

Student Commuting Patterns and their Effects on Readiness to Learn and Academic  
Achievement

Paul Tayler, Master of Arts

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Faculty of Social Sciences, Brock University  
St. Catharines, Ontario

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## **Abstract**

This study examines how student modal choice to commute to school influences student readiness to learn and academic achievement during the first learning period of the day. The goal of all educational policies, curriculum expectation, literature, and studies is to develop a deeper understanding of student learning, teaching, teaching strategies, and conditions around educating that can better education and teach students. It is vital to understand how students learn, in which conditions promote different levels of learning and to help students succeed in the classroom. Much of the research around student learning and understanding how to better prepare students to learn has focused on social, emotional, physical and intellectual factors at home, in the community, and at school. There has been virtually no formal research investigating the role that transportation and modal choice have on student learning once they arrive at school. This research includes surveying students to determine their individual commuting patterns and interviewing the students' teachers to outline students' readiness to learn in the morning and perceived academic achievement. The study areas in this research are elementary schools in St. Catharines and Thorold within the District School Board of Niagara. The findings from this research seem to suggest that students who walk to school are more ready to learn in the morning than any other mode of transportation. Also, students' perceived academic achievement is less dependent on modal choice as teachers could not explicitly link mode of transportation and academic achievement. This research was exploratory and there are opportunities to further research how student modal choice to get to school influences student readiness to learn and perceived academic achievement.

# Table of Contents

<b>Chapter One: Introduction.....</b>	<b>1</b>
<b>Chapter Two: Literature Review.....</b>	<b>8</b>
Educational Policies.....	9
Student Diet and Food Consumption.....	12
Sleep.....	15
Excitability.....	16
Physical Activity.....	17
Modal Choice.....	24
<b>Chapter Three: Methodology.....</b>	<b>37</b>
<b>Chapter Four: Results and Discussion.....</b>	<b>48</b>
What are the general commuting patterns of Grade 6 students in the study area?.....	48
What correlations, if any, do teachers find between their students’ mode of travel to school and their readiness to learn in the classroom?.....	52
What influences do teachers feel their students’ mode of travel to school have on their overall levels of academic success?.....	75
<b>Chapter Five: Conclusion.....</b>	<b>83</b>
<b>References.....</b>	<b>90</b>
<b>Appendices.....</b>	<b>95</b>

## **List of Tables**

<b>1:</b> Perceptions of Grades 6-10 students in Canada about What would make talking or cycling to school better.....	22
<b>2:</b> Student Participation rate by school and the mode of transportation students use to get to school (Survey Results).....	49
<b>3:</b> Student self-rated level of sleepiness and percentage of positive and negative sleepiness.....	68
<b>4:</b> Student self-rated level of excitability to go to school in the morning and their percentage of positive and negative excitability.....	72

## List of Figures

<b>1:</b> Percentage of Students by Grade That Use Active Transportation While Commuting to School.....	2
<b>2:</b> Comparison between Student Age and Use of Active Transportation to School.....	3
<b>3:</b> Breakfast Programs in Canada.....	14
<b>4:</b> Formal and informal shortcuts created by communities, planners, and developers that function to serve a wide variety of alternative transportation users.....	35
<b>5:</b> Niagara Region Municipalities Map.....	39
<b>6:</b> Average Level of Readiness to learn by mode of transportation to school.....	57
<b>7:</b> Average level of readiness to learn with Dalewood French immersion Public School data removed.....	58
<b>8:</b> Student Sleepiness in the Morning and their Rated readiness to learn.....	67

## **Chapter One: Introduction**

Education in society can lead to equality and equity within the society, and generally an increase in the overall wellbeing of society. For those that look to improve the educational system, the discourse has moved away from classical, rote repetition and understanding concepts verbatim, to critical thinking and the conditions students are subjected to which influence their cognitive capacity (Wright, 2002; Ontario Ministry of Education, 2011). Student readiness to learn has been largely linked to educational policies, diet and nutrition, and physical activity (Esposito, 1999, Sorhaindo & Feinstein 2006, Rothman et al., 2014). However, the modes of transportation students use on a daily basis have been largely ignored by academics, or simply overlooked, as a possible contributing factor towards better preparing students for the classroom. Geographical and educational studies are linked when trying to understand how students learn, how to make them learn better, how to achieve higher levels of success from students, and how to prepare them to enter the classroom and be ready to learn (Ontario Ministry of Education, 2011). Social geographers have discussed the impact society has on education and the role education plays in society as a whole (Ottaway, 2013). Many social geographers argue that education is one of the leading indicators of a strong society. The lower the educational rates in a particular place, the worse off the society is (Ottaway, 2013). Also, economic geographers have investigated ways that education impacts the political landscape and the economy of places. For instance, areas with high socio-economic status can afford better educational opportunities such as better school teachers, better infrastructure or even private schools (Zhu et al., 2012). In my thesis, rooted in the sub-discipline of transportation geography, I will examine if and how students' mode of travel to school may affect their readiness to learn and their levels of academic success. Although different characteristics and factors have been studied regarding the improvement of student readiness and

cognition, there has been limited research regarding how students travel to school and perhaps the implications of using different modes of transportation on student readiness.

To explore school readiness and mode of travel, I will research the commuting patterns of Grade 6 students in suburban schools within St. Catharines. Active Healthy Kids Canada (2012) identified that, although by a small margin, Grade 6 students across Canada are the highest users of active transportation as they commute to and from school (Figure 1).

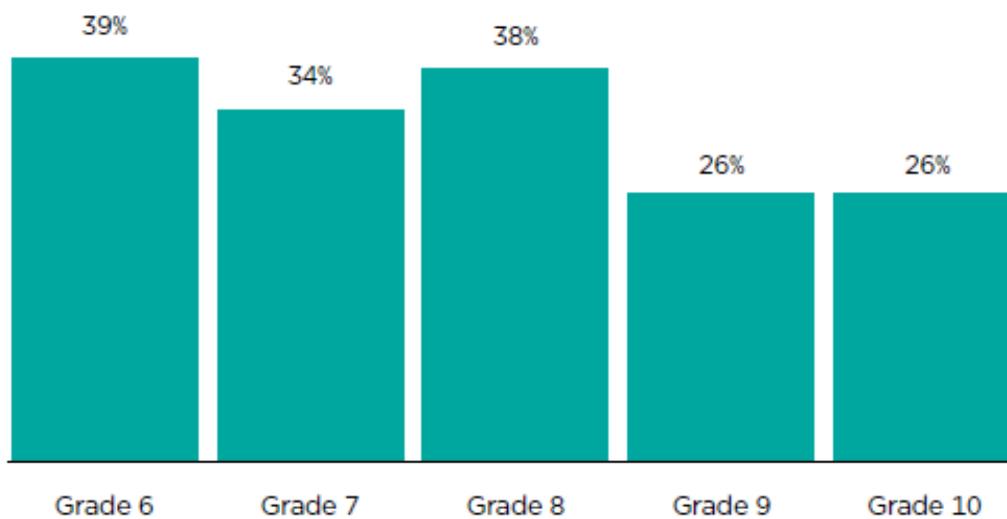


Figure 1: Percentage of Students by Grade That Use Active Transportation While Commuting to School. Source: Active Healthy Kids Canada, 2012

Grade 6 students may be more inclined to use active transportation because (a) they are of an age where parents are more likely to allow their child to travel to school on their own and (b) the boundaries of elementary schools are smaller in comparison to high schools in suburban areas. Hence, as further outlined by Active Healthy Kids Canada (2012), high school students have to travel greater distances between home and school which limits their use of active transportation (Figure 2).

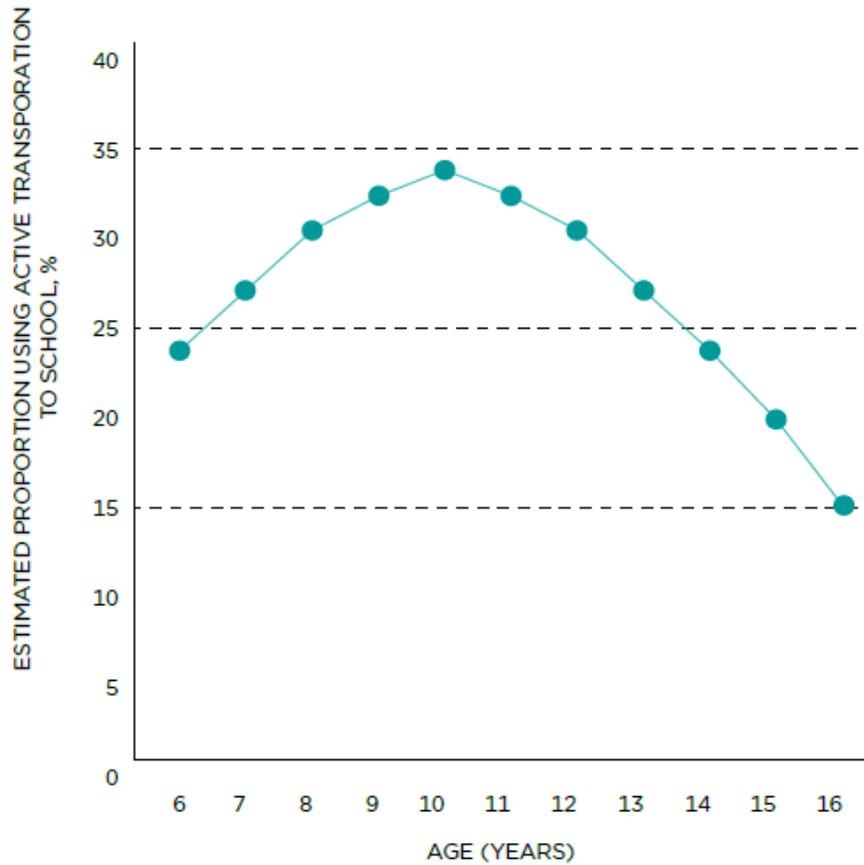


Figure 2: Comparison between Student Age and Use of Active Transportation to School. Source: Active Healthy Kids Canada, 2012

Also, by Grade 11 high school students have the opportunity to acquire a driver’s license and access to a personal vehicle, which further deters their use of active transportation modes when travelling to and from school. Furthermore, in some elementary schools, Grade 6 is the highest grade, resulting in further possible freedom and permission from parents to use alternative transportation such as biking and walking as students travel to school. Furthermore, active transportation can be defined as “all human powered forms of transportation, in particular walking and cycling... active transportation can also be combined with other modes, such as public transit” (Transport Canada, 2011, 9.1).

The percentage of children using sustainable modes of transportation to and from school has decreased between 1986 and 2006 (Buliung et al., 2009). For instance, sustainable modes of transportation used by Grade 6 students in the Greater Toronto Area have slowly decreased while the use of the automobile has increased. The erosion in the number of pedestrians, cyclists, and public transit users has come at the hand of individuals using their car to move students to and from school. Although this research was conducted in the GTA, it can be telling regarding the overall transportation trends around the country. Specifically, major metropolitan centres such as Toronto have the optimal conditions for individuals to choose alternative modes of transportation, such as high and mixed density development, safety concerns with so many people and cars, and high levels of congestion on main city streets. All of these conditions promote sustainable transportation. If students and families in these cities are electing to drive rather than walk, bicycle, or use public transit, those in small cities and towns may also demonstrate this trend to a greater degree because of the lack of sustainable transportation and built environment conditions.

The general purpose of this research is to investigate whether and, if so, how students' daily modes of commuting between home and school influence their readiness to learn and levels of academic achievement. This research is exploratory, as no substantial research has previously been conducted that has sought to define or understand the role that commuting patterns have on a student's readiness to learn and perceived academic achievement as soon as they enter the classroom during their first period of the school day. Accordingly, my three research questions are:

1. What are the general commuting patterns of Grade 6 students in the study area?
2. What correlations, if any, do teachers find between their students' mode of travel to school and their readiness to learn in the classroom?
3. What influences do teachers feel their students' mode of travel to school have on their overall levels of academic success?

There are different understandings and perceptions of ‘readiness’ and how to define the term. It is important to explicitly identify what ‘readiness’ means in the scope of this research in comparison to other definitions within the education system. Ontario’s Ministry of Education (2004) identifies that “readiness does not refer to the student’s general ability, but to the current knowledge, understanding, and skill level a student has in relation to a particular sequence of learning” (p. 4). This definition focuses on the building of knowledge from one day to the next. Before a student is “ready” to learn progressively complicated material, they must demonstrate their understanding of the previous day’s material. However, for this research, ‘readiness’ is defined as the student’s preparedness to enter the classroom and learn as soon as the learning period begins (Thomas, 2006, Ramsey & Legg, 2006). Regardless of understanding of previous knowledge, this research will explore the role students’ travel has on making them better learners in the morning, as soon as the bell rings. Like readiness, it is important to outline what “perceived academic achievement” means for the purposes of this research. Perceived academic achievement is the perspective or view that a student is achieving without measured empirical or formal tangible evaluation. Daily, teachers are asked to assess their student’s learning through a variety of ways including observation, conversations, and assessment tools. For example, a student can have a conversation with the teacher about the material in class. There is no formal evaluation with an assigned grade; however, the teacher can nonetheless perceive the student’s academic achievement. In order to determine student commuting patterns and students’ readiness to learn and perceived academic achievement, students completed a survey and teachers were interviewed. Finally, an analysis of variance (ANOVA) test performed to assess the statistics significance that were collected regarding student’s readiness to learn by mode of transportation (Appendix A).

Everyday, each student must travel from their residence to their school. It is important to recognize that this daily activity might impact students' readiness to learn in the classroom and also influence their academic success (Thomas, 2006, Stewart, 2011, McDonald, 2006, Active Health Kids Canada, 2012). Exploring the possible links between daily transportation modes and readiness to learn is vital to understanding how to get students better prepared to learn and succeed. I contend that a student who uses sustainable transportation methods to travel between their home and school - such as biking, walking, skateboarding, and even public transit - is better prepared for the day because these modes ensure physical activity which promote increased oxygen levels and blood flow to stimulate alertness and preparedness for the classroom (Wojcicki and McAuley, 2014, Cooper et al, 2003; Fulton et al. 2005). These modes enable students to be ready to learn and achieve in a classroom setting (Cooper et al., 2003, Active Healthy Kids Canada, 2012). All of these modes of transportation can promote cognitive, social, and physical stimulation and awareness of their surroundings, all of which may better prepares a student for the rest of their academic day (Transport Canada, 2011). An example would be a student who walks to school. The student must wake up earlier to make time to walk to school and arrive on time, thus allowing for more time to cognitively prepare for the day. Furthermore, the student has increased their brain function through walking and interacting with their surroundings as they walk (Rosenberg et al. 2006, Stewart, 2011). Furthermore, walking and having additional time to 'wake up' makes them ready to be social and functional at a high level among their peers (Drummond & Stipek, 2004).

It is important to note that throughout this research the role modal choice and general commuting patterns have on student readiness to learn and perceived academic achievement may just be one element of a student's readiness and achievement. The factors that influence modal choice are highly complex. There are familial, community, cultural, and individual elements that

impact both modal choice for students, how it may influence student readiness to learn and academic achievement, and overall student readiness and achievement. The mode of transportation students use to commute to school may be one part of incredibly complex and diverse decision process. Likewise, students that use similar commuting patterns may experience or be affected by the mode differently, as such, not one mode will elicit the same influence on readiness to learn and academic achievement for all students.

## Chapter Two: Literature Review

Research that has focused on student development and learning has largely focused on educational policies, student nutrition, sleep, excitability to go to school, physical activity, and modal choice all influence student readiness to learn and achievement. Educational policies developed by the provinces and the nutrition and food consumption of students both strive to give each student the opportunity to succeed in the classroom (Wright, 2002; Weinstock et al. 2009; McKenna, 2000; Vine & Elliot, 2013). Changing educational policies such as the teaching curriculum regularly maintains the interest and relevance to students' lives so they can take ownership and engage with their learning. Furthermore, proper nutrition has been linked to students' cognitive development and focus in the classroom, as well as to their overall level of health.

Additional research that has been conducted regarding student travel to school has not focused on their mode of transportation and its impact on their readiness to learn or academic achievement. Instead, student transportation research has primarily focused on modal choice based on the built environment and the perception of having 'adequate' physical activity through walking or cycling to work and its possible implications on their overall health. Finally, although individuals may be willing to use alternative modes of transportation as they commute to school, it is vital to understand what conditions encourage students and families to choose alternative modes of transportation or, alternately, inhibit them from doing so. Clark et al., (2015) argues that "the current rate of [active school transportation] has been linked to many different individual and neighbourhood characteristics" (p. 2). Individual and neighbourhood conditions that impact modal choice while travelling to school can include aspects of the family including family type, socio-

economic factors, parents' perspectives, the built environment, perceptions of particular modes of transportation, distance to travel, and routes to school. Although there has been extensive research regarding education policies, nutrition, physical activity, and factors and conditions that influence modal choice, very little research has been conducted exploring the question of whether student commuting modes might influence their readiness or preparedness to learn as they arrive at school. All of the previously mentioned aspects of student life and transportation impact student readiness and cognition, but there has been limited exploration of how using different modes of transportation impacts a student in their first class of the day. Furthermore, the following literature identifies and explores the role that particular modes of transport have on student readiness and achievement; however, this is a complex and evolving issue and the factors that are discussed in this literature review identifies only some of the elements that impact student readiness and achievement.

