] included the following noteworthy quote:

> It would be cool if someone from the transportation place could come to a high school and kind of talk about it [transit] in front of a lot of high schoolers, or have our school news [with] a segment [on transit] or some way to reach a lot of high schoolers per school to kind of explain how transportation works. It would be great because a lot of people just don't really know how it works, and that it's mostly safe would be a good thing to hear from an adult.[114]

The author's focus was developing ridership and ridership loyalty. Participants believed that success occurred when individuals valued transit, regardless of whether they used transit. Public transit could be a success if people live their best lives through mobility opportunities. The participants believed in supporting the economic engine of a community where people could connect with opportunity. The participants' insights showed the value of education and transit, not just ridership.

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[113] *Youth for Equitable Streets—Youth Perspectives on Transit*.
[114] Ibid, 31.

CHAPTER 7

DISCUSSION OF RECOMMENDATIONS

Advancing the findings of this study requires showing the outcomes had sufficient value to warrant the investments in developing and promoting educational content for transit ridership. After reviewing the input, some value propositions emerged in support of education for students to become lifelong transit loyalists:

- Increased ridership (which also supports better service)
- Increased public support (even from non-riders)
- Access to education
- Access to jobs
- Access to basic services
- Money saved using transit is available for food and other expenses
- Wealth-building opportunities through education, good health, and participation in the workforce.

Transportation and Transit Curriculum Identified for Reference

A baseline of sample curriculum exists to present as a starting point for more complete and comprehensive development. There are college-level courses for transit available for planning or engineering students. Therefore, it is possible to draw from and tailor the content from college-level courses to fit the high school curriculum and meet the required academic knowledge and skills (AKS). One example of such course modules address data collection, facilities, service planning and standards, route design, station

planning, economics, public engagement, transit-oriented development, timetables and scheduling, the planning process, regulation and finance, communications, marketing and branding, policy and technology.

Further, the Southeastern Transportation Research, Innovation, Development and Education (STRIDE) Center produced course material, well-aligned with transit education for grade 5-12 students using a federally funded grant.

An Oregon Transportation Research and Education Consortium program produced educational materials for the Young Scholars Program with the theme of transportation. The educational material could be a handbook or workbook or undergo adaptation for other educational programs. The learning objectives for the curriculum were to support making tradeoffs in communities, support community decision-making, examine competing priorities and informed recommendations, increase knowledge, develop math skills, engage in interdisciplinary learning, and better understand public processes. Other topics in the curriculum included the following:

- Business: The availability of public transportation, ease of access to businesses, and the impact of transportation on businesses
- Chemistry: The development of renewable energy technologies
- Health policy: The analysis of health outcomes based on residential demographics, mobility concerns, and access to health care
- Urban planning: The consideration of public input in transportation planning, especially in underserved communities
- Arts and culture: An analysis of diverse stakeholders, such as artisans and consumers, and the improvement of public spaces via art

- Environmental sociology: The consideration of proposed changes to community infrastructure and small businesses. How will the changes affect the community's economy? What is the impact on the environment? What are the related sustainability issues found through citizen interviews around the city?

The National Institute for Transportation and Communities (NITC) is a federally funded U.S. Department of Transportation center for livable communities. The NITC produced the Multimodal Transportation Planning Curriculum for Urban Planning Programs.[115] The curriculum is an example of material potentially adaptable for high schools, with topics such as inventorying transportation assets, developing a vision statement, setting priorities, and using geographic information systems for transit planning.

Georgia Tech received federal funding to develop a transit course in their Transit-Serving Communities Optimally, Responsively, and Efficiently (T-SCORE) Center. Figure 22 shows the course topics.

[115] Kristina Williams, "Phase 2 Multimodal Transportation Planning Applications Curriculum for Urban Planning Programs" (National Institute for Transportation and Communities, December 2016), https://ppms.trec.pdx.edu/media/project_files/NITC-ED-998.pdf.

Figure 23. Transit course curriculum by T-SCORE.[116]

In addition to the lecture material, the course includes class and homework exercises, as shown in Figure 23.

[116] Georgia Tech. "Transit Course," Transit-Serving Communities Optimally, Responsively and Efficiently Center, 2021, https://tscore.gatech.edu/education/transit-course/.

