The Intersections of Vision Zero and School Zones

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Student Number

School Zones: A Crossroad to Education

The acquisition of education for Canadian youth does not begin in the classroom, but is intricately tied to the excursions to and from school. The physical welfare of children in the community should increase as proximity to educational institutions decrease. Yet there is a stronger connection between child-pedestrian motor vehicle collisions (CPMVCs) and geographical student hotspots, known as school zones. Defined by the City of Toronto (2014), a school zone is the 1km radius around a school. Contrastingly, a school *safety* zone is the designated road networks which incorporate safety measures such as but not limited to, 'watch your speed' signs and flashing beacons (Toronto, 2023). The transition of school zones into school safety zones is critical for cities to accomplish their vision zero goal for their youngest and most vulnerable demographic.

Experts have denominated children as victims of urban form (Chekoway et al., 1995). Approximately 824,000 students travel to school in 16,000 vehicles (Anonymous, 2023). Between 1986-2011, the rate of GTHA students aged 11-13 that were driven to school doubled (Shaker, 2023), while the rate at which students used active transportation to school fell from 62% to 31%(Shaker, 2023). However, 25% of Canadians have reported witnessing a (near miss) collision involving a child within school zones (Canadian Automobile Association [CAA], 2019). Though school zones are designed for the congregation of children, the vehicle dependency and lack of safety implementations within these areas suggest the importance of adult convenience over childrens' well-being. Planners deprioritize how children view the urban form of school zones; geographic hotspots designated for their holistic development. Children are not actively engaged in the planning process; there is untapped innovation within children that planners are yet to explore. Curriculum integration is a tool used in mathematics and arithmetic, that is yet to be honed in the context of pedestrian safety skills (PSS). Like adult-centred communities, children also envision a city in which they can thrive.

Issue Exploration

This report will provide a re-strategization framework that mitigates school zone CPMVCs with a focus on pre-existing communities and elementary schools. The prospective implementation of active transportation, youth engagement, and pedestrian safety education will create safer and inviting spaces for students that foster pedestrian-focused communities, social empowerment, and effective education of street safety.

Active Transportation

Road traffic injuries are the leading cause of preventable death amongst children in Canada (Rothman et al., 2016). School zones are areas designed to reduce vehicular speed and improve childrens' safety. However, there is a disconnect between these urban safe zones and safe motorist behaviour. Every school year, approximately 72 children get injured in B.C school zones (Mckinnon, 2022). Children are overrepresented in vehicle fatalities, with 33% being pediatric deaths in

juxtaposition to 13% geriatric deaths (Rothman et al., 2016). The economic ramifications of CPMVCs cost the Canadian healthcare system $60 million annually (Rothman et al., 2016). A 2009 study in Toronto identified that fatal collisions involving children occur more in school zones, decreasing as proximity to elementary schools increase (Warsh et al., 2009). Additionally, the density of these collisions mostly occur in September (CAA, 2017), associating the beginning of the school year with the highest safety risk imposed on children.

A case control study by Rothman et al. (2016), analyzed the variables of CPMVCs within school zones. Observational research indicates that walking as a mode of active transportation to school was not associated with increased collisions (Rothman et al., 2016). Surprisingly, the presence of crossing guards increases collision densities during peak traffic times of 7:00-9:00 and 15:00-18:00 during weekdays (Cloutier & Apparicio, 2008; Yiannakoulias et al., 2002). However, the study has not established whether the presence of crossing guards is a dependent variable or is an indicator for historically high CPMVCs hotspots. Hard infrastructure such as road networks has a profound impact on CPMVCs. In Louisville, Kentucky, the transition from two-way to one-way streets resulted in a 24% decrease in all collisions (Rothman et al., 2016). This case control study determined active transportation, such as walking, is not directly related to increased CPMVCs. However, soft infrastructure, like crossing guards, are associated with higher collisions.