### *Educational Policies*

Throughout the history of education and the educational practices used in many western societies, the teachings and ways to teach were one dimensional. For example, this has often comprised of the traditional classroom of students in rows, listening to the teacher, and memorizing the material in order to regurgitate it back to the teacher in a later class (Wright, 2002; Weinstock et al. 2009). However, many educational theorists and policy makers have more recently geared teaching towards critical thinking and assessment (Ontario Ministry of Education, 2010). In Ontario, teachers must use differentiated instruction and enable students to work cooperatively in order to solve problems on their own (Ontario, Ministry of Education, 2011). It has been argued that students learn more efficiently and effectively when they are given the tools to solve a problem or learn a concept but come to the conclusions on their own (Ontario Ministry of Education, 2011).

There has been much done to ensure teachers are properly trained to carry out this style of teaching (Marin & Halpern, 2011). Additionally, there have been initiatives to understand how to increase students' learning and their preparedness to learn in the classroom.

Many studies and initiatives have focused upon the impacts that social, physical, emotional conditions have on student learning and ways that the province, school board, community, and teacher can promote learning in the classroom. One such way that has been widely accepted is by regularly updating and creating curriculum documents to guide teachers. Curriculum documents are the blueprints of a teacher's lessons, unit plans and culminating tasks (Hopmann, 1999; Ontario Ministry of Education, 2011). The curriculum clearly outlines overall expectations regarding what each teacher must teach and each student must learn by the end of the learning period. It is argued that by changing these documents and reworking them to continuously be relevant and impactful on the students' lives, the students will be more engaged and in a position where they will take an active role in their learning (Marin & Halpern, 2011; Ontario Ministry of Education, 2011). As curriculum documents change to better prepare students to learn, so has the outlook regarding the impacts of food and diet on student learning. One such educational policy that has influenced student learning is a focus on daily and regular numeracy and literacy.

In all the schools included in this study, students in Grades 1 to 8 receive 300 minutes of instruction which is broken into three 100 minute blocks and two 40 minute nutritional breaks between periods two and three and between periods four and five. This means each student receives approximately 1500 minutes of instructional classroom time each week. Each day, to focus on numeracy and literacy, 100 minutes are dedicated to both numeracy and literacy, which leaves 100 minutes for additional subjects, including social studies, art, physical and health education, and French, to name a few. However, Hillman (2014) has pointed out the "declining health of youth

through the implementation of policies aimed at minimizing or replacing physical activity opportunities from the school day in an effort to increase academic performance” (p. 2). Physical activity has been linked to increased cognitive ability in students. Likewise, students that have daily physical activity outperform their less active peers in the same tasks (Hillman, 2014). In an effort to maximize student achievement according to standardized test achievement rates within school, much more time is spent on immersing students into these subjects at the cost of others, such as physical education and the arts. W’ojcicki and McAuley (2014) state that “opportunities for children and adolescents to regularly engage in physical activities throughout the school day are becoming increasingly limited, and, in some cases are being abandoned altogether” (p. 9). Although the overarching themes of literacy and numeracy are effective ways to help student achievement in school and in the work force, the ways through which to maximize the conditions of achievement are overlooked. Such conditions include coupling literacy and numeracy with other subjects such as art and physical education. Additionally, by having students engage in daily physical education via educational policies to promote equity among literacy, numeracy, and physical education, students may be able to perform better in all subjects. However, the time the physical activity occurs and the structure of the physical activity may influence student readiness to learn and student achievement. Student overall health and development through physical activity cannot be discarded or replaced in hopes of increased scholastic goals. Along with educational policies, student diet and food consumption has been linked to student readiness and achievement in the classroom.

### *Student Diet and Food Consumption*

Over the past ten to fifteen years there has been an overhaul of which foods are available to students in schools and which food students are allowed to bring or be given in the classroom (Vine & Elliot, 2013; Sorhaindo & Feinstein, 2006). Some notable changes include the banning of peanut butter in many Ontario elementary schools, such as in District School Board of Niagara elementary schools. The ‘pop’ machines in many elementary schools and any other vending machines now offer healthy snack alternatives, such as juices and fruit bars rather than the traditional soft drink, chocolate bar and candy options. Furthermore, the food a teacher is allowed to give out during times of celebration, such as the Christmas holiday break, or for special events, such as a movie day in the classroom, is restricted to only ‘healthy’ options (McKenna, 2000; Vine & Elliot, 2013). Teachers are directed to promote healthy alternatives. These initiatives have been put in place in order to promote heart healthy living and healthy student behaviours. It is argued that students who consume excess amounts of caffeine or sugar are less likely to have prolonged attention spans and a lower readiness to learn in the classroom in comparison to their ‘healthy’ learning companions (McKenna, 2000). Sorhaindo and Feinstein (2006) outline that “maintaining adequate levels of glucose throughout the day contributes to optimising cognition...” (p. i). Through monitoring the glucose intake of students and maintaining adequate glucose levels through healthy alternatives, students are better prepared to learn. Furthermore, with the proper nutrition levels, students can perform better in the classroom. Not only have there been diet changes through health-conscious choices in available foods, there have been initiatives to feed students in underprivileged schools or from neighbourhoods deemed to be of a lower socio-economic status.

There has been a direct link between the nutritional intake of a student and their readiness to learn and academic achievement (Sorhaindo & Feinstein, 2006). Much like changing the food that is accessible to students in schools, initiatives have been developed to give students the necessary nutrients and food to succeed in the classroom where there is otherwise no food for the students. As Basch (2011) states, “An emerging body of research is documenting the adverse effects of skipped breakfast on various aspects of cognitive performance: alertness, attention, memory, processing of complex visual display, problem solving, and mathematics” (p. 636). Basch identifies that researchers have made the connection between nutrition, cognitive development and readiness in the classroom. Without adequate nutrition, students are not prepared to learn. Initiatives such as breakfast programs and other meal delivery systems are created to ensure students receive the necessary food and nutrition. These initiatives target the most at-risk schools and neighbourhoods in order to maximize the impact of the program of helping students that suffer the most through malnutrition. *Breakfast for Learning* is a foundation which strives to feed undernourished students in order to help them perform better in the classroom. *Breakfast for Learning’s* (2013) vision is “to ensure all children and youth in Canada attend school well nourished, improving their ability to learn, giving the best chance of success in life” (Figure 3). Most of these programs target the most impoverished neighbourhoods and schools in Canada. The poorest students in Canada are receiving the lowest levels of nutrition and balanced diet. Sorhaindo and Feinstein (2006) state that, “while constraints of low income create barriers to healthy eating, additional socio-environmental factors, such as culture and lack of literacy and education reinforce the effects of deprivation” (p. i). There is a complex interrelationship between students’ readiness to learn, how students prepare to learn, and the amount and types of food the student consumes.



Figure 3: Breakfast Programs in Canada. Source: Breakfast for Learning, 2013

Additional research regarding the relationships between student readiness to learn and nutrition has focused on the effects of nutritional levels on the student’s school experience. Undernutrition has been discussed, but overconsumption can also have an adverse effect on learning. When a student does not like school, does not want to attend school, or does not have the desire to learn, their readiness to learn and their learning are limited. Sorhaindo and Feinstein (2006) determined that “obesity has adverse health implications but there are also important social repercussions of obesity experienced in youth. Stigmatisation and social exclusion in the school environment accompanies overweight status and add further difficulty to an often challenging school experience” (p. ii). Students who are overweight or obese also have problems regarding their nutrition and readiness to learn. Those that do not find school to be a safe and secure

environment often refuse to engage with the material, the teacher, and other students, which in turn limits their cognitive, social, emotional, and physical wellbeing and readiness to learn in the classroom. Along with diet's connection to students' readiness and ability in the classroom, diet impacts students' physical activity levels, which, in turn, further impacts student learning.

### *Sleep*

When individuals lack sleep both in duration and quality, there are adverse effects in multiple aspects of their lives. The signs of sleep deprivation and the negative effects of poor sleep can manifest themselves in many ways. Such ways can include personality shifts, erratic behaviour, and a lack of focus to name a few (Spreitzer and Grant, 2012, Field, 2008). These conditions elicited from poor sleep also occur in children. Students have the same responsibilities as adults, it is just called something else; instead of a boss, students have a teacher, instead of a lunch break, it is a nutrition break, instead of paperwork, it is assignments; these students go through the same conditions as adults and sleep plays a major role in their readiness to learn and academic success.

Students that are tired when they arrive at school or have not received enough sleep to maintain high levels of attention and active learning throughout the day, are not ready to learn and cannot achieve as well as other students that are well rested. When students are tired, they lack ambition, willingness to engage in the content, and ability to negotiate a wide range of academic and social situations (Spreitzer and Grant, 2012). Students that lack quality sleep when they arrive at school are at a severe disadvantage in comparison to those who are well rested. When students are tired and lack sleep, they will not be ready to learn and will not achieve to their potential regardless of the subject, morning schedules, assessment activities and strategies, or other

initiatives a teacher, school, or school board may implement in the morning. Similarly, student excitability to go to school in the morning influences student readiness to learn and academic achievement in the morning.

### *Student Excitability*

Students in a classroom come from a wide variety of ethnic, cultural, and socio-economic situations that all influence student readiness to learn and academic achievement. Teachers strive to create learning environments and develop activities and assessments that are inclusive and engaging (Railsback, 2002, & Bonwell & Eison, 1991). However, for many reasons students may not be engaged or excited when they get to school, or when they continue throughout the day. When individuals, children and adults alike, are engaged, excited, and passionate about aspects of their lives, activities, and their goals, they work harder to achieve (Bonwell & Eison, 1991). Furthermore, students that are able to take control of their learning and create their own realities, play an active role in their education and thus are more engaged, ready to learn and achieve.

Students may not be excited to go to school or about school as a whole which influences their overall readiness to learn and academic achievement. Some reasons for a lack of excitability for students include external factors such as family dynamics, peer relationships, previous learning experiences, the topic of study, and the assessment and activity strategies being implemented in the classroom. When students are not excited to go to school and to be in school, students can exhibit their lack of excitement in many ways. Students may refuse to comply with school and classroom rules, they may not complete their work, they can be disruptive to other students, or may find excuses to not attend school (Railsback, 2002). When a student lacks excitement to go to school and learn, their overall readiness to achieve and academic success is negatively impacted.

If a student enters the classroom already feeling a level of resentment and lack of engagement about school and their learning, regardless of the assessment strategies and activities implemented to help engagement, students will refuse to participate or offer their absolute minimum effort to complete the task (Railsback, 2002). Student's excitability plays a major role in student readiness to learn and academic achievement. Much liked educational policies, student nutrition, sleep, and excitability, student physical activity impacts student learning.

### *Physical Activity*

There has also been a research focus on student well-being, heart-healthy living, and the amount of physical activity each student is receiving each day. It is well known that being physically active and healthy has positive implications on overall mental and bodily health (Cooper et al, 2003; Fulton et al. 2005). McMillan (2007) states that "the reduction in children travelling to school by active modes – walking and bicycling – represents a lost opportunity for physical activity, an important health behaviour in the prevention of many chronic diseases" (p. 70). With the increase in physical activity, there is a decrease of many diseases and heart conditions. Linked to diet and nutrition, physical activity manages and maintains healthy blood pressure and insulin levels, which further promotes health living and focus on classroom success (Active Healthy Kids Canada, 2012). Many educators and physicians have made links between a student's level of physical activity and their abilities in the classroom. Physical activity has been linked to influence mental health and a student's readiness to manage adversity and stressful issues within the classroom (Active Healthy Kids Canada, 2012). Furthermore, increases in physical activity have a positive effect on student academic performance, as well as the development of inter- and intra-personal skills. Transportation-to-school research has primarily focused on modal choice by parents and children and their linkages to the built environment, but with little focus on the

implications of such choices once the student is in the classroom. Likewise, the placement and structure of the physical activity may influence student readiness and achievement.

In a school day, students are given 100 minutes through a nutrition break which consists of 25 minutes inside eating a lunch or snack and 25 minutes outside for physical activity. In many elementary classrooms, students are given a period of physical activity two to four times a week.

Hillman (2014) has stated that,

“Over the last two decades, a wealth of empirical data from nonhuman animal models and a variety of neuroimaging tools to applied measures of scholastic performance in the educational environment has suggested a significant relationship between markers for health behaviours, cognition, and brain structure and function” (p. 4).

As physical activity and cognitive development are linked, an ever-growing number of studies have explored these connections. Moreover, the role of physical activity and the time in which students receive this activity has become problematic, according to the current educational philosophy. It has been suggested that, although students do receive some time to have physical activity, the times in which this occurs could be better placed. After physical activity, students may have increased cognitive readiness and thus may be able to perform better in an academic setting (Wojcicki and McAuley, 2014). As such, students may be better prepared for the school day if they were given time for physical activity throughout the day to achieve better academic performance. Similarly, the importance of structured versus unstructured physical activity may influence student readiness.

Structured physical activity includes outlined and predetermined physical activity such as in physical education classes, games, and other physical activities that have clear goals and

guidelines, such as organized sports. Unstructured physical activity includes aspects of the physical activity that does not have organization, whereby students can develop and adapt to the conditions and are self-selected. Active transportation can be included as unstructured physical activity. Although the pathway may be set and structured, the students' experiences while traveling are unstructured. As Burdette and Whitaker (2005) argue, "children tend to choose active [unstructured] play for a variety of reasons, including increased social involvement and a sense of affiliation, perceptions of choice and/or control, desire for achievement, improved self-esteem, and fun" (p. 48). Students using unstructured play have the ability to develop multiple functions and achieve a variety of physical, cognitive, and developmental goals simultaneously. For instance, student learning in a structured play setting via physical education class may learn a skill such as how to dribble a basketball and a series of pass techniques. In contrast, while learning basketball fundamentals in unstructured play settings, students can learn how to dribble, how to pass, and how to work together with others, communicate, be creative on how to demonstrate their skills, and have control over the game, rules, and what they achieve. Students in unstructured physical activity can create the conditions to best suit them. Furthermore, the concern over injury and safety from structured and unstructured physical activity may reduce the overall engagement by students in physical activity and active transportation.

While students are engaging in physical activity, injuries are possible in both structured and unstructured play. Similarly, in both conditions when students follow and do not follow the rules, regulations, and adhering to safety protocols, injuries still occur (Collard et al., 2010). Although injuries can occur both while engaging in structured and unstructured play, the perceptions of supervision and controlled environment with proper safety equipment and mechanisms in place such as in physical education classes will help protect students in comparison

to self-regulated play in the school yard. The occurrence of physical injury while participating in activities can inhibit student readiness and cognition. Student readiness and cognition is adversely affected by physical injury through the loss of school and instructional time if the student is forced to miss classes or entire days of school to receive medical attention and recover. Likewise, students that experience injuries while in school have different protections, both legally and physically, than students that are engaging in their own physical activity. From this, parents and students may be less willing to promote and engage in physical activity through the use of active modes of transportation to school. For instance, if a student is injured as they are walking, running, or cycling to school, such as falling and incurring physical harm, the student can be in a vulnerable position without adults around to offer help. For many Grade Six students there may be no accessibility to cell phones to call for help and, in the case of major injury, there could be no legal ramifications and financial compensation for injury. Parents and students may choose to use an automobile in order to ensure maximum safety. Finally, one such unstructured physical activity that has been largely overlooked and understudied includes active transportation and the role student transportation has on their academic readiness and achievement.

Parents and students must choose how students get to school in the morning and the movement to school can be a way that students receive their physical activity in the morning. The number of students using active transportation or alternative transportation methods such as public transit, walking, and cycling has been on the decline (Chillion, Evenson, Vaughn, & Ward, 2011; Faulkner, Builiung, Flora & Fusco, 2009; Tudor-Locke, Ainsworth & Popkin, 2001). Although the end goal of arriving to school is the same for each student, the experiences and ways students choose to travel varies between students. While a student walks to school, he/she can create a story about their travel and use their imagination throughout their journey. Another student may choose

to walk and run at different points on their way to school. Students can walk and talk with one another as they go to school, thus increasing social engagement. A student can also choose to walk different routes, creating different experiences in different settings. Students that use active transportation may have the ability to increase their cognitive levels through different stimuli, which can result in increased readiness to learn. However, the role of active transportation regarding student development and achievement for the first period of the day has been largely overlooked or understudied.