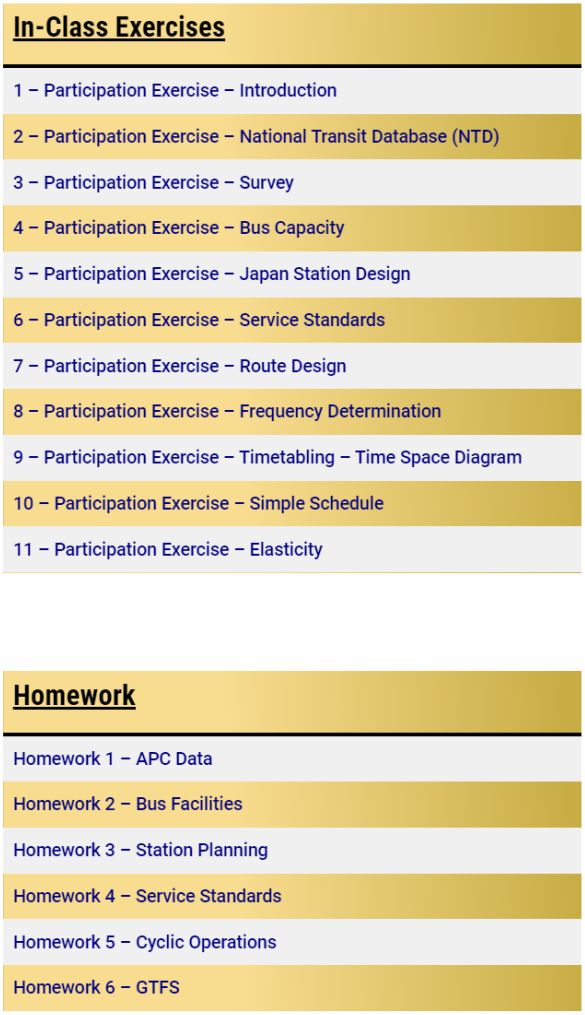

Figure 24. Class and homework exercises.[117]

The materials underwent adaptations for a summer camp by a foundation for high school students to learn more about data science and computer programming.

A research participant shared an example of integrating transit into an active learning experience with a youth group. The active learning experience included economics, community engagement, and problem-solving. After dividing the students into four groups, the youth participant groups were assigned a persona, such as a senior

[117] T-SCORE.

adult needing to get to a doctor's appointment and an exercise class at a community center, or a teenager who had to get to school and an after-school job, and pick up groceries on the way home. The students discussed their personas and priorities, the service frequency needed, desired stop locations, and other useful system features. The students then received information about the cost of operating buses. Afterward, the students came together and reported on their proposed systems, discovering their differences and finding how they focused on only their personas' needs. The young people learned to consider service and cost tradeoffs and the needs of others in decision-making to build a system for everyone.

Discussion of Academic Knowledge and Skills (AKS) as the Framework

The following are four actual school system AKS examples, followed by the suggested transit curriculum: a high school social studies unit on economics and personal finance in Gwinnett County, Georgia; an example from TEKS; an example from Florida; and an example from the State of Georgia Standards of Excellence.

- Gwinnett Economics and Personal Finance:[118]
    - Analyze how economic systems influence the choices of individuals, businesses, and governments.
    - Analyze factors that affect the standard of living of individuals and nations.

[118] "Gwinnett County Public Schools, "High School Social Studies – Economics and Personal Finance," 2024, https://www.gcpsk12.org/Page/33163.

- Texas Economics with Emphasis on the Free Enterprise System and Its Benefits[119]
    - Explain the benefits of the U.S. free enterprise system, including individual freedom of consumers and producers, the variety of goods, responsive prices, investment opportunities, and wealth creation.
    - Analyze recent changes in the basic characteristics of the U.S. economy, including private property, incentives, economic freedom, competition, and the limited role of government.
- Florida Standards for Economics[120] focuses on the national economy's institutions, structure, and functions:
    - Identify and explain broad economic goals.
    - Use a decision-making model to analyze a public policy.
    - Research the contributions of entrepreneurs, inventors, and other key individuals from various gender, social, and ethnic backgrounds in developing the United States.
- Georgia Social Studies Standards of Excellence[121] focuses on the factors that affect the standard of living for individuals and nations.

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[119] "Texas Essential Knowledge and Skills for Social Studies Subchapter C. High School," Texas Education Agency, August 2022, https://tea.texas.gov/about-tea/laws-and-rules/sboe-rules-tac/sboe-tac-currently-in-effect/ch113c.pdf.

[120] "Florida's State Academic Standards – Social Studies, 2023," Florida Department of Education, 2022, https://www.fldoe.org/core/fileparse.php/20578/urlt/5-3.pdf.

[121] "Social Studies Georgia Standards of Excellence: Personal Finance and Economics" (Georgia Department of Education, December 2021), https://www.georgiastandards.org/Georgia-Standards/Pages/Social-Studies-Economics.aspx.

- Explain how investments in human capital (e.g., education, job training, and health care) can contribute to a higher standard of living.
- Explain how investments in equipment and technology can contribute to economic growth.
- Explain how individuals, businesses, and governments benefit from specialization and voluntary, nonfraudulent trade.
- Illustrate economic growth with a production possibilities curve.

Similar topics showed that although the titles or requirements may vary by school district, the courses had themes useful for integrating and teaching transit-centered information in standard high school courses.

According to the DART website, the On The GO! Program has a TEKS-aligned curriculum (https://www.dart.org/about/news-and-events/transit-education/resources) for easy substitution for lessons in the curriculum. The curriculum contains content targeted at elementary grades.