Pedestrian Collision Type	Number of School Aged Pedestrian Collisions
Pedestrian hit at mid-block	107 (2)
Vehicle goes straight while pedestrian crosses without right-of-way	100
Vehicle turns left while pedestrian crosses with right-of-way at intersection	81
Vehicle turns right while pedestrian crosses with right-of-way at intersection	62 (1)
Vehicle goes straight while pedestrian crosses with right-of-way at intersection	45 (1)

() Denotes collisions involving trucks

Figure 1: Most common school aged pedestrian collision types from 2008-2012 (Toronto, 2014)

In 2014, Toronto audited 9 high density collision school zones to identify immediate actions that can alleviate the number of pediatric fatalities (Toronto, 2016). Post safety reviews, the municipality observed that most frequent immediate actions included the maintenance and restoration of damaged, faded, and missing safety signs, pavement markings, and streetscape fencing (Toronto, 2016). The total cost of reparation was $36,000; well within the Transportation Services annual budget (Toronto, 2016). The money was available in the budget but Toronto had neglected and ignored the restoration of traffic calming infrastructure within school safety zones. As a result of these findings, Toronto will conduct biannual road safety audits in school zones that experience high CPMVC frequencies (Toronto, 2016).

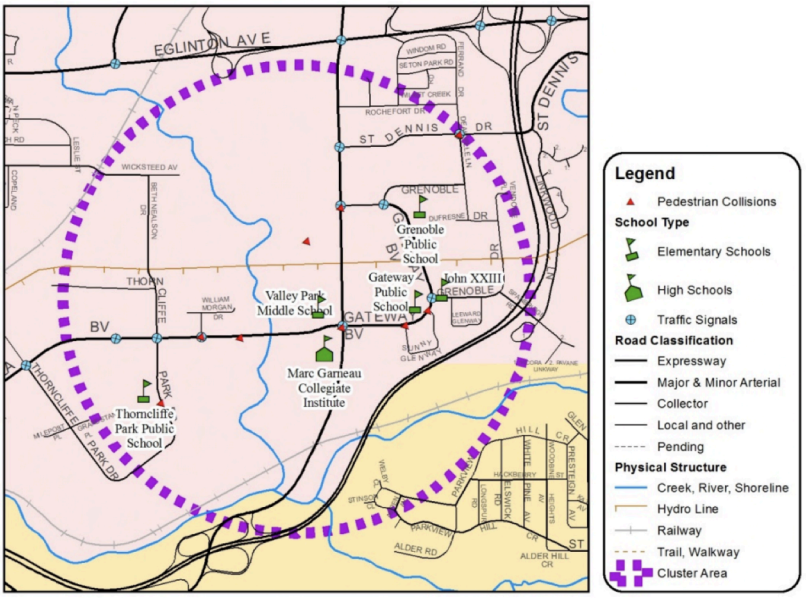

Figure 2: School zone located at Don Mills Rd. at Gateway Blvd. experienced ten collisions, two occurring at the pedestrian crossover. (Toronto, 2014)

Aside from improvements of traffic-calming infrastructure, Toronto should implement other initiatives which have been proven to eliminate CPMVCs. The IBI Group has made actionable recommendations in Hamilton (Hamilton, 2022) to empower students to walk or cycle to school via pedestrian-focused infrastructure. Current regulations require sidewalks to be 1.5m wide but Hamilton is voluntarily implementing sidewalk widths of 3m in school zones to accommodate the congregation of students during arrival and dismissal times (Hamilton, 2022). At Ancaster Meadow Elementary School, the widening of sidewalks was executed alongside additional pathways that connect to the school (Hamilton, 2022). This encouraged walking via convenience, as before these renovations, there was only one lengthy walkable pathway that connected the school to the surrounding residential areas; which is predominately connected via road networks (Hamilton, 2022). These shortcuts, in correlation with distance of routes, is a significant factor in children choosing to walk rather than be driven to school (Ozbil et al., 2016). Hamilton is considering the addition of pedestrian amenities such as benches and shade structures along school routes (Hamilton, 2022). Pathways designed for high volumes and varying uses from pedestrians are critical when determining navigation choices (Ozbil et al., 2016).

The recent acknowledgement and maintenance of traffic-calming infrastructure in Toronto, though boastful, is not enough to annihilate CPMVCs. Like Hamilton, cities should improve school zones through better pedestrian infrastructure, such as wider sidewalks, additional routes, and pedestrian amenities. Traffic-calming devices are effective, to a degree. Fostering pedestrian-focused school zones that promote active transportation will discourage the use of private vehicles; minimizing the perpetrators of preventable pediatric injuries and deaths.