One theme of research regarding physical activity and transportation to school has focused on modal choice from a student and parent perspective. The research explores why people make the modal choices they do and how schools, governments, and municipalities can promote sustainable transportation. Infrastructure is one of the key contributing factors that impacts modal choice for parents and students. Infrastructure includes personal and property safety. According to the Active Healthy Kids Canada 2012 report card (Table 1), students outlined “safe places to leave bicycles at school” as the most important factor to promote active transportation. Furthermore, “not worried about being bullied or attacked” (Active Healthy Kids Canada, 2012) is the second most important factor to choosing sustainable transportation methods. This identifies that students are worried about their physical and social well-being more than being healthy when making their choice of transportation (McDonald, 2006; Muller et al., 2008”. Along with modal choice, the promotion of active transportation has been greatly researched.

Table 1: Perceptions of Grades 6-10 students in Canada about What would make talking or cycling to school better.

	VERY IMPORTANT (%)	IMPORTANT (%)	NOT IMPORTANT (%)
<b>A Continuous Pathway for Walking or Cycling</b>	29	49	22
<b>Wider Sidewalks and Trails</b>	28	43	29
<b>Less Traffic</b>	29	39	32
<b>Safe Places to Leave Bicycles at School</b>	50	35	15
<b>Safer Places to Cross The Road</b>	38	39	23
<b>People to Walk With</b>	34	39	27
<b>Not Worried About Being Bullied or Attacked</b>	44	27	29

Source: Active Healthy Kids Canada, 2012

Another aspect of modal choice for transportation to school has been focused on the built environment. The built environment can include the infrastructure within and along the transportation route and the conditions of that infrastructure, all of which influence the modal choice (Mitra & Buliung, 2012, Mitra & Buliung, 2014, Fusco et al., 2012). Mitra and Buliung (2012) state that “the built environment, including land use distribution within the neighbourhood, transportation infrastructure, and urban design characteristics, may encourage active transportation, particularly walking” (p. 51). The infrastructure must be in place in order to have individuals use it. For example, if there are not bike lanes or sidewalks, biking and walking will most likely not be the transportation mode of choice due to factors of safety and convenience. Additionally, the overall condition and aesthetics of the neighbourhood impact transportation mode choice. If the neighbourhood is well maintained and in good condition, individuals are more likely to choose active modes of transportation, such as walking and biking for their daily commutes. This is because in cleaner, better-kept neighbourhoods, there is a sense of safety and security that promotes the use of alternative transportation methods. Active transportation has been largely researched in connection to student travel to school.

Active transportation research has largely focused on student travel practices to school. There have been initiatives developed to promote active transportation to school, such as walking school buses, bike-themed days, and other school-wide programs; however, according to Active Healthy Kids Canada (2012):

“less than half of Canadian children and youth use active modes of transportation to and/or from school. While it would be ideal for all children and youth to actively transport to and from school, this may not be considered a practical option by many parents due to distance and other constraints” (p. 25)..

The decision to use active modes of transportation as discussed is highly influenced by the built environment. To promote active transportation and to make it a practical option, municipalities should invest in the proper and related transportation infrastructure. People are more likely to choose active transportation methods if the infrastructure is in good repair and includes direct routes to school.

Active transportation and active transportation initiatives promote healthy and active lifestyles for students. When using active transportation methods such as cycling and walking, students are increasingly physically active and thus combating obesity and promoting increased cardio vascular activities and heart-healthy living. From the increase in physical activity, students are increasingly able to participate in physical education, class activities, and perform in all aspects of education. However, it is still unclear whether students that use active transportation are less likely to be obese in comparison to students that are driven to school. This is because there is little conclusive evidence and research. Active Healthy Kids Canada (2012) argues that “it is possible that children and youth ‘compensate’ for using active transportation by eating more or spending more time in sedentary pursuits during the remainder of the day” (p. 27). Students may be using active transportation their only form of daily physical activity. This practice limits the

effectiveness of active transportation at limiting obesity. Students are more likely driven into school for a variety of reasons including trip chaining with other stops in the morning, time constraints due to a variety of schedules, weather and climate, and infrastructure of the neighbourhood. These conditions impact modal choice and engaging with alternative modes of transportation to school.

### *Modal Choice*

Modal Choice includes the decision-making model individuals use to choose which mode of transportation they will use while they travel to and from destinations. Modal choice can depend on a wide variety of factors and conditions. These conditions can include what the destination is, the time spent while travelling, the time spent while at the destination, the weather, the amenities while travelling and around the destination, transitions from destination to destination, self- and public perception of certain modes of transportation, overall comfort, directness of routes, and the ability for the modes to fit into routines. These are merely a small portion of the factors and condition that influence and impact modal choice as individuals move across space. Choosing a specific mode of transportation for a specific destination is a complex process and there is never one specific reason or one unanimous modal choice. Individuals put all of these factors into a personal hierarchy which then determines that mode of transportation they use. For instance, two individuals that are going to the same destination both choose different modes of transportation to get there; one uses a bicycle and the other drives. The one the bicycles may put the environmental impact of their modal choice at the top of their decision hierarchy and time and comfort after, while the automobile user places time and comfort above environmental impacts. People perceive the world differently and, as such, modal choice is different across space, place, and time. Urban form and the built environment influence modal choice, whereby “neighbourhood, route, and

school environments, [are] significantly associated with walking or cycling behaviours” (Panter et al., 2010, p. 274).

Across the world there has been a decrease of students using alternative modes of transportation as they travel to school. Alternative modes of transportation can include but are not limited to walking, cycling, and public transit. McMillan (2007) argues “walking and bicycling represented 87% of all trips to school of less than one mile in 1969 while the automobile accounted for only 7% of trips. Conversely, by 2001 36% of trips to school less than one mile were automobile trips while percentage of walk/bike trips dropped to 55%” (p. 69). The growing downward trend of students using alternative modes of transportation has been linked to urban form and the built environment. Urban form and the built environment consist of the physical development of space. Panter et al. (2010) outline that “three environmental components should be considered as possible influences on active commuting: the neighbourhood around the home, the route between home and school, and the environment of the school itself” (p. 268) This development includes road systems, buildings, overall condition of the urban landscape, and the placement of certain mechanisms to promote specific initiatives, such as sidewalks, crosswalks, streets lights, and overall aesthetics. These are just a small portion of factors and conditions that make urban form and the built environment. Firstly, the built environment and the urban form around schools create congestion on roadways and in parking lots because of the vast number of students being dropped off. Although the congestion is caused by the automobile, people do not choose to use alternative modes of transportation, but in fact alternative transportation users choose to use the automobile (McMillan, 2007). Individuals move to the automobile in these cases of congestion because around schools the built environment has sidewalks, bike lanes and roadways in close proximity and cross in multiple places. As such, in order to ensure safety for themselves

and their student(s), parents will elect to join the congestion rather than allow their children to walk or cycle.

Conversely, there have been initiatives through urban form development to create the conditions to protect families around schools. Such initiatives include having crossing guards at major intersections and in front of the school to ensure the sidewalks that were placed in front and around the schools are used effectively and properly by users and respected by motorists. Mitra and Buliung (2012) state “the built environment influenced walking” (p. 52). Furthermore, around schools during key times such as drop-off times, lunch, and end of school pick-up speed limits are reduced to 40 km/h to ensure motorists are travelling at a reduced speed around the users of alternatives modes of transportation. Likewise, the built environment and urban form along the route students use to travel to school influences their ability or willingness to use alternative modes of transportation.

Along the route to school, the built environment plays a major role regarding how students travel to school. Some key built environments that will optimize the students’ ability to travel to school include continuous transportation networks from the residence to school. This includes pedestrian networks, bicycle networks, and public transportation networks which can ensure direct place to place connectivity. Individuals that can use one mode of transportation in a direct route with minimal divergences along the way are more likely to use that mode . Individuals that must navigate through complex road systems, cross as multiple intersections, change from roadway to sidewalk, or have their network end before their destination such as a bike lane ending or starting while on route, may elect to use the automobile instead. Panter et al. (2010) noted that “the presence of cycling infrastructure was associated with more cycling” (p. 274). Modes of transportation that are fluid and consistent are more likely to be chosen over ones that are in flux

and change. For parents and students, the built environment that consists of thorough and dependable transportation infrastructure is more likely to be used on a daily basis. As such, network completeness influences the overall usefulness to users. McMillan (2007) argues that “planning decisions should be sensitive to how a place and the population it is meant to serve, particularly the more vulnerable and dependent users of the system” (p. 77). Urban planning and policy initiatives should keep in mind the community that network is trying to serve. Around schools, the urban form should be tailored to meet the needs of the school, families, and the residents. In comparison, urban form and transportation network planning in the city centre or around industrial complexes should meet their needs, which may include wider roads, less frequent traffic stops, and lights. Comprehensive, complete, and connected urban form and the built environment influences modal choice. Just as the built environment influences modal choice, the perceptions of the built environment and the perceptions of the mode of transportation influences modal choice.

The development of the built environment and urban form that is conducive to alternative modes of transportation influences individuals’ modal choice, even when the built environment promotes alternative transportation, the perceptions of the built environment and the modes itself can both inhibit or encourage an individual to choose a particular mode of transportation. For parents and students, the overall perceptions and condition of the built environment while en route to school influences their modal choice. When the built environment is in good condition, well-maintained, and is aesthetically pleasing, students may elect to use the mode of transportation that will interact with their surroundings. When the built environment is in this state, students may feel comfortable, safe, and inspired to walk, bike, or user other modes of sustainable transportation (Timperio et al., 2004. & Giles-Corti et al., 2009). However, in the case of modal choice, although

these conditions may be met, it does not necessarily equate to individuals always choosing alternative modes of transportation. Having the built environment in good condition, complete, comprehensive, and aesthetically pleasing simply makes alternative modes of transportation a viable option. Furthermore, not only the immediate built environment must meet these positive conditions but along the entire way of the travel must because if at any point during the route there are any perceived adverse conditions, the overall likelihood of individuals choosing that mode diminishes (Timperio et al., 2004). Regarding student safety while using alternative modes of transportation, if the built environment is perceived not necessarily to reduce student safety but rather just not promote it, parents are less likely to allow their children to use specific modes of transportation. Similarly, the ways in which modes of transportation themselves are perceived influences modal choice.

Individuals and society perceive certain modes of transportation in particular ways and associate individuals using those modes with specific characteristics. For instance, public transit has a stigma attached to it and thus the users themselves are often stigmatized while they use it. Such perceptions of public transit users include low socio-economic standing, poor hygiene and unsuccessful. In contrast, individuals who drive a car are perceived to have enough money to support a car and all the payments that come along with automobile ownership, and even among car users, perceptions of Ford users are different than Lexus users. However, these perceptions are not accurate and do not reflect the characteristics of the users but are often enough to stop individuals from using alternative modes of transportation. Although these are the general sentiments that surround perceptions of general commuting choices, they are not as destructive and divisive around school travel but nonetheless still exist. Parents' perceptions of their local neighbourhood and the mode of transportation they were using would reflect their social position

(Timperio et al., 2004). Furthermore, although student travel is not always reflective of adult travel and the modes they choose, some students acknowledge that they know and are aware of students that walk, bike, get bussed in, and get dropped off and picked up (Timperio et al., 2004, Boone-Heinonen et al., 2010., Larsen et al., 2009 & Cerin et al., 2009). Social pressure and the desire to fit into a certain group or to be perceived in a certain group will help determine the choices they make. This includes the mode of transportation students choose to use as the characteristics attached to the mode could alter others' perceptions of the student and his/her family. Although the general stigma attached to specific modes of transportation and perceptions of those users may be inaccurate, the socio-economic status of individuals and families may play a role in modal choice.

As economic, social, and community elements influence student modal choice as they commute to school, so does familial perspectives including culture. The way a particular cultural group views a particular mode of transportation influences modal choice. McMillian (2007) argues "A family's approval of the child walking to school increased the likelihood of walking/bicycling to school, controlling for other variables in the modal" (p. 75). When the student's parents view particular modes such as walking and cycling as appropriate modes of transportation, students are not only then allowed to choose that mode of transportation, but they themselves may view that particular mode of transportation in a positive perspective and may elect to use that mode to commute to school. Furthermore, McMillian (2007) states,

"the result that being born in the United States decreases the likelihood of walking/bicycling to school...differences may exist related to accepted/preferred modes of travel, in a sense validating the popular image of the US car-dominated culture" (p. 75).

Different cultural groups perceive modes of transportation differently. In immigrant communities perhaps some modes of transportation are more likely to be chosen for students in comparison to non-immigrant communities. In North America there is a particular dependence on the automobile while in other countries and regions of the world, sustainable transportation may be more prevalent in society. When individuals immigrate to Canada and the United States from countries of high sustainable transportation practice, their practices may continue to be used. Along with perception and cultural practices, modal availability influences modal choice.

Modal choice assumes that individuals have the ability to choose between modes of transportation. However, this is not always the case, as for some families the modes of transportation are limited. Limitations can be emotional; through stress or anxiety, physical; paralysis, loss of limb, etc. and socio-economic; the services are not available or the individual cannot afford it. In depressed or low socio-economic neighbourhoods, the built environment may not be conducive for alternative modes of transportation. This can include poorly maintained, developed, or safe urban form. Cerin et al., (2009) outlines,

“Socio-economic status (SES) is a strong and consistent correlate of physical activity and is a major source of health inequalities. Low SES has been associated with higher odds of being overweight or obese and lower odds of engaging in obesity-protective behaviours” (p. 1014)

Individuals with a low SES are unable to afford the obesity-protective behaviours which can include physical activity and access to physical activity facilities, time to participate in physical activity and make nutritious meals, and the money to afford nutrient rich and healthy food. However, Cerin et al. (2009) further outline that this may not be associated with mode of travel,

“the associations of SES indicators with walking [and other forms of sustainable transportation] for transport are less clear. Some studies have identified negative relationships of

individual-level and area-level SES with walking for transport reported non-significant or even positive associations” (p. 1014).

Although having a car is expensive and all of the costs associated with automobile ownership are vast, this does not necessarily mean that individuals with a low SES are not still making automobile ownership a priority. Conversely, just because an individual has a high SES, does not mean they do not use alternative modes of transportation. For some of the poorest people, having an automobile and using a vehicle is essential when they have to work multiple jobs or at times that are not conducive to walking and public transit. Furthermore, most of the public transit system and other transportation systems are geared toward a steady 9:00AM – 5:00PM occupation which are more stable and tend to pay well. In this case, public transit or commuting into major metropolitan areas, such as into Toronto, using the train system or car-pooling is viable due to the consistency, ease of travel, and ability to afford it. This outline of SES and modes of transportation is toward adults, it can be echoed and reflected in student travel and modal choice.

Parent and students’ SES plays a role when choosing to use a specific mode of transportation. For many students, when a parent does not own an automobile, getting driven to school is not possible. However, as outlined previously, some of the poorest families find a way to afford an automobile because public transit is relatively expensive, walking and cycling networks may not be efficient and complete, and the time crunch associated with potentially working multiple jobs and at a wide variety of times, thus making the automobile the only viable option. Likewise, for students that have family members working at a wide range of times, walking to school in the morning may be the only consistent option available (Cerin et al., 2009). Additionally, for some parents that are busy and under a time crunch, giving time to get students up in the morning, ready for school, provide a breakfast, and get them into school on time is not

possible and, thus, driving the student into school offers a possible time saving for the family (Larsen et al., 2009).

In comparison, families of a high SES may have the ability to have consistent work at a consistent time and in cases where one parent works and the other works from home or is a stay-at-home caregiver, time and money may not be an inhibitor to using alternative modes of transportation. Additionally, students that may come from a high SES have been noted to use alternative modes of transportation because parents can afford to properly outfit their students in a variety of weather conditions, walk with their students to ensure safety, and have the time to ensure their student is ready for the day (Larsen et al., 2009, Perry et al., 1998, McMillian, 2009, Wen et al., 2008, Timperio et al., 2006, Cerin et al., 2009 and Boone-Heinonen et al., 2010). Student's socio-economic status may inhibit or encourage alternative modal choice for students based on a variety of conditions that the SES may create. Along with SES, the routes and distance students travel may influence student modal choice.

In both Canada and the United States, there is a growing trend to remove small community-based schools and build larger schools to service multiple communities simultaneously. This planning and development trend has come about because of the increasing financial constraints on the public education system. The financial shortfalls of the public education system have been incurred due to raising costs of maintaining buildings through repairs, land taxes, and monthly expenditures including heating, water consumption, and hydro. Additional costs include monthly wages for administration, teachers, and support staff, as well as increasing costs for teaching materials. This is further compounded by the desire for lower taxes which diminishes the overall operational budgets for the public school system. To resolve these financial issues many school boards have elected to close small schools and build large schools to amalgamate many

communities together. By doing so, schools may be able to have fewer teachers by having larger class sizes, fewer administrative staff, a decrease in support staff such as custodians, and reduced repair, maintenance, and monthly expenditures such as taxes. It is cost-effective to pay land taxes on one large property than the taxes of multiple small properties. A by-product of this move to minimize the financial burden while still meeting the demands of a strong, thorough, and reliable education system has been an increasing distance students need to travel to school, which reduces the overall ability for students to use a variety of transportation modes as they commute to school.