Potential Curriculum Form

Some schools have a teaching method called Project Based Learning (PBL). In PBL, a project is a central theme for the entire unit, generally spanning one school quarter, with all subjects covered through that theme. The goals of the PBL process are discovery and collaboration, not lectures. Therefore, the students are active participants in teaching and learning. The participating educators in this study emphasized the value of PBL for student engagement. One participant noted that students in the PBL cohort had consistently higher test scores.

Transit is relevant to many subject areas, including engineering, science, math, language arts, art, geography, and other subjects. The participants felt the PBL environment was a natural fit for addressing transit as a theme for one or more study units. Guest speakers and opportunities to visit physical locations also contribute to an enriching learning experience. Another participant suggested using the transit environment as a topic for capstone, individual, or group projects. Students could select topics in conjunction with transit partners and present their work to their class or school.

Alternate Channels for Curriculum Distribution

Publicly available internet sites regularly used by teachers could be another avenue for getting materials to classrooms. For example, the K–12 Internet Resource Center[122] website provides links to free materials from different organizations for each grade level by subject area. A search for transit, trains, and buses did not find any content on the website, but transportation as a keyword resulted in the following discovery:

[122] "K–12 Internet Resource Center" (K12IRC, varies), https://k12irc.org/.

Figure 25. Transportation content discovered through K–12 Educational Resource website.

The website also contains a thematic unit studies component without listings for any form of transportation. However, the component has many categories for embedding transit topics into the content. In addition, there could be a transportation category created to provide transit content.

The participants reported that most school systems or states had standardized testing in main subject areas. Therefore, there is a need for content that enables students to test well on material that also includes transit topics.

Examples of Educational Content Meeting Academic Requirements

This chapter included a summary of the interviewees' input, the subjects, and topics to incorporate into academic courses. However, there is a need to take the findings further to show how these subjects and topics may address the requirements of educational governing bodies. Table 5 provides examples of select high school subjects, the academic knowledge gained, and the associated skills.

Table 5. Samples of academic subjects and transit-related content with AKS identified.

Subject	Content title	Academic knowledge	Skills
Mathematics	Data Analysis in Transit	Using census data or GTFs (general transit feed specification) analyze transit operations	Gathering, manipulating and interpreting data, statistics
Economics	Funding of Transportation	Economic factors, government regulation, taxation	Data analysis, interpretation of policies
Geography	Planning Transit Networks	Building networks Analyzing movement of people and equipment	Use of technology such as Geographic Information Systems
Biology	Impacts of Transit Use on Health	Identifying health effects of walking Identifying health effects of air pollution	Gathering data and interpreting, statistics
Physics	Operating Transit in Mixed Traffic	Identifying attributes of different types of buses (propulsion systems, braking systems, etc.)	Gathering data and calculating speeds, momentum, braking and safety implications
Engineering or Science	Sustainable Transportation Systems	Sustainability, Infrastructure, Technology	Gathering information and data on different systems, defining sustainability and identifying transit impacts

Subject	Content title	Academic knowledge	Skills
Chemistry	Powering Public Transport and the Environmental Impacts	Identifying power sources and attributes; understanding chemical reactions	Understanding fuel consumption and pollution; exploring alternatives
Political Science or Social Studies	Transit Around the World	Identify several countries and research the available transit options	Understand the cultural matters surrounding the use of transit.
Health Education	Physical and Mental Health	Identify the Psychological impacts of exercise and stress	Gather concepts of different forms of exercise and different forms stress. Analyze the relationship related to transit as a tool.
Journalism	Reporting on Transit Issues	Identify current issues and trends in a local community	Gather information about the commute habits, the policies and the options available.

Other activities associated with academic requirements that could be incorporated into the school day or occur outside of class hours or the classroom include scavenger hunts, transit field trips, development of transit games,[123] transit design competition, and speaker series.

Multiple participants suggested connecting with or adapting a program for transit, recommending the Safe Routes to School program. The extant program focuses on elementary and middle schools but could apply to the high school level. The most

[123] Carolyn Pang et al., "City Explorer: Gamifying Public Transit Trips While Exploring the City," in *Proceedings of the 2017 CHI Conference Extended Abstracts on Human Factors in Computing Systems* (CHI '17: CHI Conference on Human Factors in Computing Systems, Denver Colorado USA: ACM, 2017), 2825–32, https://doi.org/10.1145/3027063.3053252.

transferable program elements are the training for safely traveling to school and the focus on infrastructure for walking, cycling, or scooting to school. Educators or program leaders could enhance programs to include public transit.

Examples of Policy Areas to Support Transit

Policy is an important part of transit education discussions. Setting and implementing public policies is rarely led by transit entities, however, their input to the governments that have that responsibility is critical. First, there should be education to support identifying and understanding needed policies. Second, there is a need to develop and promote good policies. The NITC Multimodal Transportation Planning Curriculum[124] presents several examples for policy. See Table 6 for an example.[125].