Youth Engagement

Children perceive the current conditions of streets as unwelcoming and unsafe; streets are not built with children recognized as stakeholders (National Association of City Transportation Officials [NACTO], 2020). Children are stakeholders and have concerns, ideas, and thirst for information just as adults do. Youth engagement in the planning process is pivotal to achieve vision zero goals. Children provoke professional planners by asking a series of questions (McKoy & Vincent, 2007). Simple-minded phrasing, "Why do I walk behind my friends on the sidewalk?" begs for practical solutions to overlooked questions (McKoy & Vincent, 2007). Most programs that incorporate youth engagement use children as a token, rather than a vehicle for direct community feedback (Norouzi et al., 2022). Planners are reluctant to involve youth in the planning process due to fear of inaccurate information (Hart 1992); however, children are unexplored assets. Unlike older residents, children can bridge generational gaps and voice out their distinct needs and interests (NACTO, 2020).

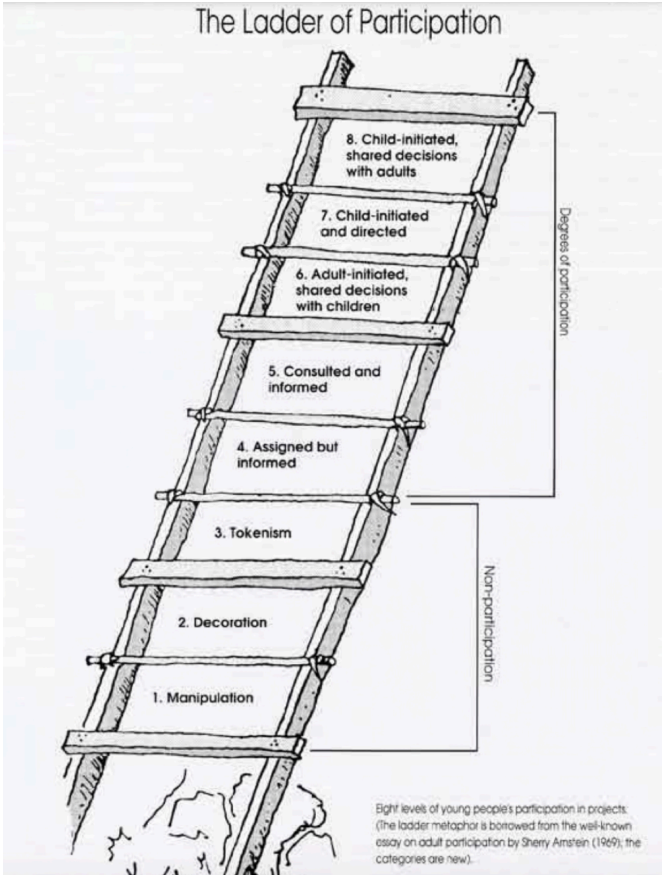

Figure 3: Hart's Ladder of Youth Participation (Hart, 1992)

Roger Hart's Ladder of Participation, is inspired by Arnstein's Adult Ladder of Participation; Hart's ladder is composed of six rungs with adjusted terms that reflect the varying roles of children in public participation (Hart, 1992). The fabrication of youth participation manifests itself in three discerning ways: (1) Manipulation - where children are consulted and are revoked the opportunity to provide feedback (Hart, 1992). (2) Decoration - children are involved for superficial reasons. Youth are given the opportunities to participate, but adults use them as vehicles to strengthen their cause (Hart, 1992). (3) Tokenism - children can vocalize their concerns, but are drowned out and ignored by surrounding adults (Hart, 1992). Adults have a misconception that children are naive, but their knowledge transcends adult understanding. In terms of vision zero, planners should aim to reach the fifth rung, consulted and informed (Hart, 1992). "Young people sometimes work as consultants for adults in a manner which has great integrity. The project is

designed and run by adults, but children understand the process and their opinions are treated seriously" (Hart, 1992, p.12) Through a vision zero lens with a focus on school zones, children surveying, analyzing, and reporting their gathered data (Hart, 1992) is beneficial for their holistic understanding of the intricacies involved in planning. The development of their critical thinking skills, collaboration, and autonomy not only will manifest itself in school safety zones, but in their personal endeavors.