Distance to school influences modal choice for students as they travel to school. Distance not only affects the overall length of the trip and thus the time it will take students to commute, but distance also influences the overall effect of other variables such as weather or safety. Schlossberg et al. (2006) argue that “distance to school appears to influence the likelihood of walking there, as would be expected. Those living within one mile of school are the most likely to walk. Other factors, such as population density and tree cover close to school, have been shown to be positively correlated with rates of walking to school” (p. 338). While the distance to schools increase, the likelihood that students will walk or use alternative modes of transportation decreases. Furthermore, while the distance between residence and school increased so does the amount of time a student would be in adverse weather conditions. A student that lives close to their school would be more likely to walk in rain or snow because they would only be in it for a short period of time. If the school is far away, even for a student that would normally walk the greater distance, the increased time in the poor weather conditions is now enough of a deterrent to walking and now will opt to get driven into school (Schlossberg et al., 2006). Likewise, student safety and the possibility of something to happen to the student increases as the distance and time it takes students to travel to school increases. Furthermore, student safety is reduced as distance to school increases

because more students are being driven to school and thus there is more traffic and congestion around schools and pedestrian, cyclist, and other alternative transportation users' safety decreases (Schlossberg et al., 2006, McMillan, 2007, Mitra & Builiung, 2012). Not only the distance to school, but the routes students can take to school influences modal choice.

The built environment along the path student's travel to school has been largely discussed, but the linkages between route and pathway plays a vital role to modal choice for students. Such linkages include shortcuts to school property through walkways between houses and through suburbs, breaks in fences along school property, and multiple connected pathways such as bicycle lanes or a network of complete sidewalks directly from home to school (Panter et al., 2013). For schools, communities, and planners, it is important to develop highly connective routes, linkages, and perceived shortcuts to travel to promote the use of alternative modes of transportation. Clark et al., (2015) argues,

“In neighbourhoods where there is low connectivity, planners and developers can shorten the travel distance between home and school by including shortcuts in their development plans. Shortcuts are defined as path, either formal or informal, the increase connectivity and shorten the travel distance between locations” (p. 3).

The shortcuts for students as they travel to school can be formal, where the pathway has been built in or constructed with the explicit intent for alternative transportation users to use as the navigate through communities. However, just as important as formal shortcuts are informal shortcuts. Informal shortcuts can include leaving open, unused space, giving alternative transportation users opportunities to forge their own pathways (Figure 4) (Clark et al., 2015). These shortcuts all play a role in creating different conditions for different transportation users as they navigate through

place and space. Clark et al., (2015) identifies six different formal and informal shortcuts found in London, Canada but these can be seen all around Canada and the United States.



Figure 4: Formal and informal shortcuts created by communities, planners, and developers that function to serve a wide variety of alternative transportation users. Source: Clark et al., (2015).

By having both formal shortcuts or informal shortcuts, students include the possible use of these into their overall modal choice and thus, by not including these in planning, the option for student to use alternative modes of transportation as they travel to school is reduced (Clark et al., 2015, Frank et al., 2007, Mitra and Buliung, 2012, Panter et al., 2008, Schlossberg et al., 2006, Timperio et al., 2004, Chin et al., 2008, & Wen et al., 2007). Although there have been comprehensive studies on student learning and modal choice, there has been limited explicit research regarding the mode students use to travel to school and the impact it has on their readiness to learn for the first class they have in the day.

The general purpose of this research is to explore the impact transportation choice has on student readiness to learn and perceived academic achievement. Educational policies, student health and diet, sleep, excitability and student physical activity may influence the cognitive state and development of students. Likewise, student readiness to learn may be affected by these factors and through regular policy, dietary, and physical interventions students are better equipped to learn. Furthermore, the conditions around modal choice including the built environment, urban form, conditions around the school and linkages between home and school influence the ability or willingness to students to choose alternative modes of transportation as they commute to school. However, although all of these conditions and factors impact how students learn and travel to school, and address some hurdles to student engagement in the classroom, the direct relationship between the mode a student uses to travel to school and the impact it has on their readiness to learn has been largely overlooked and under researched by education and academic professionals. The closest link between mode of transportation and readiness has been through an informal and generic connection between the results of physical activity on brain function and thus active transportation must influences students' cognitive state. This research strives to make formal connections between modal use as students travel to school and their overall readiness to learn throughout the first learning period of the day. It is important to note that although the mode of transportation may influence student readiness to learn and academic achievement, it is only one part of a complex set of variables that also influence student readiness and achievement, such as educational policies, student diet, level of physical activity, perceptions of modes of transportation, and family and community practices. All of these factors influence student readiness and achievement and only when they wholly work together can student readiness and achievement be positively impacted.

## **Chapter Three: Methodology**

Students were surveyed to determine their commuting patterns and other controlling factors that may influence their readiness to learn in the morning, including their level of “sleepiness” and general levels of excitement towards going to school. One-on-one interviews with the students’ teachers were used to address the second and third research questions. The teacher had unique and detailed insight regarding their students’ readiness to learn and academic achievement (Ontario Ministry of Education, 2011). The interviews took place at the end of February 2016, approximately half-way through the year, to ensure that the teachers have had enough time to get to know their students and develop perceptions regarding their students’ readiness to learn and perceived academic achievement from the teacher’s perspective. By completing the surveys and interviews later in the year, teachers were given the necessary time to get to know their students, develop a reliable and valid understanding for their students’ learning, and teachers were able to see how they have progressed through different stages of the year. This section will give a brief outline of the area of study followed by a detailed account of the methods used in this research study.

The area of study for my research is the city of St. Catharines, which is located within Southern Ontario’s Niagara Region (Figure 5). The research will be focused upon Grade 6 students in suburban St. Catharines and Thorold schools administered by in the District School Board of Niagara (DSBN). The DSBN educates over 35,000 elementary and high school students in 88 public elementary schools and 18 public secondary schools. In St. Catharines and Thorold, there are 30 elementary schools (DSBN 2015a). Furthermore, St. Catharines is where the bulk of the students and elementary schools are located.

The schools in both St. Catharines and Thorold are located within suburban areas which may enable all modes of transportation to be equally chosen by parents and students due to infrastructure and distance from home to school. It is equally feasible to drive a student to school as it is to walk or bike in St. Catharines and Thorold (Active Healthy Kids Canada, 2012; Cooper et al. 2003). Also, Grade 6 students will be studied because, due to their age, they may have an increased possibility of using a wide range of transportation methods in comparison to younger students in the same school. Additionally, elementary students are the focus of this research because the elementary school boundaries are smaller per school than a high school, which increases the opportunity for students to use a variety of transportation methods as they travel between their home and school. The purposed elementary schools within suburban St. Catharines and Thorold that were included in the study are namely Port Weller (JK-8), Lockview (JK-8), Applewood (JK-6), Dalewood (1-8 FI), Burleigh Hill (JK-8), and Richmond Street (JK-8) (DSBN, 2015b). These schools were chosen because they meet the requirements of being within the St. Catharines city limits, located in the suburbs, and having at least one Grade 6 class.

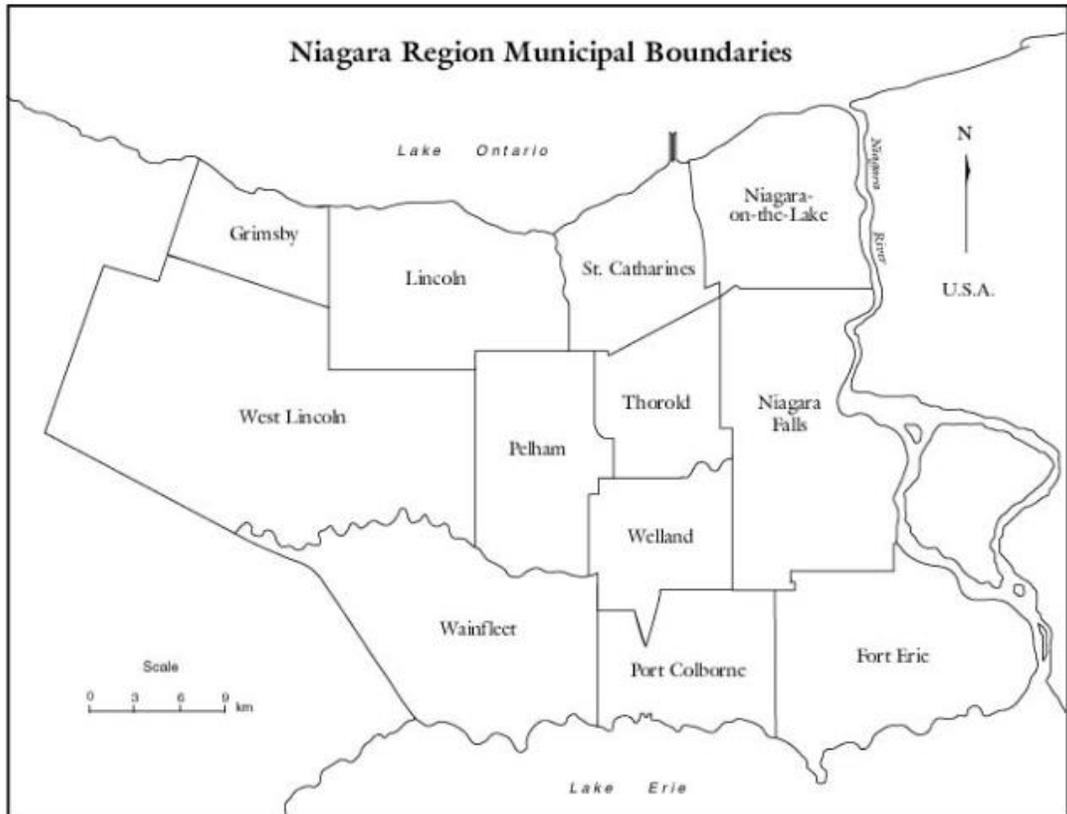


Figure 5: Niagara Region Municipalities Map. Source: Brock University Map Library

Two data collection methods were used in this research, including a survey of Grade Six students and one-on-one interviews with those students’ teachers. Interviewing is the process whereby a researcher engages in a one-on-one dialogue with an interviewee in order to ask them particular questions related to the area of study and the research problem that the researcher is investigating. Secor (2010) argues that “the goal of interview research is usually not to generalize a population, but instead to answer questions about the ways in which certain events, practices, or knowledges are constructed and enacted within particular contexts” (p. 199). An interview is a method a researcher will use in order to acquire specific insight, about specific topics, with direct answers and dialogue. This allows for further discussion in a fluid-like state where the questions and discussion can evolve when using a semi-structured or unstructured format.

One of the benefits of a one-on-one interview is that the conversation can evolve in a variety of ways and cover many different aspects of the research from the interviewee's perspective. The variability of semi-structured and unstructured interviews gives the interviewee freedom to talk about anything they want and connect it to the research according to their perspective. As Valentine (2006, p. 111) has noted:

“Interviews, in contrast to questionnaires, are generally unstructured or semi-structured. In other words, they take a conversational, fluid form, each interview varying according to the interests, experiences, and views of the interviewees.”

Without having the rigid structure found in some quantitative methods, the interview allows the interviewer to deviate from their pre-formulated questions in order to gain additional information that better represents the interviewee's perspectives or understandings. Byrne (2012) defines an interview as a “loose conversation with a purpose” because the interviewer does not keep a tight rein on the topics discussed but instead allows the interviewee to explore the phenomenon of interest from as many angles as they wish (p. 208). Allowing for the fluidity of questions and answers and for the conversation to evolve can empower the interviewee. It can give them a sense of comfort and the knowledge that their perspective is valuable, as well as a space to create and explain their realities, or at least how they perceive their world around them and explain their reality.

One-on-one interviews gain insight into how individuals perceive their world and societal relationships. Longhurst (2009) notes that interviews aid in gaining information that is ‘factual’, descriptive, thoughtful or emotionally based. However, the word factual can be problematic because in an interview, it is from a particular perspective and reality which can lead to misrepresenting the phenomena or even more destructively, taking one interview and making a blanket statement as ‘Truth’. As Luker (2008) argues, “I think that interviews are, almost by

definition, accurate accounts of the kinds of mental maps that people carry around inside their heads, and that it is this, rather than some videotape of reality” (p. 167). This is a strong representation of what an interview is and what it can do for research. Luker is observing that each person’s perspective is just that, their own, and that it is important to understand there are a variety of realities constructed from beliefs, lived experiences, media and other outlets.

The survey conducted with students was intended to gauge their general commuting patterns, overall sleepiness when they arrive at school, and their overall excitability to go to school in the morning. This comprised only a portion of the data collection. The bulk of the qualitative research was comprised of the interviews of teachers responsible for the Grade Six classes that were surveyed. The teacher interviews gave valuable insight into the students’ apparent readiness to learn. Interviewing the teacher was vital because, as Ontario’s Ministry of Education has outlined, a teacher’s “successful implementation of policy depends on the professional judgement of educators at all levels, as well as on educators’ ability to work together and to build trust and confidence among parents and students” (2010, p. 2). Professional judgement is defined as “judgement that is informed by professional knowledge of curriculum expectations, context, evidence of learning... and judgement involves a purposeful and systematic thinking process that evolves in terms of accuracy and insight...” (Ontario Ministry of Education, 2010, p. 152) It is through a teacher’s professional judgement that she or he is able to identify which students were more ready to learn than others. One of the roles of the teacher is to create a caring, insightful and meaningful environment, and for successful teachers that are completing their employment requirements as mandated by the Ministry of Education, interviewing the teachers is important to understand the teacher perceptions of a student’s readiness to learn and their perceived academic

success because teachers engage with their students daily and have the most direct understanding and interaction with the student as soon as they enter the classroom.

The first step to conducting surveys with students and interviews with teachers was getting the necessary permission from the school board and the school's administration to be allowed into the school and conduct my research on the school premises. This was completed by applying to the District School Board of Niagara research committee; which I was given permission in January, 2016. With the permission of the school board, I requested meetings with the principals of the schools to introduce myself, to explain what my research is all about, and to outline the questions I am investigating and would be asking the students and teachers. I also left them with a formal letter outlining the details and scope of my research. I requested their formal permission to be on the property to conduct my research. The principal's permission was necessary because, according to Ontario's *Education Act*, one of the responsibilities of the principal is to maintain the safety of the students and teachers in the school. Regulation 298, Section 11(3)(e), states that the principal is to "provide for the supervision of pupils during the period of time during each school day when the schools buildings and playgrounds are open to pupils" (1990). The principal is responsible for the safety and security of all students during the school day and, because I surveyed students and entered their classrooms to conduct research, the principal's permission was essential in order for me to legally be there. Not only did I get permission from the principal, but I also received the teacher's permission to be in their class, as well as their consent to participate in the interview portion of my research. Also, a letter to the students' parents was sent home several weeks before the survey portion of the research was completed. The teacher sent home a letter outlining the objectives and purpose of the research. By sending home the letter of permission several weeks before entering the classroom, parents had the opportunity ask the teacher and myself any

questions they may have had about the research. Then, parents had the opportunity to give or not give me their permission to survey their child.

Teachers played the critical role in my research because they had the insight regarding their students' readiness to learn and academic achievement. It was important to note that throughout the research and interviewing to explore students' academic achievement, no personal information or actual levels of achievement such as report cards, student progress reports, test results, or any tangible assessment tools created or used by the teacher were shared in the interview. I was not interested in the actual academic achievement of each student, as the scope of this research was to explore the role that commuting patterns had on a student's readiness to learn (as defined for this research) and a student's academic achievement, as perceived from the teacher's informed point of view. Teachers use a variety of assessment tools over the course of the school year, and through constant interactions between the teacher and the students, teachers have a clear and insightful understanding of their students' readiness to learn and levels of academic achievement. Prior to the interview taking place, the teacher was given a script of the interview questions as they have been developed by the researcher, along with certain definitions such as 'readiness,' in order to maintain control and perspective of the interview as well as the results from the surveys. Furthermore, by giving teachers additional time to consider the definitions, scope, and questions of the research, it enabled the teacher to assess their perspective of students' readiness to learn and possible implications that their students' transportation methods have on their preparedness to learn in the classroom.

Each teacher is mandated to continually assess their students. These assessment practices are broken into three assessment groups. First, *Assessment For Learning* is done before or at the beginning of a learning period to assess where the student is in their learning. Examples may be a

review of the previous day's material or a brain teaser to judge student readiness to learn. Second, *Assessment As Learning* is throughout the learning period and assessing their progression of the curriculum to give meaningful feedback as well as to differentiate instruction to ensure the student understands the material. An example may include giving students feedback on their work. Third, *Assessment Of Learning* is the done at the conclusion of a learning period and is usually represented by a grade awarded to a student based on their school work. For instance, assessing a student's final work which is used to evaluate and judge the student's level of success. Teachers were given the interview questions days before the interview in order to help develop an understanding and a perspective on their students' readiness to learn.