Table 6. NITC policy examples.

Topic	Establishing multimodal policies and strategies – network improvement
Objectives	This lesson walks students through the Mobility Review Guide, including the major roadway network; local street network; and bicycle, pedestrian, and transit network. After completing the lesson, students will be able to: • Review and assess multimodal policies, strategies, and projects in a local plan relative to: • The major roadway network • The local street network • The bicycle/pedestrian network • The transit network; and • Develop recommendations for possible goals, objectives, and policies to the above criteria

[124] Kristina Williams, "Phase 2 Multimodal Transportation Planning Applications Curriculum for Urban Planning Programs." (National Institute for Transportation and Communities, December 2016.)

[125] Ibid, 33.

Tools and Resources for Supporting Policy Development and Implementation

Another educational resource is the Smart Growth Implementation Toolkit: Smart Growth Code and Zoning Audit.[126] The toolkit is a guide to better understanding community codes and zoning regulations. Thus, the toolkit could provide a policy context for educational content and real-world transit activation conversations. Individuals may use the toolkit to audit community codes and zoning regulations, review specific topics (e.g., street connectivity) related to codes and zoning regulations, and review proposed changes to the codes and regulations.

There are many ways to make policies more supportive of transit in planning documents, transportation plans, and the budget allocation process. Adopted policies apply to the local jurisdiction and those who build within that geography. The jurisdiction's budget affects the projects implemented. Infrastructure projects cannot occur without funding.

The following are examples of how to draft and take relevant policies through the locally mandated adoption process:

- Jurisdiction leaders could require the incorporation of non-motorized transportation in designs and plans during the development review process. Non-motorized transportation could include sidewalks and bicycle and scooter facilities.

[126] Smart Growth America, "Smart Growth Implementation Toolkit," https://smartgrowthamerica.org/resources/smart-growth-implementation-toolkit/.

- Interconnected, unobstructed pedestrian routes should be part of any public or private development or transportation project.
- Jurisdiction leaders should coordinate with local public transportation entities to identify mutually acceptable locations for transit facilities and connections to sidewalks and bicycle networks.
- Jurisdiction administrators should require plans for maximizing bicycle, pedestrian, and transit connections in new developments and redevelopments, including those internal to the development. Such plans should also address minimizing travel distance via movement in any direction (e.g., no cul-de-sacs) and maximizing bicycle, pedestrian and transit connections.
- Land use policies and regulations should align with mobility-friendly sites and building designs.
- There should be requirements for safe and adequate bike and pedestrian facilities between residential and nonresidential land.
- Alternate mode factors may contribute to reducing vehicular trips and mobility or impact fees.
- There should be opportunities to offer transit incentives to groups.
- There should be plans to address physical impediments, such as sidewalk gaps, deteriorated sidewalks, and poor drainage ditches or landscape design.

Adequate infrastructure would require significant funding. The participants repeatedly described infrastructure as limited in public budgets. Strong policies that support mobility could be key to ensuring that responsibility for implementation extends

beyond the local jurisdiction. All entities related to developing or creating infrastructure in an area should participate, consulting existing policies for guidance.

This chapter framed a variety of ways in which high school curriculum could include content related to transit that would both meet academic requirements and support a more multi-modal, transit-oriented way of thinking about fulfilling transportation needs. In the final chapter, the steps for implementation will be explored, including those that the author intends to pursue.

CHAPTER 8

CONCLUSIONS

Interviews with subject matter experts in the areas of transit marketing, customer experience, planning, communications, operations, capital programs, public policy, and education, provided the majority of the data for this study. Additional inspiration was drawn from relevant social media and personal experience. Little exists in the literature because to date the efforts have largely been one-time activities that are not robust, regularly presented or programmatic in nature. Many activities are focused on younger children with a very limited scope or lasting impact.

Expenditures by transit agencies generally fall into three main categories: capital, operating and preventative maintenance. The most recent report[127] based on the National Transportation Database (NTD) cited that there were almost 3000 transit agencies, delivering 5.9 billion passenger trip which represents approximately 60 percent of pre-COVID ridership. Large and medium-sized agencies spent $8B on capital improvements, $18B on operating expenses and $1B on preventative maintenance. The Bipartisan Infrastructure Law[128] provided up to $108B in the following categories: workforce and rider safety, modernizing infrastructure, addressing climate impact and equity. With all of these significant investments in systems and staffing, there is currently no readily identifiable or consistently dedicated funding to build ridership for the long term. The

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[127] "2022 Single Summary of Transit" (Federal Transit Administration, Office of Budget and Policy, 2023).
[128] 117th Congress, "Infrastructure Investment and Jobs Act."

author contends, and the research supports, long term health of transit requires more ridership and that this can, in part, be fulfilled through education of high school student.