Growing Up Boulder (GUB) is a non-profit program located in Boulder, Colorado (GUP, N.D). Collaborating with the University of Colorado, the City of Boulder, Boulder Valley School District, and over 8,000 local youth, GUB uses youth's agencies to create equitable, sustainable, and child-centred communities (GUP, N.D). A 2015 "Walking Laboratory", engaged ten Crest View Elementary School students to determine what promotes and prevents walking to school (GUP, 2015). This laboratory utilized the fifth rung in Hart's Ladder of Participation (1992) to allow children to identify key themes that were overlooked by adults. For instance, students identified property maintenance as a variable that affects their desire to walk to school (GUP, 2015). A student raised concerns that the long grass and dense trees mimicked the 'scary woods' (GUP, 2015). Concerns raised over private property affecting route networks did not raise concern to planners because their jurisdiction lies within the public realm. The association of private property having a direct relationship with walkability would not have been thought of if it were not for children having the opportunity to voice their opinions. In response to the student's criticism, the Street Model Project implemented wider sidewalks and added functional multi-use paths opposite of the sidewalk, directly across the 'scary woods' (GUP, 2015).

Figure 4: Participating children in the walking laboratory identify 'good' urban planning with green frame and 'bad' urban planning with red frames (GUP, 2015)

The perspectives of children are untapped areas that need to be explored. What adults perceive as mundane, children perceive in a different manner. In figure 5, cars are viewed as towering dangerous boxes of metal, posing hostility and fear to a child. Like other stakeholders, the implementation of children in engagement through vices such as informal conversation, visual art, or 'walking laboratories', can provide valuable insight on how children perceive school zones. The

Figure 5: Cars from a student's point of view (GUP, 2015)

omission of fabricated youth participation assists in building mutual trust and respect between youth and adults; encouraging holistic civic engagement towards a child-friendly city.

Pedestrian Safety Education

CPMVCs are responsible for over 400 pediatric deaths and 45,000 pediatric emergency room treated injuries annually in the U.S (Schewbal et al., 2016). Urban environments are characterized by their dense road networks, which increase the likelihood of pedestrian-vehicle interactions. These complex networks require pedestrians to act quickly - predominantly affecting children who are unaware of road safety and less visible to drivers (Lalande, 2023). Frequent vehicles stopping, dense volumes of children crossing streets, and endless children exiting vehicles, all contribute to the dangerous, chaotic, fast-paced environment of school zones (Lalande, 2023). Due to their young age, children have an inaccurate perception of speed and distance of vehicles (Lalande, 2023). Child development experts say that by age 10, children should be proficient to navigate these complex road networks independently (Utah, 2020). Children may not be attentive to their surroundings and in combination with driver inattentiveness in a chaotic dissemination area, school zones are hotspots for CPMVCs.

A child development research study, How do children learn to cross the street? The process of pedestrian safety training, by Schewbal et al. (2016), analyzed the effectiveness of pedestrian safety training through virtual environments and complex cognitive-perceptual tasks. After 270 trials, children ages 7-8 were below adult level PSS fluency (Schewbal et al., 2016). However, children did make exceptional progress in building up their foundational skill levels (Schewbal et al., 2016). Through observation, children gained sophisticated knowledge in traffic perception (Schewbal et al., 2016); a catalyst for improved PSS. However during the pedestrian safety training trials, children had increased their risk of injury outside of virtual simulations (Schewbal et al., 2016). Children decided to take more risks in the real world, applying what they learned in increasingly dangerous situations (E.g., Crossing at non-intersection locations, crossing at peak traffic times, etc.) (Schewbal et al., 2016). The growth and development of PSS is effective through virtual resources (Schewbal et al., 2016). However, a study on the influence of AI and PSS concluded that though expensive and laborious, training alongside simulated conditions in the real world is more efficient in developing necessary pedestrian skills in children (Thomson et al., 2005).

In the 2014 School Zone Safety Strategy staff report, the City of Toronto forwarded the motion to develop enhanced safety and awareness initiatives (Toronto, 2014). There is an emphasis on using modern mediums to deliver messages to target audiences (E.g., Social media for school boards, animated Youtube videos for elementary students, etc.) (Toronto, 2014). Though an inexpensive and diligent method of improving PSS amongst students, Toronto's implementation of modern mediums remains vague and broad. There is no plan on how to ensure students meaningfully engage with these mediums that directly address PSS. The Child Pedestrian Safety Curriculum, implemented in the U.S

by National Highway Traffic Safety Association (NHTSA) is a teacher resource that bridges PSS directly to physical education (NHTSA, 2008). Through teacher intervention, elementary students in grades k-5 learn skills such as walking safely near traffic, crossing streets safely, and school bus safety (NHTSA, 2008); the building blocks for all PSS.