Some teachers may not be assessing student readiness to learn in the morning and by giving the questions ahead of time, the teacher was better equipped to assess their students' readiness to learn by tailoring their assessment tools and strategies towards the students' cognitive, social, and emotional readiness in the morning and throughout the day to gain insight into my research questions and the scope of the research. By tailoring their Assessment For Learning tools at the beginning of the day to assess readiness to learn, the teachers were able to gain valuable insight into the students' preparedness and alertness as soon as the school day starts. Finally, teachers' schedules are constrained, thus meaning they had limited free time available to participate in an interview. By giving the teachers the questions ahead of time, they had the opportunity to hand-write answers to the questions which supplemented the interview audio tapes and my handwritten notes, and acted as a reference for the teacher throughout the interview.

For the surveys, each student in the class as a whole was asked to complete a paper-based survey. Once they completed the paper-based survey in their classroom, I asked them to put their heads on their desk and close their eyes in an attempt to ensure limited interactions with other

students that may not have completed their own survey and thus limit biased or non-representational answers. The three questions on the survey were:

1. “Which mode of transportation do you use on a daily basis as you travel to school in nice weather?” The options were walking, biking, driving, or public transit and other.
2. “How ‘sleepy’ are you when you arrive at school?” The options were very sleepy, somewhat sleepy, neutral, awake, and very awake.
3. “How excited are you to go to school in the morning?” The options were highly unexcited, somewhat unexcited, neutral, somewhat excited, and very excited.

Using student sleepiness and excitability as control enabled me to account for some other possible reasons as to why the student may not be alert or prepared in the morning as they arrived at school and that may affect their perceived levels of academic achievement. For students that did not feel rested as they come to class, their alertness and readiness as defined for this research may be severely impaired regardless what mode of transportation they used to travel to school. Also, students that did not like school or want to be at school may have little to no drive for enthusiasm and work ethic, as perceived by the teacher. It was vital to understand that there are a variety of conditions that may affect a student’s readiness to learn and to account for these variabilities.

Students were asked which mode of transportation that they use in nice weather because parents are less likely to allow their student to use alternative modes of transportation as they commute to school in adverse weather conditions. “Nice weather” was explicitly discussed with the class. For instance, if the weather conditions are poor (including rain, extreme cold, or intense snow), parents will more likely elect to find alternative modes of transportation for their student, such as driving them in a car or keeping them home for the day. Additionally, when school buses have been canceled for the day due to adverse weather conditions, many parents decide to keep

their students home, even if they do not use the bus and the schools are still open. Nice weather implies conditions that are conducive to the use of all modes of transportation. It does not necessarily mean in warm and sunny weather conditions, because nice weather can include moderate to cold temperatures. Likewise, nice weather can include a variety of road and ground conditions, including clear roads and sidewalks to well salted and maintained conditions which ensure that all modes of transportation are viable options for parents and students.

The teachers were interviewed in their classrooms in order to ensure they felt comfortable and in a setting that they were able to draw on examples to further answer questions. By situating the teachers in their own classroom, teachers could think about the questions in relation to actual events in their classroom and it may have stimulated further responses. The interviews were audio recorded. The start of the interview included probing questions that aimed to get the teachers comfortable with me. Furthermore, we shared stories about classroom experiences, that I perceived, put them at ease and created a level of trust with me to answer the interview questions open and honestly. Furthermore, once the interview was concluded, I provided the teachers with information about when I would supply them with a copy of the interview transcript in order to ensure my data accurately reflected their interview.

It was important that I understood how to structure the interview and be mindful of the positionality between myself and the teachers. It was important for me to interview them in their classroom setting, as it made them feel comfortable; furthermore, the setting might be used as a trigger to motivate conversation. Additionally, positioning myself as an ‘insider’ was beneficial because the teacher then knew that I understand the terminology and issues that face the teacher and the students in the classroom. I have a Bachelor of Education degree from Brock University and I have the training and experience as a teacher. I am certified as high school and elementary

teacher and I am currently employed by the District School Board of Niagara as an elementary occasional teacher. Knowing I had experience in the classroom most likely made me somewhat of an 'insider' to the teachers I was interviewing. The teachers saw me as someone who was empathetic to their situation of trying to teach and create caring relationships with their students, as well as someone who truly cared about student wellbeing and exploring ways that prepared students to learn. Once my research was completed, it was important that I followed-up with the teachers to ensure my representations of their interviews were accurate, reflective, and complete.

## Chapter Four: Results and Discussion

The data were collected at six schools within the District School Board of Niagara through nine teacher interviews and the completion of 139 student surveys. The six schools were: Port Weller Public School; Lockview Public School; Burleigh Hill Public School; Dalewood French Immersion Public School; Applewood Public School; and Richmond Street Public School. A total of eleven public schools were invited to participate in this research. The principal of one school noted a recent change in teacher and felt that the new teacher would not have gotten to know his/her students well enough yet to be able to accurately reflect and give insight into the students' mode of transportation and the overall levels of student readiness in the morning. Three teachers at three schools elected to decline the invitation to participate and one administrator at another school decided not to initiate the research within their school, citing confidentiality and the presence of vulnerable persons within their school as determining factors.

The socio-economic status of the six schools' catchment areas varied significantly, as did their enrollment levels. The schools, which were located in St. Catharines and Thorold, ranged in size from 120 students to over 500 students as expressed by the teachers. The nine teachers who elected to participate in the study have a total of over 100 years of experience as licenced professional teachers.

*What are the general commuting patterns of Grade 6 students in the study area?*

Each school has a unique set of conditions and the schools that participated in this research have a wide range of characteristics which may influence the general commuting patterns of students as they travel to school. Community and family conditions such as income, modes of transportation used by family members, and amenities influence the availability and culture around

commuting patterns for students as they travel to school. Some schools had low student participation rates in the survey due to low enrollment, the withholding of parental and/or informed consent, or absence from school on the day of the survey; however, a vast majority of students in the participating classes did participate and complete the survey (Table 2). One hundred and thirty-eight of the 186 students, or 74%, that were eligible to participate in the survey did so. Almost three out of four students participated in the research, and while this was not a random sample, the number of responses relative to the size of the sampling population provides us with insight into the reported transportation modes used to get to school.

Table 2: Student Participation rate by school and the mode of transportation students use to get to school (Survey Results)									
School	Number of Participants (Participation Rate %)	Mode of Travel to School							
		Walk		Bike		Bus		Car	
		#	%	#	%	#	%	#	%
Burleigh Hill	3 (50)	2	66.6	1	33.3	0	0.0	0	0.0
Port Weller	31 (91)	13	41.9	4	12.9	5	16.1	9	29.0
Richmond St.	34 (69)	7	20.5	4	11.8	19	55.9	4	11.8
Applewood	12 (66)	7	58.3	0	0.0	3	25	2	16.6
Lockview	24 (75)	14	58.3	0	0.0	2	8.3	8	33.3
Dalewood	34 (72)	4	11.8	3	8.8	22	64.7	5	14.7
TOTAL	138 (74)	47	34.1	12	8.7	51	36.0	28	20.3

The survey included three questions about the students’ general commuting patterns, their general levels of alertness or sleepiness during the first period of the day, and their general levels of excitability to be at school during the first period of the day. The first survey question asked “Which mode of transportation do you use on a daily basis to get to school in nice weather”. When the students were asked which mode of transportation they use on a daily basis to get to school in nice weather, 37% rode the bus, 34% walked, 20% travelled by car, and 9% said they bike to school (Table 2).

Walking and bussing are the most common modes of transportation students use to get to school in the morning. Students that use the bus to commute to school are generally given this option because they live too far from the school to walk on a consistent basis. The Niagara Student Transportation Service outlines that “transportation may be provided for elementary students when the walking distance from the student’s residence to their home school is equal to or greater than 1.6 kilometres” (nsts.ca, 2009). Many families that live 1.6 km or more from school may perceive that the travel distance is too far to travel on foot or by bicycle. Teacher E explains, “With some school closings more students seem to be bussed”. Additionally, some of those students that live too far from their school to walk and that are offered the bus, may be driven into school, and may therefore be among those who selected the car as the main mode of transportation to school. This is echoed by Teacher I, who explained:

“I would say more bussing. More school closures means bigger boundaries and distances so more are being bussed in”, and with the additional distances from home to school due to school closures makes sustainable modes of transportation such as walking or cycling less likely to be chosen”.

Conversely, based on the data collected, of those students who do not receive bussing as an option to commute to school, approximately one-third walk to school. Much like having the bus as commuting option, some who could walk may still get driven in by their parent and use the car to get to school.

In all situations the car is a viable option for parents and students to get to school in the morning so long as their parents or guardians own one. According to the data, students used bussing to get to school 17% more than those that used a car. Likewise, students use walking as a mode of transportation 14% more than getting driven-in, which demonstrates that parents and

students elect to walk over travelling by car when commuting to school. Using a bike was the least selected mode of transportation to school. This may be because additional factors influence the choice to ride a bicycle, safety concerns associated with sharing road space with automobiles concerns around the possible theft of the bicycle, and the question of whether or not the school has adequate and secure bicycle storage facilities, such as bike racks. Teacher A explains the general commuting trends witnessed over their career as “[there are] more bussing and dropping off than when I first started. Morning congestion is bigger and more kids are getting dropped off and picked up.” Many families may elect to drop off their student in order to ensure safety as they travel to school through the congestion that surrounds schools in the morning.

Busing and walking can be an appealing option as students commute to school. For the students that meet the requirements for busing, specifically living more than 1.6 km away from the school, it may be the most often chosen as a mode of transportation because of the routine, consistency, general safety, and reduction of time pressures on the parents. Taking the bus normally ensures their child(ren) will arrive at school safely and on time. However, when are not given enough time to make the bus, students may be driven in. Teacher G states “I think many of our kids that get dropped off in the morning should be taking the bus but they can’t get their act together in the morning which forces [their parents] to drop them off in the morning”. As listed below biking may be less used because of safety and accessibility issues whereas walking albeit may be less secure and increase the risk of injury, the parents and the student develop a routine through walking and this mode of transportation must be maintained when there is enough time to use it. Bussing in traditional catchment areas in St. Catharines and Thorold may be less frequent in comparison to non-traditional catchment areas such as for French Immersion schools.

Teacher C explains,

“It’s funny, in a French Immersion school you are forced to broaden your reach and a boundary so bussing becomes more prevalent. So many more students are taking the bus and have to travel so far. But in regular school environments I would think that if bussing wasn’t used as much as it is here, I think more students are walking now because more and more parents are working and may not be able to drop them off. I would assume the increase would be towards walking if transportation like bus or car was not available to them”.

Students may walk, bus, or bike, to travel to school because getting a ride to school by car may not be practical for all families. Due to parents’ schedules, students’ schedules, extra-curricular activities, and additional factors, walking may alleviate some time and energy strain on parents.

It is important to note that although the data demonstrates these modes of transportation to be more prevalent for Grade 6 students, it is for commuting in nice weather and within suburban communities. In different conditions and different settings the general commuting patterns may be vastly different. For instance, rural and urban land uses may elicit different modal choices and the distance from dwelling to school may be changed, which will normally change the general commuting patterns. The following section moves to the next and more central focus of the research, which sought to understand if – and, if so, how – students’ mode of commuting influences their readiness to learn, as perceived by their teacher.

*What correlations, if any, do teachers find between their students’ mode of travel to school and their readiness to learn in the classroom?*

Throughout a school year, teachers must assess and evaluate their students in a variety of ways and in a wide range of subjects and tasks. Some assessment strategies are for learning at the beginning of the day or the start of a learning period, such as the beginning of a unit, to judge

where their students' knowledge and understanding is. Likewise, teachers must assess as students learn to ensure students are understanding, conceptualizing, and critically thinking about the material and concepts. Additionally, teachers are to complete assessments of their students' learning at the end of the learning period and to further create demonstrations of learning for evaluation of overall understanding and learning of particular subjects. However, much of the assessment and evaluation at different stages of the day and throughout the learning period are focused on the material and skills themselves. This research explores the influence that mode of transportation may have on student readiness to learn and academic achievement.

Many teachers recognize that the level of engagement, focus, and learning continues to erode throughout the day. Students are at their most ready and able to succeed in the classroom at the beginning of the day and, as the day progresses, students seem to be less interested in their learning. As the following excerpts reveal, many teachers use specific routines at the beginning of the day to ensure student success because students know the process of the classroom, understand what to expect, and can start the day off in a strong state of mind for academic success.

Teacher I: "I use DLR, which is the Daily Language Review, to get them into a routine to get them right into work and I think the consistency really helps getting them ready to learn.

Teacher E: "Most of them are oral first thing in the morning. We usually start with math and it's problem solving, so I look at the oral discussion and see what is going on with them. I look at whether or not they are following what is going on.

Teacher B: "At the beginning of the day, we always do math so we always do a bell work question when they come in. Usually I make up the question based on something we've been doing to kind of reassess what we've been doing and see if they need to go back and relearn something or if we can move forward. It's usually only something that's a couple of minutes so they come in and get right to work on it. It's not just an assessment type of tool but also a behavioural one because they come in and there is something for them to do. I'm also using a math calendar, and each night they have

one question which is not based on what they are doing its just each day is a different strand and question and so I check that, especially with Grade 6 and EQAO because they realize it's something they did in September and they have to keep thinking about what they have already learned".

Teacher D: "I want the kids to get lost in a book or be thinking, so if anything, even when the timetable says language we may do math at the beginning of the day to get the kids thinking and going. What I want to see is evidence of thinking and applying and collaborating when given that choice".

Teacher G: "I can speak for the other grade class that comes in here; generally we start with bell work. Sometimes they hand it in and see where they are and other times just take it up. It eases them into the day so we don't have to go hard right away.

Teacher F: "If we have language first thing in the morning, they come in and have bell work to do right away. I like it because it's a routine that they know what to do and what to expect when they come in. All the questions are similar and the structure is relatively the same. Bell work allows time for the student to warm up for the day, get them thinking, and really set the tone. When they are finished, they do silent reading which helps those that are struggling to start can have more time and sets the tone for the day and keeps the noise level to a minimum".

Teacher A: "Greeting them in the morning makes a big difference. You can always tell something about them just by greeting them in the morning. Every morning there is always something that needs to be done. I can see who is on task and ready to move and who is not for various reasons such as lagging, socializing, or just out of sorts for a variety of reasons, you can tell just some simply tasks in the morning. We do some tribes activities too, although we tend to do those at the end of the day more than the start of the day, they are helpful when we do them at the start just to get things going and their brains working".

To ensure all students are engaged and 'ready' in the morning to promote academic success, many teachers have set routines or assessment strategies geared to have students 'warm-up' their brains, engage with the work to prepare for the lessons throughout the day, or for the teacher to assess their students' readiness to learn. Not all students are at the same level of readiness

and engagement during the first learning period of the day. These activities and strategies outlined by the teacher, such as bell work, offer students an opportunity to be ready to learn in the morning. Not all modes of transportation elicit the same readiness to learn as outlined by teacher ratings of their students. Through recognizing how modes of transportation impact readiness and knowing which students use particular modes of transportation as they travel, teachers may be able to tailor morning strategies to maximize student academic success throughout the day, match up students or create learning groups to ensure that the more ready students can help the less ready students, or give time and space for all students to get ready to achieve in the classroom. After opening routines, to best help possibly unprepared students, the core subjects tend to be earlier in the day to ensure maximum attention, retention and engagement. Along with teacher interviews, teachers rated their students' readiness to learn.

Teachers in this study identified that there are two key variables to promote readiness in the classroom. These variables are sociability and physical activity. Being social includes the ability to engage with others as they move through space, but also engage and be social with their environments and surroundings. Students that walk and ride the bus are able to talk with others as they commute to school, which can help them to develop social skills that may help them in the classroom through peer-to-peer learning and engage in classroom discussions. Furthermore, by possibly engaging with their environments and surroundings, students are given the opportunity to question and make sense of the world around them. Students might develop questions and create further intrigue into how things work and what they are as they move from place to place within space. Likewise, physical activity was outlined by teachers to promote overall body and mind health. When students are physically active, such as when walking to school, they may be able to be alert in the morning when they arrive at school because the oxygen and additional natural

chemicals associated with physical activity are present, which further helps students be ready to learn. Teachers associate these two variables with positive readiness to learn.

Teachers were asked to grade their students' readiness to learn on a level-based grading system, which is most familiar in elementary school: Level 1 is the lowest and Level 4 is the highest. Teachers evaluated their students' readiness to learn based on their time spent with each student throughout the year without knowing their students' mode of transportation they use to commute to school in nice weather (Figure 6). Teachers rated their students that walk to school to be the most ready to learn of all the modes of transportation identified within the survey. Moreover, the students that take the bus and car to school were evaluated to be at virtually the same level of readiness to learn during the first block of the day. Lastly, students that take their bike to school were evaluated on average to have the lowest level of readiness to learn by their teachers.