According to the research results, there are opportunities to create transit-focused and policy supportive content that aligns with high school academic knowledge and skills requirements while informing this cohort about all aspects of transit. Such a comprehensive approach can be informative but can also influence mode choices as these young adults become more and more responsible for decision-making in their own lives. The Youth Councils that have recently been formed, although very limited in number, are an indication that this is one potential tool for advancing transit education and engagement of high school students. It is the author's contention that investing in teaching youth about transit will develop ridership and support the continued investment in transit systems.

The following sections outline some of the paths that can be followed to advance the concepts with the goal of actual implementation. Ultimately, it will take a champion (individual and/or organization) to ignite the associated communities who will be needed to support, fund, and implement these ideas.

Guiding Framework for Next Steps

Below is a simple graphic that demonstrates how to prepare the information that can be shared with the noted organizations (or others) to maximize the likelihood that some or all of the concepts presented will move forward. In the early stages, with the input of key partners and informed by the work reported in this document, a Central Theme should be developed as a way to convey the intent for this mission. Each element will be discussed in the sections that follow.

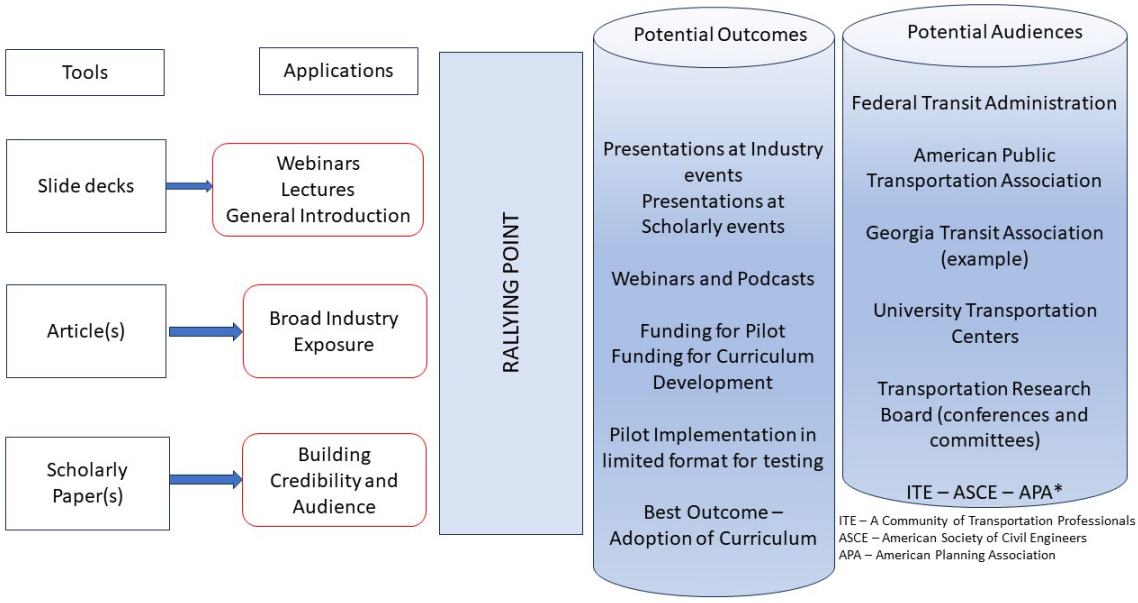

Figure 26. Moving from ideas to implementation.

Tools: Production of Content to Tell the Story

The research that was done for this work is sufficiently comprehensive to provide content to tell the story to many different audiences. Outreach needs to be done in different ways for the public sector, private enterprise, technical and non-technical organizations, and academia to receive that message in a way that fits their framework the best.

Slide decks should range from high powered, concise pitch decks to very detailed, including all the theory behind the concepts with the target audience in mind. At least one should be more animated and turned into a short video that can be shared widely, even promoted through social media. One goal of disseminating these decks is to excite others who are similarly devoted to the success of transit and has a basic understanding of the

need to develop transit ridership. That individual or group will be more likely to join the effort given the facts, concepts and tools.

There are many magazine publications in the United States that are candidate for sharing the ideas presented in this dissertation. They include Mass Transit™, Metro Magazine™, TR News Magazine™ and APTA's Passenger Transport™. In addition, there are the more technical publications such as the ITE – Community of Transportation Professionals Journal™, Planning Magazine™, and the newsletter of the American Society of Civil Engineers' Transportation and Development Institute.

Engaging academics and practitioners for additional research and development of the concepts offered can be accomplished by presenting and/or publishing scholarly papers. The places that are most beneficial to publish such works include: Transportation Research Board (e.g. Transportation Research Record™, conference proceedings or podium sessions), Journal of the American Planning Association™, Journal of Urban Planning and Development™, as well as the APTA Mobility Conference or TRANSform™ event.