Lesson	K-1	2-3	4-5
Lesson 1: Walking Safely Near Traffic **Time Allotted:** 20–25 minutes **Goal:** To Teach Students the Basic Concepts of Sharing Spaces with Motorized Traffic	Teacher Discussion & Demonstration: Where and How Do We Walk? • Introduce Vocabulary: *walker, traffic, reflective materials*	Teacher Discussion & Demonstration: Where and How Do We Walk? • Vocabulary Review: *pedestrian, traffic, reflective materials*	Teacher Discussion & Demonstration: Where and How Do We Walk? • Vocabulary Review: *pedestrian, reflective materials*
Objectives: ■ Explain reasons we walk places and identify common places to walk ■ Define and use appropriate pedestrian safety vocabulary ■ Recognize and demonstrate safe practices near traffic such as walking with an adult, walking on a sidewalk or side of street, and wearing bright-colored clothing	Class Brainstorming: Rules for Safe Walking Behavior Guided Practice: • dramatize scenarios • practice behavior on school grounds • practice behavior on community walk Lesson Closure & Review	Class Brainstorming: Rules for Safe Walking Behavior Guided Practice: • dramatize scenarios • practice behavior on school grounds • practice behavior on community walk Lesson Closure & Review	Class Brainstorming: Rules for Safe Walking Behavior Guided Practice: • dramatize scenarios • practice behavior on school grounds • practice behavior on community walk Lesson Closure & Review

Figure 6: NHTSA lesson plan given to physical education instructors (NHTSA, 2008)

However, this curriculum is sponsored by the National Association for Sport and Physical Activity (NHTSA, 2008). This patronage is not effectively ingraining PSS into students because it is solitary within physical education. The prospective use of curriculum integration, "A philosophy of teaching in which content is drawn from several subjects areas to focus on a particular topic or theme" should assist students in transitioning basic knowledge into sophisticated decision-making (McBrien et al., 1997; Alberta, 2007).

If Ontario's Ministry of Education were to adopt a PSS compulsory curriculum similar to the NHTSA, that is holistic and not segregated to physical education, Ontarian children will seamlessly make connections bridge concepts learned in class and proper application on complex road networks (Alberta, 2007), such as school zones. Although CPMVCs can be mitigated through active transportation and good urban design, those render ineffective if children do not know how to conduct themselves in dangerous environments. Immediate and practical PSS education is critical for the mitigation of pediatric fatalities that arise as a result of chaotic school zone environments.

Reflection

Vision zero school zones within the North American climate is an achievable goal. Given the strong relationship between school zones and CPMVCs, municipalities and NGOs are working towards alleviating these collision hotspots. Vision zero in the context of children extends past the confines of urban planning; it transcends hard and soft infrastructure, and is intertwined with child studies.

Active transportation and traffic-calming measures are critical in preventing CPMVCs during peak school zone times. The implementation of wider paths, pedestrian-focused and bicycle infrastructure addresses the immediate issue of pediatric fatalities by discouraging the use of private vehicles. Toronto can take inspiration from cities like Hamilton, who have begun to eradicate high collision school zones by making the journeys to and from school child friendly. Unfortunately, this is an immediate solution to a long-term problem.

Incorporating children in civic development is important in minimizing pediatric fatalities both in and out of geographic student hotspots. School zones give children the opportunity to holistically develop. Working with NGOs and schools to encourage youth engagement not only stimulates a sense of civic ownership but also reflects their distinctive needs and interests. This ensures that the public realm can effectively put in correct procedures and infrastructure that protect North America's youngest demographic.

Adequate pedestrian safety education delivered by educational professionals is pivotal to vision zero in the context of children. PSS in schools ensures that necessary safety skills are fostered in children. The emphasis transcends awareness of danger on the streets but ensures children have the sufficient knowledge to make informed, fast-paced decisions on complex road networks. Collaborations between planners and school boards can birth a curriculum taught in the classroom but applied to the community.

Planning is an interdisciplinary problem and vision zero is a multifaceted issue. Planners can implement traffic-calming measures, adjust zoning regulations, and encourage active transportation, but that is only one fraction of the solution. Children see the world as a connective whole and not isolated disciplines. This philosophy if applied to vision zero implies that planning school zones is about the collaboration between planners and child developmentalists. Through child sociology, planners will understand how children perceive the public realm and can adjust their implementations accordingly. Embracing the notion that conventional urban planning stretches beyond infrastructure placement to the holistic development of children, ensures that future school zone masterplans can reflect vision zero values.

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