An ANOVA test was performed to assess the level of significance regarding the rated level of readiness for each student by mode of transportation. This test demonstrated that the p-value for the data was 0.001143 which means there was a 0.1% that the data regarding student level of readiness as perceived by their teachers was significant and is highly representable of observable factors (Appendix A). The ANOVA test demonstrates that there is a statistical significance regarding the role mode of transportation may have on student readiness and it lays the statistical foundation for further research regarding how mode of transportation may influence student readiness to learn.

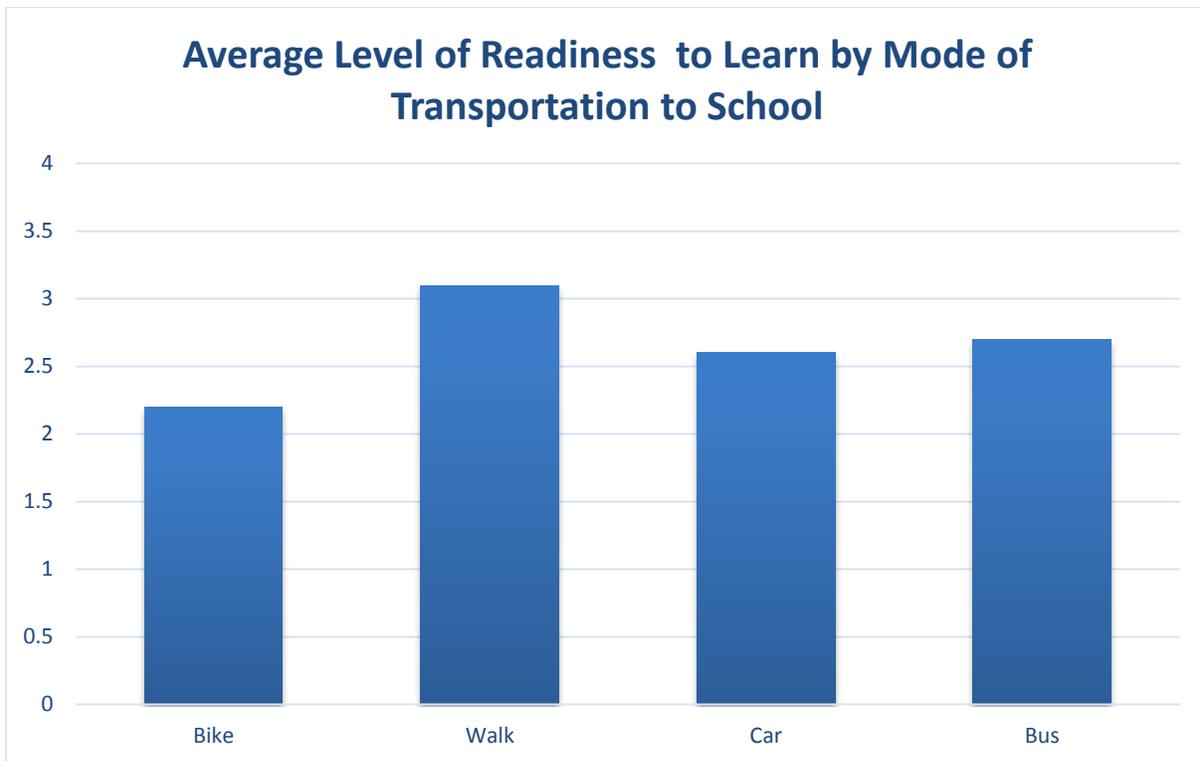


Figure 6: Average Level of Readiness to learn by mode of transportation to school.

Although these levels are simply one, two, three, and four, they can be further changed to a level one representing a D grade or 50% - 59%, level two is a C or 60% - 69%, level three is a B or 70%-79%, and a level four is an A or 80% - 100%. As such when converting the ‘level’ assessing to ‘letter grades’ and ‘percentages’, each mode of transportation are graded as follows: bikers are graded at a C- or 62%, walkers are a B- or 72%, students that get dropped off in a car are a C or 66%, and students that take the bus are a C+ or 67% of ready to learn in the morning. This demonstrates that students who walk to school as their main mode of transportation in nice weather are 10% more ready to learn in the morning than students that bike in the same conditions. Students that take a vehicle to school were evaluated to be relatively the same regarding their readiness to learn in the morning. Dalewood French Immersion Public School impacted the general commuting patterns of students as they travel to school due to the extended catchment boundary they have to

make up their student body. However, the atypical catchment boundary of Dalewood French Immersion Public School did not impact or alter the average evaluated level of readiness to learn by teachers by any significant amount (Figure 7).

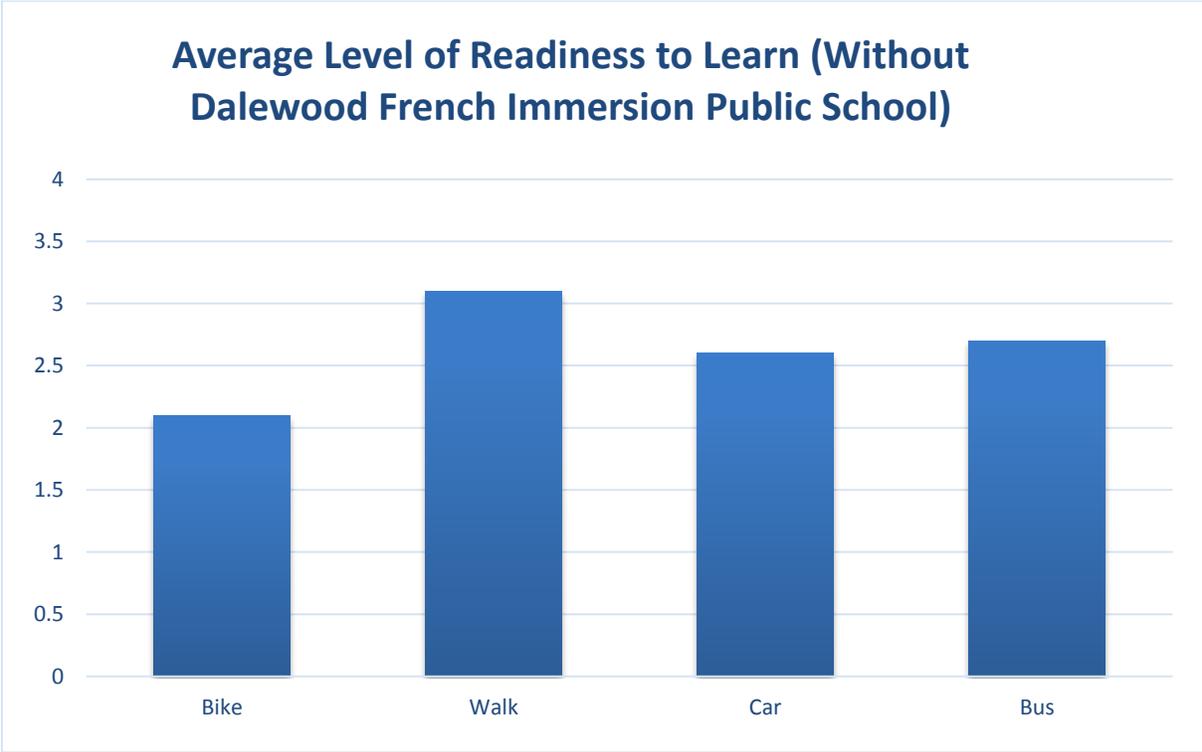


Figure 7: Average level of readiness to learn with Dalewood French immersion Public School data removed.

Without the Dalewood French Immersion Public School, the only change in the teacher’s evaluation of their students’ readiness to learn was for students that identified as biking to school in nice weather, and it went down from Level 2.2 to Level 2.1. This demonstrates that even with the change in boundary size and school size, student readiness to learn based on their mode of transportation appears to remain the same when solely based on teacher’s rating their students’ readiness to learn. As such, student readiness to learn based on their mode of transportation seems consistent and reliable. Although students and parents may choose a particular mode of

transportation for a variety of reasons, the mode's influence on readiness to learn and academic achievement may be reasonably forecasted.

The four modes of transportation explicitly identified for student commuting patterns can be broken into two subgroups, one for the physically active modes and the other for the not-physically-active modes. The students that use non-physically-active modes of transportation for the commute to school were evaluated to be relatively the same regarding their readiness to learn and alertness in the morning. One teacher explains, "A car and bus are very similar...too similar to make a difference, I think" (Teacher C). However, with these subgroups, there is a major discrepancy between students that bike and students that walk as they commute to school. When a student regularly walks to school they tend to have a routine to their morning. For most of these students, parents get their child(ren) up in a timely manner and enable enough time to complete the routines within the home, which may include breakfast, getting dressed, brushing their teeth, and ensuring they have all their materials for the day at school. Additionally, in these cases, students leave the house with enough time to get to school, they know how long it takes to get to school, and they go through this routine daily when there is nice weather. Some students that bike to school go through the same routines as those who walk and are given enough time to get to school and complete all the necessary tasks to best prepare them for school. However, in many instances this is not always the case; students that ride a bike to school in the morning can be running behind or miss their bus in the morning and, as a result of the time crunch, and when a car is not available to them, they are forced to ride their bike to school. In these conditions where they are rushed and they are not prepared for the day, they are not ready to learn in the morning and not particularly alert as they enter the classroom during that first period of the day. This research is

exploratory in nature and it is understood that some students may choose particular modes for a variety of other reasons such as for the adventure.

According to many teachers, routines were important indicators of how well the student is ready to learn in the morning. Additionally, the time at which they arrived at school was seen as playing an influential role in shaping their readiness and alertness in the morning. As such, students that take the bus were explicitly mentioned to be perceived as more ready in the morning. This was attributed to the time they have to wake up in the morning, which may be earlier than students that use other modes of transportation and may then result in an increased time to “wake up” in the morning. Additionally, the social factor for students that take the bus was identified to be immense, which helped with their readiness to learn because they have been engaging with one another; this, then, was seen to translate into the students’ classroom performance. Moreover, students that take the bus are on a specific and dependable schedule that ensures students will arrive at school on time.

Teachers expressed that they believe students who are driven to school by car in the morning were less ready to learn in the morning than other students. This sentiment was attributed to the time crunch some families feel in the morning, whereby the parents are forced to drive their students into school because otherwise they may be too late in the morning. Teachers outlined that the students whom are chronically late tend to be those that get dropped off. Teacher B discusses,

“The ones who are late, which is usually the ones being dropped off, have usually and more of a crazy morning so they would be less ready to learn first thing in the morning. I would definitely say that that affects their learning but with bus or walking, I don’t know. I know what it feels like when you’re rushing, you’re not even thinking about learning you’re just thinking about getting there on time. I like the idea of the bus because you know when it’s coming

and dropping you off and you're ready to go at the time when you have to be there".

Likewise, students that get dropped off in the morning do not have the same level of sociability in the morning because their car ride may only consist of the radio and little to no interaction with others. Similarly, the car might be the most efficient mode of transportation to commute to school with regard to travel time. As such, these students have the increased ability to sleep longer. Although increased sleep may result in overall restfulness, which in turn may help students to focus and learn in the morning, the benefits associated with additional sleep tend to manifest throughout the day as they may have more energy than their peers. However, with the increase of sleep and the ability to wake up later in the morning because they get dropped off in a car, they may not be ready to learn and alert because the student is still "waking up" in comparison to their peers who have been up for a longer period of time.

The differences, advantages, and disadvantages for students who take the bus and students who get commute by car are evident. However, the teaching professionals believe and argue that busing is better for student readiness to learn, even though the evaluated level of readiness for busing and taking a car is the same. Teacher F outlines bussing to be a positive influence on student readiness:

"It's interesting, at the other school I worked at almost all of the students were bused and their morning routines went much smoother. It was a different community, with different parents, and kids but it was easier to get them started in the morning because they took the bus".

This is further echoed by Teacher B:

"I don't know, it's funny that you ask me that because my daughter has to take the bus but I think if they walk they might be more ready only because they have the exercise and fresh air. If they're taking

the bus, you're going to be on time, the ones that get a ride are often more late and are normally scrambling more and maybe would be less ready".

Moreover:

"there are the kids that had to get up, eat breakfast, wait at the bus, talk to other on the bus and when you're talking to other you are waking up and starting your day" (Teacher G).

At the same time, using a car to travel to school was associated with negatively influencing student readiness by many teachers. As Teacher (A) noted:

"I tend to think the ones that are just being dropped off, like their parents just drop them off each day even if they don't live far away they just get dropped off I sense that they are often less prepared; they haven't gotten themselves together."

Similarly, Teacher (D) stated:

"Some parents that drop their kids off are chronically late, and those kids already feel the pressure because they are late, they feel like they are behind, and I think that really effects some kids more than others".

It is unclear as to why the strong belief exists among teachers that busing is better for students while getting dropped off is worse for student readiness to learn and why it is not demonstrated in the data, though observer bias in the teachers should be taken into account. However, this demonstrates that there is a belief and argument teaching professionals are making and that there needs to be further studies to identify student readiness to learn between students that take the bus to school and those that take a car to school. In this research, suburban Niagara is the area of study; however, perhaps including a variety of settings and different areas of study may better demonstrate the relation between student readiness to learn and using a bus or car as they commute to school. For instance, students that live in a rural setting but receive schooling in a suburban

setting, these students would need increased time to get to school, have increased travel time, and may have to get up especially early. Likewise, within Niagara and the District School Board of Niagara, the DSBN Academy is a school that takes students from the entire region resulting in some students living down the street while others in the same class have one-to-two-hour bus ride. Additional research is required to understand and conceptualize the impacts that taking the bus and getting driven in by car have on student readiness to learn and academic achievement. Moreover, when asking teachers to rate their students' readiness to learn, specific to the morning, the rating could include a sum of the student's academic readiness and achievement.

As stated, students that take the bus have a set routine in the morning at home and on the way to school which is widely accepted to help with the routines of the classroom and readiness in the morning. However, although they may be 'ready', due to the routine associated with using that mode of transportation, such as waking up earlier, getting to the bus stop on time, and arriving to school on time, these students were rated just as poorly as car-using students. For many teachers, although asked to rate their students' readiness in the morning, perhaps their rating could include a holistic perception of the student's readiness. Moreover, for those students that must get up early, arrive at the bus stop on time, and make it to school in a timely manner, by the end of the day these students may be more fatigued. As such, their readiness to learn may be skewed. It is important to understand how students view themselves and any correlations with the mode of transportation they use as they commute to school in the morning.

Sleepiness undoubtedly affects students' learning throughout the day. Although these students may be tired their sleepiness can be manifest in different ways. This could include a lack of concentration while completing tasks, diminished stamina to complete assignments, inappropriate or disruptive behaviour, or simply a lack of input towards experiential and self-

regulated learning. It was widely accepted by the teachers who were interviewed that student sleep patterns and the amount of sleep they receive influences student learning. When asked about their perceptions and views on the influence of sleep on student readiness to learn in the interviews, the following was discussed:

Teacher B: “Lack of it takes its toll. There are students that come in and they can’t pick their heads up off the desk and they’re only wanting to sleep. And we start at 8:25 so if they’ve only gone to sleep late at night, they can’t focus and contribute because all they’re trying to do is make it through the day, so I think it’s huge. It’s no different than when I go to bed late at night. I mean, I try to go to bed by 10:00 because I need that sleep. It also goes hand in hand with nutrition and what they’re eating. When they open up their lunches with all sugary stuff, there’s no way they’ll be producing what they need”.

Teacher E: “If they do not get enough sleep they are tired, less responsive to problem solving in math because they are tired, they are not as flexible in their thinking. They just need the sleep; otherwise, their stamina just isn’t there to do the work”.

Teacher I: “100%. One of first questions I ask if a student is sluggish or unfocused is ‘how is your sleep?’ And if the answer is poor, they usually shut down after the first block. I mean, they try but it’s just not there”.

Teacher C: “I definitely think it influences their readiness to learn. You hear a lot of kids come to school and they are yawning, or they have their head on their desk and you will hear them talking and engaging about what they did the night before like they went to a hockey game, played video games, or what they watched on TV like the Grammy’s, the Oscars, or whatever. Those instances, for sure, impact their willingness and readiness to learn when they get here in the morning because they are so tired. It does impact the students in a negative way; I find the students that have received a good sleep the night before are rested for the day. I think technology also plays a role. If you go into the bedroom at home, there are families where they don’t allow them to watch TV in bed and they don’t allow them to be on their iPad, iPhone, video games; you have to just read your book and straight off to bed; those students seem more rested and more ready for the day. I think it’s a timing thing but also the quality of sleep you are getting”.