Application of the Tools

Using the tools described above, the author and others who are dedicated to multi-modal transportation solutions will be armed with material to share the concepts with policymakers, decision makers and funding partners. Beginning with self-publishing opportunities such as LinkedIn™ and YouTube™, the ideas can be shared broadly.

For the more focused or targeted outreach, key potential partners need to be identified early and engaged. It is proposed that the Federal Transit Administration and

APTA be the main focal points for the next steps. The individual transit agencies involved in the research can also be approached for support to continue this work. Their participation would be more likely to succeed with broader industry support. While the early work with these organizations is continuing, pursuing speaking and publishing opportunities on both the academic front and in the industry realm should be the focus.

Audiences and Desired Outcomes

As mentioned earlier, the first outcome that is to be pursued is a Central Theme establishing this as a credible and encouraged approach. The intent is to win the confidence and support of leaders in the industry for this longer-term method of consistently and more permanently growing ridership through the education of high school students. Once that is accomplished, the second outcome is finding a "North Star", a champion, to shepherd the mission and pursue successful implementation and development.

The desired outcomes are summarized in three parts: actual content that needs to be developed then subsequently adoption and finally put into classroom use. As one resource to accelerate the effort, the Transit Workforce Readiness Guide[129] contains excellent examples of content that can be pivoted from a workforce focus to general educational material meeting academic standards.

Packets of lesson plans with the required materials, activities, and expected outcomes could provide the most flexibility for school systems and teachers. Lesson plans with pre-made or locally adaptable lessons could be a way to ease the burden for teachers trying to create material to cover their subjects. Project Based Learning (PBL) is

[129] "Transit Workforce Readiness Guide."

an active teaching method and can be a suitable learning format for incorporating transit into subjects and topics. Developing these packets based on a probative question with collaborations and identifying the speakers (or organizations) to enhance the material will make the course material desirable. Covering subject material while easing the teachers' preparation time can be make this content effective and appealing.

Workforce programs are a good source of content, partnerships, and education for high school students. In addition to classroom learning, internships and paid positions could be a means of enhancing learning. Youth councils can be a resource and sounding board for educational content, and young people can be ambassadors for presenting the ideas to schools or school boards with valuable insight for the teachers to bring these lessons into the classroom. They may also help produce content that the agencies deploy to spread the message further.

There are challenges to focusing on the school system lesson plans. Many schools have prescriptive curricula, requiring teachers to use system-directed plans. Solutions to that challenge may require more engagement from educators and education policymakers. Well-prepared content that meets academic standards will be required to open the door.

Partnerships and Funding

Funding is a significant challenge for most transit agencies, with very limited, operational dollars providing the majority of education funding at present. An overarching industry leadership group could collaborate with potential funders to develop the curriculum. To obtain sufficient resources, agency leaders could contribute to the curriculum on a prorated basis with or without outside funding sources or collaborate to

pursue external funding sources. The figure below presents one model of how the program could be initiated, developed and disseminated.

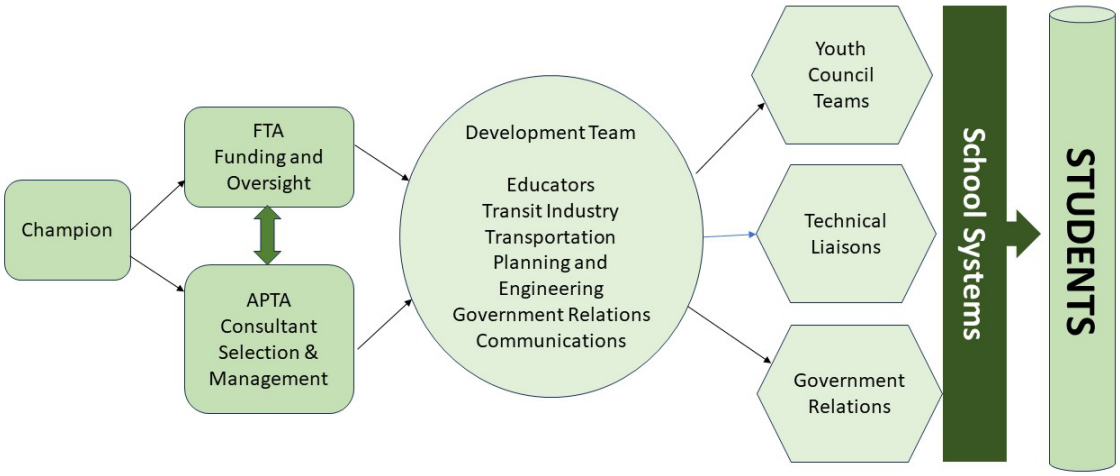

Figure 27. Potential implementation process.

In addition, the Transportation Research Board annually receives Research Need Statements (RNS) from standing committees for projects that can be funded through the Transit Cooperative Research Program. One of the transit-focused committees could champion this work through the RNS and, if funded, sample materials and pilot programs could be developed and tested.