Teacher G: “Big time, I mean, myself you have to be on your toes and ready to prepare a lesson, give a lesson, and ready to teach and if I am tired I have to switch gears...it’s hard. If you had a late night the night before you’re not as sharp the next morning. There are some conversations you hear from these guys and you hear them say they were up past midnight playing video games and I am thinking, ‘Why were you up past midnight playing video games?’ Kids being zoned out after school watching TV and being zoned out at either 4 o’clock or 10 o’clock, that can’t be good for alertness. I do notice those conversations about being up too late and some kids come in grumpy and I say what’s going on and they will usually say they are tired from something the night before, whether it is playing video games, watching TV, or playing sports, they aren’t as rested and it does affect them when they get here”.

Teacher C: “It affects everyone, even the teachers. You can tell the kids that haven’t had a good night’s sleep. Some kids come in and whatever it might be, either they were up too late, they had sports the night before, or even after the holidays, it is difficult to keep them awake for the entire day if they are tired. It can also be difficult to get them started at the beginning of the day if they are tired, they can sit on an activity for a long period of time and not generate a lot of work and I think it goes back to the night before and how much sleep they have had. It can be because of how much video games they played, what they were doing, and even whose house they were at. If mom and dad have different rules and routines and it can affect them”.

Teacher A: “I think it’s huge from personal experience, but also the kids that are “dozing” are clearly exhausted and it is pretty evident in their learning. It also impacts them emotionally, as they are tired they are not able to work as hard or focus”.

Each one of the teacher identify a wide range of reasons why students may be tired; however, the outcome is the same, which includes a lack of attention, stamina, focus, work ethic, positive behaviour, and flexible. Moreover, perhaps the most important implication of sleepiness to today’s education philosophy of self-regulation, self-exploratory knowledge, and peer-to-peer learning is the lack of imagination, determination, and ability for students to think ‘outside the box’ to solve problems and manifest meaningful and personal conclusions. Although these are the

perceptions of teachers, it is important to know how students view their sleepiness and if it can be correlated with specific modes of transportation students use to travel to school.

Students were asked two control questions, which were “How ‘sleepy’ are you when you arrive at school?” and “How excited are you to go to school in the morning?” These questions were asked because they identify key characteristics that may influence student readiness to learn. Students that are tired in the morning may not be ready to learn because they are still trying to wake up. Likewise, for students who do not like to go to school and do not enjoy school in general, no matter what mode of transportation they use to commute to school and what they do in the classroom in the morning, they will not exhibit signs and indicators that they are ready to learn. Students that identified as ‘very awake’ in the morning were evaluated at a level 3, students that selected ‘awake’ were evaluated at a level 2.8. Similarly, students that circled both ‘Neutral’ and ‘Somewhat Sleepy’ were evaluated to be at a level 2.9. Finally, students that identified themselves as ‘Very Sleepy’ when they arrive at school were evaluated as a level 1.9 regarding readiness to learn in the morning by their teachers (Figure 8). Students that were ‘very awake’ were rated as the most ready and the students that were ‘very sleepy’ was rated the lowest. However, there are discrepancies between ‘awake’ and ‘somewhat sleepy’ which may be attributed to students self-assessing their sleepiness with no benchmarks or standard of measure.

The number of students who rank their own sleepiness when they arrive to school in the morning is important because only they know how they feel in the morning. Unless the student is eliciting atypical behaviour, the teacher may not be able to identify when a student is feeling somewhat sleepy to awake. However, the issue with self-identifying sleepiness based off of predetermined categories is the lack of consistency and reliability from student to student. For one student, their awake may be a neutral or somewhat sleepy to another. In contrast, a student that

regularly arrives to school in a state of somewhat sleepiness may move to awake; this might feel very awake to them in comparison to other students that may have just identified as awake in the same state. As such, the difference between students that selected very awake, awake, neutral and somewhat sleepy and their evaluated readiness to learn by their teachers is negligible. What is most telling and identifiable result is that students whom identified as very sleepy were evaluated to have on average the lowest readiness to learn in the morning. Although there may be some student-to-student discrepancies regarding how sleepy they are in the morning, those that chose the highest level of sleepiness in the morning tend to know that they are truly too tired to be ready in the morning.

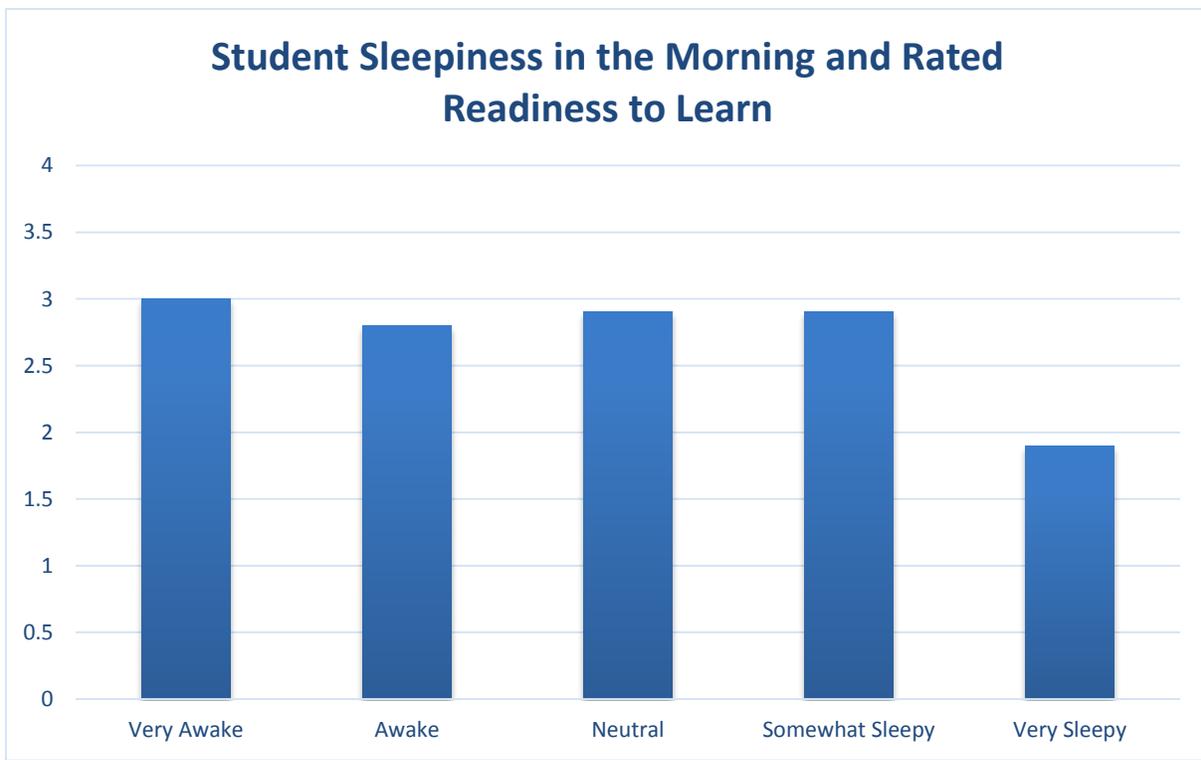


Figure 8: Student Sleepiness in the Morning and their Rated readiness to learn.

Student mode of transportation, sleepiness, and readiness seems to be correlated. Students that walked had the largest difference between positive and negative sleepiness than all other

modes of transportation. Likewise, the two active modes of transportation have the highest positive sleepiness (Table 3). Students that elected to walk to school not only made up the highest number of ‘Very Awake’ students, but also the highest level of positive sleepiness (Very awake, Awake). This echoes the teacher-evaluated level of readiness for their students, as students that walk are more ready and thus more alert, and biking as the lowest level of readiness to learn and the highest level of self-identified negative sleepiness (Somewhat Sleepy and Very Sleepy).

Table 3: Student self-rated level of sleepiness and percentage of positive and negative sleepiness.

Mode of Transportation	Level of ‘Sleepiness’ in the morning	Number Selected Sleepiness	Percentage of Selected Sleepiness (%)	Percentage of Positive (Very Awake & Awake) & Negative Sleepiness (Somewhat Sleepy – Very Sleepy)
Bike	Very Awake	0	0	41.6%
	Awake	5	41.6	
	Neutral	1	8.3	50%
	Somewhat Sleepy	4	33.3	
	Very Sleepy	2	16.7	
Car	Very Awake	1	3.6	32.2%
	Awake	8	28.6	
	Neutral	10	35.7	
	Somewhat Sleepy	8	28.6	32.2%
	Very Sleepy	1	3.6	
Walk	Very Awake	5	10.7	40.4%
	Awake	14	29.7	
	Neutral	15	31.8	
	Somewhat Sleepy	11	23.4	27.7%
	Very Sleepy	2	4.6	
Bus	Very Awake	2	3.9	17.6%
	Awake	7	13.7	
	Neutral	20	39.2	
	Somewhat Sleepy	17	33.3	43.1%
	Very Sleepy	5	9.8	

Again, the middle two modes of transportation to school are the bus and car. These modes of transportation have a wide variety of factors and conditions that influence student readiness to learn. Students that drive in a car and get dropped off as they commute to school have the highest number of self-identified 'Neutral' sleepiness which can demonstrate those students whom take a car may feel indifferent about their sleepiness in the morning. The car does not aid a student in waking up in the morning, but it also does not *prevent* individuals from waking up. On the other hand, the bus may prevent wakefulness because of the potentially extended duration of travel which may mean that students need to wake up earlier in the morning. However, there is room for further study and research explicitly identifying and studying students that take the bus into school and those that take a car to school in a variety of conditions and settings.

The other control question included student desire to be at school in the morning. Individuals that lack desire, passion, and willingness in anything they do are less productive and lack overall initiative. Conversely, those that have a strong desire and passion for what they are doing tend to have increased levels of competency, determination, and productivity. This is not different among students. When teachers introduce activities or new topics, or students look at the day's timetable, their excitability is direct and explicit. In many instance, students will demonstrate their discontent by moans, groans, and outright objection. In many instances, when the day, activities, or lessons, are prefaced by this lack of excitement, their readiness to learn, work, and achieve is impacted negatively. Conversely, when students are excited about what is happening in the classroom, they are invested and engaged, which helps foster positive and strong learning. Many teachers identify and outline their perception of how student excitability influences student readiness to learn:

Teacher A: “Most don’t state anything one way or another but there are definitely some that do not want to be at school or don’t show much in desire and effort. They are the most obvious. I have some kids that just like being at school and even tell you, and that carries them throughout the day. Most aren’t always excited to be at school but not mostly say they are thrilled, but the ones that are one end of the spectrum you can tell the difference it makes”.

Teacher F: “If someone doesn’t want to be here they probably won’t do any work. I have some kids that it is a struggle to get them to school and when they are here they do not do any work or hardly any work. Sometimes they do not want to be here that they ask to go home and say they are sick or something which is often denied because it happens with such frequency, unless there is something seriously wrong, they do not need to go home. And the ones that want to be at school also want to achieve when they are here and they have more success because they want to be here so they do their work”.

Teacher G: “I’m sure huge, do I know everything they are going through, but I know some feel like they don’t belong and getting picked on are feeling anxious and their anxiety goes through the roof when they sit in their class, yes. Would they rather be in a safe place like their home? Probably. I think there are some kids naturally in this class that are keeners that want to get good marks and it looks like they are engaged and want to be here, but is that the case? I don’t know. There are some that can fly under the radar all day. With the sheer size of the classroom and what happens in the classroom, they could sit there and not do a single thing for 100 minutes. They could be redirected a couple times, but if you look at their work, there could be nothing”.

Teacher D: “It’s huge. I mean, it’s with any adult too; if you’re not wanting to be there and you’re starting off with a poor attitude, it kind of steers you where you’re going. An attitude is a little thing that makes a big difference”.

Teacher C: “I think their overall attitude, if you come to school with a negative attitude, for valid reasons sometimes, they set themselves up with some road blocks and it makes it more challenging. Whereas other students come to school and there is willingness, or it is important for them to succeed. Those students tend to be a little bit more successful because of course they are coming to school ready to learn, while the other students are not as ready to learn because they do not want to be here in the morning”.

Teacher I: “100%, because if they don’t want to do their work they won’t. Wherever your desire is, that is where you will succeed”.

Teacher B: “I think so, I mean, if they don’t want to be there, they’re not going to want to participate, they’re not going to care. I have kids who just sit there, basically putting in the time and it doesn’t matter what angle you come at them from, they don’t want to be there. I’m not sure why they’re coming exactly, but absolutely it affects their learning”.

Teacher E: “Those whose parents support the school, they definitely have more success here because they are motivated at home by their families. It’s one of those expectations”.

The sentiments are echoed between all teachers, much like sleepiness and overall alertness, desire to be at school, desire to learn, and overall excitability influences student learning and student readiness to learn at the beginning of the day and throughout their learning periods. In large classes, there are some that want to learn and are excited to get to school and work on tackling the day’s lessons. However, for many this is not the case. Some are not excited about school because of specific conditions within the home that have started the student’s day poorly or in a poor state of mind. Other times it is based on their personal preferences for activities, strategies and subjects. For many students, their favourite subjects tend to be physical education, the arts, music, social studies, and technology. However, as outlined, numeracy and literacy are at the forefront of education in Ontario and teachers push to have these core subjects placed as early as possible in their day to ensure maximum energy, focus, and success. However, for those students that dislike numeracy and literacy, knowing they have these core subjects right away starts their day off with low desire to be in school which is demonstrated in many instances by their poor readiness to learn and academic achievement. Furthermore, students understand their excitability and desire to be in school and how they feel regarding excitability in the morning.

Students that have an increased desire to be at school in the morning will likely have an increased level of achievements and readiness to learn. Likewise, when students are excited and

engaged in their work, they will be ready to learn and achieve at increased levels. Students were asked to rate their excitability in the morning as they get to school (Table 4).

Table 4: Student self-rated level of excitability to go to school in the morning and their percentage of positive and negative excitability.				
Mode of Transportation	Level of ‘Excitability’ to Go to School in the Morning	Number Selected	Percentage of Selected Excitability (%)	Percentage of Positive Excitability (Very Excited – Neutral) & Negative Excitability (Somewhat Unexcited – Highly Unexcited)
Bike	Very Excited	0	0.0	25.0%
	Somewhat Excited	3	25.0	
	Neutral	5	41.6	
	Somewhat Unexcited	3	25.0	33.4%
	Highly Unexcited	1	8.3	
Car	Very Excited	2	7.1	28.5%
	Somewhat Excited	6	21.4	
	Neutral	8	28.6	
	Somewhat Unexcited	9	32.1	42.9%
	Highly Unexcited	3	10.7	
Walk	Very Excited	5	10.6	48.8%
	Somewhat Excited	18	38.2	
	Neutral	14	29.8	
	Somewhat Unexcited	9	19.1	21.3%
	Highly Unexcited	1	2.1	
Bus	Very Excited	4	7.8	33.3%
	Somewhat Excited	13	25.5	
	Neutral	21	41.1	
	Somewhat Unexcited	11	21.6	25.5%
	Highly Unexcited	2	3.9	

Of the students that bike to school in nice weather, 25.0% self-identified as having positive levels of excitability (Very Excited and Somewhat Excited). Students that selected walking as their main mode of transportation as they commuted to school in the morning had a 48.8% positive excitability, while 33.3% of students that take the bus to school had a positive level of excitability.

Lastly, students that get dropped off had the lowest percentage of excitability to go to school in the morning with 28.5% of positive excitability.

There appears to be a strong relationship between students that walk and take the bus to school and their overall desire to be at school. Both walking and taking the bus to school have an increased likelihood of social interactions as they commute to school. Students that walk are able to walk with others, engage in conversation, and perhaps experience their surroundings. Walking can be the slowest mode of transportation for students as they commute to school, which also gives an increased opportunity for students while they talk, engage with others and their surroundings to develop questions about the world around them and the things individuals have spoken about which can fuel their desire within the classroom in the morning. These interactions can fuel connections to previous lessons or to ask questions once they have arrived in the classroom. These questions can stimulate conversations and activities within the classroom. Likewise, when students develop questions about the world around them, they have a strong desire to receive the answer and as such are positively excited to go to school in the morning. These questions demonstrate that students are processing events and items as they commute which demonstrates that they may be more ready to learn because their brains are already functioning and assessing before they enter the classroom. This is echoed by students that use the bus to commute to school.

Students that use the bus to commute to school have the highest opportunity to engage in conversation and be social with their peers. This is where the benefits of taking the bus and the sociability it manifests influence their readiness to learn. Individuals are naturally social creatures and students, especially, desire and yearn for social contact and interaction. While taking the bus, students are immersed in social interactions. Taking the bus is unstructured activity where students are in close proximity to one another and are able to talk. This increase in interaction excites and

stimulates students as they commute to school and arrive. This stimulation and excitement may be transferred within the classroom and students may view going to school in the morning as a positive because of its association with riding the bus and being social. The adverse effects of taking the bus, which include prolonged length of time to commute, may be prevalent in other communities and areas; however, within this data and the selected schools there almost localized school catchment boundaries within a relatively short distance to travel. Instances of extended commutes to school may result in a reduction of desire to be at school.