Policy Needs

For transit ridership to grow, in addition to education, the actual system and surrounding environment needs to be aligned. Some of the changes to existing deficiencies are driven by policy improvements.

Policy work may occur nationally and/or locally. Each proposed national transportation funding bill could be an opportunity to drive change. Current programs under two major pieces of legislation (the Infrastructure Investment and Jobs Act and the Inflation Reduction Act) include recommended focus areas, including diversity and inclusion and reconnecting communities, for example. These components can be used to drive sidewalk programs which are essential, and often missing or in disrepair, but needed for people to access transit.

There are also local policy opportunities, some presented in this document. Community members should consider transportation and transit access important enough to support policies to facilitate access, good land use decisions and multimodal transportation solutions. Programs could receive funds through general or legislated special funding. In either case, funding is critical for success.

There should also be strategies for collaborating with local governments; quasi-governmental entities (e.g., public improvement districts, business improvement districts, or community improvement districts [PIDs, BIDs, or CIDs]); and business partners. Collaborations may contribute to the success of the ridership growth initiative and policy initiatives for transit accessibility.

Final Words

The author grew up riding transit in New York City providing otherwise unavailable opportunities for education, culture, jobs and so much more. As such, it has been surprising to see such a lack of knowledge and understanding of this valuable mode of transportation with no programmatic approach to effect change.

There is extensive information about cars and driving generally available and teens are presented with lessons about driving licensure. The imbalance in this exposure influences the choices that are made by young adults.

If the high school-aged students were more holistically taught about transit through various subjects, it is more likely that they will choose this mode (where available) for at least some of their trips. They may also make life choices that makes transit more readily available when they choose where to work and live. Those choices could result in increases in ridership both short and longer term as those who start riding at a younger age tend to stay with that mode longer.

Future Research Needs

This body of work presented the general concepts for educational content that transit leaders can use to create lesson plans for high school subjects based on public transit. There are several areas where additional research is needed to advance from research to practice, including the educational components, the policy areas, and the adoption process. Transit agencies generate a wide and extensive variety of data. More of this needs to be mined with the guiding principles of this research in mind. How can these be used for educational and policy purposes. The subject areas explored in this work are very general, and more specificity is necessary to build the foundation of materials for presentation to decision-makers in the educational realm. Collaboration with transit agencies, including the identification of partnerships related to data, access to facilities, and operational plans, could be instrumental in the accurate development of needed material. Further research on youth councils as a vehicle for development of content or support for adoption of curriculum would be of value. This study focused on

the continental U.S. transit environment. There are many successful transit operations worldwide that researchers could explore to inform this work.

Public policy is a key area that must work in tandem with transit to ensure transit systems are viable and accessible to all. Educational content is at the center of this work, but similarly policy requires further study to determine specific needs and means pf adoption. Finally, the most significant hurdle is the application of these concepts. Researchers should explore the policy and government relations work that will lead to adoption. Transit is a multidisciplinary topic and requires policymakers' and transit leaders' collaboration to bring the conceived plan to fruition.

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APPENDIX A

INTERVIEW PROTOCOL – TRANSIT AGENCY

1. Please describe your agency and its transit services.
2. Please describe your role in the agency and your experience in transit.
3. Please describe any recent marketing campaigns to attract riders.
    a. Do you have any samples of materials used?
    b. Walk me though what was done and how it worked
    c. Are there any specific campaigns or events your agency organizes to promote transit education among high school students?
4. How do you measure the effectiveness of those types of marketing efforts? Describe a specific example.
    a. Have you conducted any surveys or assessments to gather feedback from high school students about their experiences and needs regarding public transit education? If so, please describe. If not, why not?
5. Please tell me about any educational programs that have been offered by the transit authority.
6. How does your transit agency currently engage with high school students to educate them about using public transit?
    a. What specific programs or initiatives does your agency have in place to educate high school students about using transit?
    b. What training or workshops do you offer to high school students to teach them about using transit safely and efficiently?
    c. Can you describe any partnerships or collaborations your agency has with local schools or educational institutions to promote transit education?
    d. What resources or materials does your agency provide to high schools to support transit education efforts?
    e. How do you ensure that the transit education programs are accessible and inclusive for students with disabilities?

f. What steps have you taken to address any language barriers that high school students from diverse linguistic backgrounds may face when using public transit?

Potential follow-up questions for those people who respond negatively to the questions to do with educational programs for young people:

7. Who do you see as your main clientele?

8. Who do you see as the main audience for promotional/educational campaigns?

9. What do you do to reach these audiences?

Follow-up questions about documents related to the programs.

10. Who did the research for any of the programs?

    a. How do you involve high school students in the development or improvement of transit services in your community?

    b. How do you collaborate with other transit agencies or regional transportation authorities to ensure a consistent and comprehensive transit education approach for high school students?

11. Can you describe a time when the educational content was delivered? Where, ages of participants, setting, response of the participants, etc.

    a. Do you provide any mentorship or internship opportunities for high school students interested in pursuing careers in the transit industry?

12. Have there been any efforts to measure any outcomes from the educational effort?

    a. How do you measure the effectiveness of your transit education programs for high school students?

13. Do you have a school pass program? Is there any training for the students that goes with the pass?

    a. Are there any targeted outreach strategies your agency employs to reach high school students and raise awareness about using public transit?

    b. Are there any incentives or rewards offered to high school students who actively use public transit? If so, what are they?

c. How do you address potential barriers or challenges that high school students may face when using public transit, such as affordability or route accessibility?

d. What strategies or initiatives have you found most effective in encouraging high school students to choose public transit over private vehicles?

e. How do you incorporate technology and digital platforms to enhance transit education for high school students?

f. Are there any plans or future initiatives to expand or enhance your transit education programs for high school students?

g. How do you engage with parents and guardians to educate them about the benefits and importance of transit for high school students?

Final follow-up questions

14. Are there any other transit agencies that have educational programs?

15. Are there any questions I should have asked that I did not? Any other information you would like to share? Any other people in your organization with whom I should be speaking?

APPENDIX B

INTERVIEW PROTOCOL – NON-AGENCY SUBJECT MATTER EXPERTS

1. Please describe your experience with transit.
2. Please describe any recent marketing campaigns to attract riders of which you are aware.
    a. Walk me though what was done and how it worked
    b. Are there any specific campaigns or events your organization does to promote transit education—in general, or among high school students?
3. How do you measure the effectiveness of those types of efforts? Describe a specific example if you have one.
4. Please tell me about any educational programs offered by a transit authority or others to get students informed about transit.
    a. Have you conducted any surveys or assessments to gather feedback from high school students about their experiences and needs regarding public transit education? If so, please describe. If not, why not?
    b. What specific programs or initiatives are in place to educate high school students about using transit?
    c. What training or workshops are offered to high school students to teach them about using transit safely and efficiently?
    d. Can you describe any partnerships or collaborations with local schools or educational institutions to promote transit education?
    e. Do you know of any resources or materials to support transit education efforts?
    f. How would you ensure that the transit education programs are accessible and inclusive for students with disabilities?
    g. What steps have you taken to address any language barriers that high school students from diverse linguistic backgrounds may face when using public transit?
    h. What do you do to reach these audiences?

Follow-up asking for documents related to programs.

5. Who did the research for any of the programs?

    a. How would you or do you involve high school students in the development or improvement of transit services in your community?

    b. How do you collaborate with others, including transit agencies or regional transportation authorities, to ensure a consistent and comprehensive transit education approach for high school students?

6. Can you describe a time when the educational content was delivered? Where, ages of participants, setting, response of the participants, etc.

    a. Do you provide any mentorship or internship opportunities for high school students interested in pursuing careers in the transit industry?

7. Have there been any efforts to measure any outcomes from the educational effort?

    a. How do you measure the effectiveness of your transit education programs for high school students?

8. Do you know of a school pass program? Is there any training for the students that goes with the pass?

    a. Are there any targeted outreach strategies your agency employs to reach high school students and raise awareness about using public transit?

    b. Are there any incentives or rewards offered to high school students who actively use public transit? If so, what are they?

    c. How would you address potential barriers or challenges high school students may face when using public transit, such as affordability or route accessibility?

    d. What strategies or initiatives have you found most effective in encouraging high school students to choose public transit over private vehicles?

    e. How would you or do you incorporate technology and digital platforms to enhance transit education for high school students?

    f. Are there any plans or future initiatives to expand or enhance your transit education programs for high school students?

    g. How would you or do you engage with parents and guardians to educate them about the benefits and importance of transit for high school students?

9. Are there any other transit agencies that have educational programs?

10. Are there any questions I should have asked that I did not? Any other information you would like to share? Any other people in your organization with whom I should be speaking?

APPENDIX C

INTERVIEW PROTOCOL – EDUCATION SUBJECT MATTER EXPERTS

1. Please describe your experience with education, particularly at the high school level.
2. Please describe any experience you have with curriculum.
    a. Walk me though what was done and how it worked,
    b. What were your challenges and how did you overcome them?
3. Can you give me any specific examples?
4. Are you aware of any curriculum that developed by an outside group and offered to the school system? Can you describe how the process worked?
5. Are you aware of any content that exists about transportation or mobility other than driver's education? If so, please describe. Who authored it and how was it delivered?
6. Can you describe any partnerships or collaborations between local schools and outside organizations that resulted in new content?
7. Do you know of any resources or materials to support transit education efforts?
8. Who did the research for the materials?
9. Have there been any efforts to measure outcomes of your education programs?
10. How do you or would you incorporate technology and digital platforms for high school students?