Conversely, students that commuted to school by bicycle and by car had the lowest self-identified levels of excitability to go to school in the morning. These particular modes of transportation have far less probabilities of being overly social and engaging situations. For those that bike, due to potential a potential time crunch and the overall speed in which students can go as they commute limits not only their ability to communicate with their peers in a substantial way, but it also reduces their ability to interact with the world around them. It could be argued that students who ride a bike to school can do it at such a pace that there is not time to process their setting and perhaps engage with one another and the environment to develop those questions. Likewise, students that bike have the potential of sharing space with walkers and automobiles, and their focus may be on their safety and negotiating their commute, which takes students' focus off socializing and engaging with others and their surroundings. Additionally, cyclists may feel an added stress from having to maneuver through these spaces of contention. This may add stress to their commute and the overall sentiment towards going to school; as such, they will demonstrate a poor excitability to go to school because they have to ride their bike through these conditions. Commuting to school by car can have similar limiting social and engaging instances which may further reduce a student's excitability to go to school in the morning.

Students that travel to school by car have been rated as the least ready to learn in comparison to students that use different modes of transportation outlined in this research. Cars can be less engaging for students as they travel. Many families have their student get into the car, there may be limited engaging conversations on route, followed by the student getting out of the car once they arrive at school. In comparison to other modes of transportation, the automobile does not foster social and environmental relationships. Students that travel by car to school may be physically and socially removed from the environment and others. Without the social and physical engagement with others and the environment, students may not have the time or space to get their brain working before class. This lack of start time may limit the overall success of students because rather than entering the class with their brain ‘running’ they have to go through the start-up process while in school. Additionally, there is no physical activity to promote cognitive strength and alertness. Unlike busing where there, too, is no physical activity as they travel, there are high levels of sociability as students travel whereas the car tends to have limited social interaction with parents, siblings, or other passengers.

*What influences do teachers feel their students’ mode of travel to school have on their overall levels of academic success?*

The goal of all educational policies, curriculum expectations, literature, and studies is to develop a deeper understanding of student learning, teaching strategies, and conditions around educating that can better educate and teach students. It is vital to understand how students learn, in which conditions promote different levels of learning and to help students succeed in the classroom. Today’s education climate, specifically in Ontario, there is an explicit focus on core subjects, namely numeracy and literacy. Both numeracy and literacy should be integrated within cross-curricular strategies and lessons to ensure a strong and broad foundation in all subjects have numeracy and literacy embedded within all lessons. Although the curriculum documents guide a

teacher's lessons and units, much of the educational literature focuses on how to foster improved learning of these core subjects. A vast majority of education capital is invested into numeracy and literacy. Each school in Ontario must complete Education Quality and Accountability (EQAO) testing to ensure all students are receiving a quality education to meet the needs of society and develop individuals that will be successful and contributing members of society. EQAO testing is done in grades three, six, and nine. In these years, teachers focus on EQAO practice tests, practice strategies, and develop skills required to be successful on the tests. Likewise, in Grade 10, students are required to pass a Literacy Test before graduating. In order to meet the social, political, and economic needs of society, both numeracy and literacy have been identified as key mechanisms for success. With the identification of numeracy and literacy as the key metric for academic success, the educational system has moved from what to learn to how to best get students to learn.

Educational philosophy has moved away from top down learning, which means all the knowledge given to the students by the teacher and most often by rote and repetition. In today's classrooms, teachers should focus on peer-to-peer learning using self-guided and regulated exploratory strategies to create examples and meaning specific to them. This philosophy of education ensures that students do not only create person-specific learning, but that students are have an active stake and role within their learning. It is through expectations of the classroom, classroom culture, school culture, and creating a positive and safe environment that meaningful learning can occur. Understanding the conditions that surround a student's learning and promoting inquisitive and exploratory learning promotes academic success. The mode of transportation students use to travel to school is one of the conditions that foster positive learning and academic success.

Many teachers try to have the core subjects as early in the day as possible to ensure maximum engagement and retention. As mentioned, student readiness to learning is widely recognized to diminish throughout the day and thus, student academic achievement in the core subjects may be limited if placed at the end of the day.

Teacher B: “I definitely think the morning is the best block, which is why I always put it first thing in the morning. I always start with double math each day. As far as language, it’s not really the same because we’re always working on different things. We’re working on spelling or writing, just to try to get them going and doing stuff. Other than that it’s usually just starting a conversation about what we’ve done. I would never put it at the end of the day because they are drained or not as focused or they’ve gone outside and done lots of things so at the end of the day, I don’t find them as alert or ready to learn. It’s not that I don’t want their attention or anything else, I just find it’s best to get them working right away in the morning, where in period six they’re almost exhausted or done learning at that point”.

Teacher A: “I think that especially with my class this year the differences are striking. I think the first block is the best, they are the most focused, on task, ready to go. Broadly speaking, focus is definitely the best. In comparison, the end of the day is really difficult for them; they are falling apart by the end in terms of focus and behavior”.

Teacher I: “End of day is definitely the most challenging in keeping their energy levels up and their focus still there. I find that I can get them into a routine at the beginning of the day but I find that by the end of the day, we need to make sure the subject areas are lighter academically”.

Teacher E: “One is students arriving late first thing in the morning, they can miss instructions. By the end of the day they are tired, their perseverance and stamina is gone so a lot of their language and math is done in the morning and then the more fun subjects (gym, art, social studies, etc.) is done at the end of the day”.

Teacher C: “As your days progresses the students do become a little less engaged. At the beginning of the year when I plan out what I am going to teach and when I am going to teach it, I try to make the heavier content subjects such as language and math, I try to clump those in either period 1 or 2 versus period 5 and 6 because by period

5 and 6 it is very difficult for them to understand and run with a new concept as easily as it is during the start of the day”.

Teacher F: “I find it a struggle because I teach mostly literacy and the later in the day they have literacy the more challenging it is for them. I find the students to have more success if we start the day with language because once they have had the morning routine and warmed up, they can jump right into whatever we are doing. I find that first block becomes an hour or an hour and ten minutes of useful time. Second block, with my kids is the best part of the day, although by fourth period we have some students that struggle because of the content of their lunch and life. The last block is the worst teaching part of the day. They are just ready to go and some have checked out for the day”.

Teacher D: “Definitely we have three instructional blocks with two breaks throughout the day. The third block is after their second break, and that is the toughest because after a few minutes of getting them settled, it is time for a nap, and nobody can have a nap. I would say for the most part students are attentive at the beginning of the day, there are a few that come in late and as a class they are quieter in the morning. I think their readiness to learn is overall good. I can think back to last year, a student that would continuously come in late and was still sleepy and tired when they arrived so I could see evidence of that”.

Generally, teachers identify that student readiness and engagement diminishes throughout the day. Student engagement could reduce as the day progresses for a variety of reasons. These reasons could include the rigor that is associated with numeracy and literacy has taken most of their cognitive energy, incidents in the classroom and during breaks that derail student focus, change in routines, and thinking what will happen after school. All of these conditions and events aid in overall reduction of student productivity throughout the day. As such, the core subjects, that are argued to be most important, are preferred to be at the start of the day which leaves the remainder of the subject areas to be placed closer to the end of the day. Although these subjects are important to develop well-rounded students and develop a wide variety of skills, they are deemed to be ‘lighter’ academically. Academic success is most important at the beginning of the

due to the focus on numeracy and literacy, the need to excel in the core subjects, and the eroding behaviour and engagement of students as identified by teachers. By ensuring students are most ready in the morning, students can be best prepared to achieve in these important core subjects. Thus, understanding how modes of transportation influence student readiness to learn and how particular modes of transportation can promote student achievement through preparing them to be engaged in the morning for these core subjects.

Particular modes of transportation have been shown on average to promote different levels of readiness. This readiness helps students achieve in the classroom. By having students ready and engaged as they enter the classroom, students are in a better position to learn and achieve academically in the morning.

Teacher A: “I would tend to think that the modes of transportation that get exercise tend to be simply more beneficial. I guess I could see how you catch the bus, there is a social component to being on the bus, so I guess that’s potentially helpful too. Maybe riding with your parents is great for bonding. I would be inclined to think that for students in grade 6, being out and being moving and interacting with the other kids that are walking to school gives them at least some inkling of experiencing the world”.

Teacher F: “It’s interesting, at the other school I worked at almost all of the students were bused and their morning routines went much smoother. It was a different community, with different parents, and kids but it was easier to get them started in the morning because they took the bus. Here, there is not that homogenous mode of transportation for students. They all get here in different ways and they are very diverse learners this year. I know last year the kids that were less successful were expected to get to school on their own. The low achievers were the ones that had less reliable arrival times”.

Teacher E: “I think if they have to get on the bus at a certain time, they are learning that responsibility. They are learning time management skills, they are learning that routine and they are that much more efficient at learning and can achieve”.

Teacher B: “I mean, I guess it might be based on the kid and their situation too. I know when I was a kid and I walked, I was more alert. Walking might be the better option for that, but I’m not sure”.

Teacher I: “Yes, I do. I think walking is my favourite mode. They’ve had a little bit of air, they’re already into their routine. I find on the bus, they’ve already been dealing with drama and social problems. They get off the bus to tell me what happened on the bus. A lot of issues I think stem from the bus”.

Teacher C: “I think anytime a student can be active, it is good for the body and mind. I do think that would make a difference. Now, do I see it in the classroom when they get to me? I don’t really know. By the time they get to me they have been out in the playground and have had some physical activity before even entering my class. I know at the end of the day, we have some students that are supposed to walk home from school but they are too tired. I wonder if they do walk home when they get there, are they still tired or are they awake and energized? Kind of like myself when I go to the gym, I do not want to go but once I am there and finished my workout, I am happy and have energy and feel great. It could give you a boost of energy. That would promote cognitive development rather than just driving me around or taking the bus”.

Teacher G: “Well, I mean if you have a student that is a walker, and they are having a walk with mom and dad and they are having an engaged conversation with mom and dad about things and the world around them then sure maybe they are developing skills and is beneficial because the parents are prompting them and asking questions. Cognitive development on the bus, there is the social piece, but I don’t know”.

Many of the teachers identify some modes of transportation to directly impact the academic achievement in the classroom and students’ overall cognitive development. Students that walk are generally seen to be more ready and thus able to achieve better in the classroom. However, there is generally less of a concrete or definite link between modes of transportation and academic achievement. When asked about how modes of transportation may influence cognitive development and academic achievement many prefaced their answers, embedded it, or concluded with language that is speculative in nature. Such language included ‘I do not know’, ‘I think’, ‘I

guess', and 'I believe'. In comparison to how modes of transportation may influence readiness to learn, teachers were less confident making the direct connection between mode of transportation and academic achievement. Readiness to learn is a measurable condition or state that a student is in to be open to learning and achieve; however, actual achievement is highly dependent on the student themselves. Although the conditions can be created to learn in safe, inclusive, and positive environments, it does not necessarily equate to actual academic success.

All students learn differently. Many educators have recognized this, which has promoted the shift to exploratory and peer-to-peer learning. Some students have a certain proclivity to numeracy and literacy and in all conditions and settings; they may succeed because they tend to have a certain skillset for these core subjects. Conversely, some students do not have the same talents and they may need additional contexts to be successful. For instance, students that are more Music, Art, Drama, and Dance (MADD) inclined may not understand how to write a persuasive essay and adhere to rigid guidelines of an essay as they may find in literacy. However, when literacy is embedded within the context of writing a play on the same issue, the student may be able to conceptualize the overall idea and develop the story using the exact same points that would be found in an essay. This student may be achieving poorly in literacy, but may be excelling in MADD. The conditions before entering school such as diet, physical activity, sleep, mode of transportation, and sociability can aid in promote academic achievement, but cannot definitively ensure academic achievement of all students. Similarly, qualitative research reduces the ability to make definite conclusions linking modes of transportation and student academic achievement and success.

It would be beneficial for researchers to attain the actual evaluations of students and the level of achievement they are acquiring on their report cards in all subjects. While teachers have

significant insight into student academic achievement and learning throughout the year, in some cases the conclusions can be superficial without being able to directly link a specific mode of transportation, to a specific student and their evaluations. In these interviews there was little mention of actual students by name and given specific examples. Likewise, there is additional room for research which would include either gathering official documents with their evaluations or to administer a general numeracy and literacy test to students that meet the curriculum expectations of the students. This would enable researchers to specifically identify which level students are achieving in comparison to their peers and the mode of transportation each student uses.

## Chapter Five: Conclusion

Just as important as the curriculum students are required to learn, the ways *in which* students learn help create a learning climate that is positive, safe, and inclusive. Through understanding the variables that influence student learning, strong and positive educational policies, student and parent expectations, and community involvement can be implemented to increase student readiness to learn and academic achievement. It is widely accepted and studied that some specific variables and conditions can both positively and negatively influence student readiness to learn and academic achievement. These variables include, first, educational policies such as continually updating and modifying curriculum expectations, creating balanced timetables, and focusing on numeracy and literacy as core subjects to meet the expectation of society to create well-rounded and competent citizens and to meet the demands of modern economies. Second, student diet and food consumption is identified to impact student readiness and learning through quality of nutrition and its influence on concentration. Third is the role physical activity has on student learning. Physical activity through physical education, unstructured physical activity breaks, and active transportation have been identified to aid in student readiness and overall mental health. Lastly, modal choice plays a role in student learning. Through the reduction of sustainable travel and the increase of car use for transportation, increased congestion and a reduction of safety, the convenience of car use, the built environment, accessibility to a different modes, perceptions and stigmas around specific modes, and distance to schools impacts student learning. Likewise, this research demonstrates the possible connection between the mode of transportation students use to commute to school in the morning and its influence on student readiness and perceived academic achievement. Research has focused on variables and conditions, in the home prior to school, while in school, and after school, but virtually no research has been done to identify,

understand, and explain the role commuting has on student readiness to learn and academic achievement. This research fills this integral gap in the current literature that interprets and explains student readiness to learn and academic achievement. Commuting patterns are one part of the factors that influence student readiness and achievement, and only when all of the factors that have been demonstrated to impact students readiness and achievement work together can students' readiness and achievement be positively influenced.

There are six schools, nine teachers and 138 students included in this research. These schools are within the District School Board of Niagara and are located in St. Catharines and Thorold, Ontario. The general commuting trends for these students as they travel to school are 36% bus, 34.1% walk, 20.3% are dropped off by car, and 8.7% ride their bike. Generally, busing and walking are the two predominant modes of transportation for students as they commute to school. Both busing and walking were demonstrated to have the highest level of dependability for parents, students and teachers. There is a set routine associated with these modes of transportation. Students that bus or walk to school have to wake up at specific times to ensure they can complete the other morning tasks such as washing, brushing teeth, having breakfast, and getting dressed before leaving for school. Likewise, students that bus to school need to be at their designated bus stop in time to get on the bus. Similarly, students that walk to school must leave with enough time to travel to school and arrive on time. The car was demonstrated to be the third most used mode of transportation for these students as they travel to school. The car offers flexibility regarding morning schedules, the ability to trip-chain, and a sense of safety and security to negotiate through the morning congestion that surrounds many elementary schools. Bicycling is the mode of transportation least used by students in this research. Much of this could be because there can be a perceived risk of property loss if the school does not have places to lock it up and secure it.

Furthermore, cyclists are at an increased safety risk while commuting to school as they try to maneuver through the traffic. Finally, when there is a time crunch, students that would have walked may instead elect to ride their bicycle to school in order to ensure they arrive in a timely manner. From this, bicycling is often a secondary choice out of necessity rather than a “first-choice” mode of transportation. After understanding the modes of transportation that students use as they travel to school, student readiness and perceived academic achievement can be assessed.

Student readiness to learn was outlined to include student level of attentiveness and alertness throughout their first learning period of the day. Additionally, how teachers perceived each student’s level of readiness to complete tasks and ‘get right into’ the work for that day. At no time did readiness refer to their knowledge base of curriculum expectation or material and their ability to continue with their learning. Teachers rated their students’ readiness to learn on a traditional grading scale in elementary of level 1, 2, 3, and 4. Level 1 is the lowest level and level 4 is the highest. Students that walk were rated the most ready to learn in the morning with an average readiness to learn of level 3.1, followed by students that take the bus with an average level of readiness to learn of 2.7, 2.6 for student that get dropped off by car. Lastly, students that bike to school were rated to be the lowest ready to learn at an average level of 2.2. During the interviews with the teachers, most of them identified both walking and taking the bus were the modes of transportation that enabled students to be the most ready to learn in the morning. Commuting to school by car was widely recognized to lead to poor readiness to learn in the morning. Teachers attributed poor readiness to learn to the lack of consistency regarding the time of arrival, the routines in the morning, and the lack of social and physical activities as students travel to school by car. However, students that commute to school by car and bus were rated to have the same

readiness to learn. Teachers identified both sociability and physical activity to positively influence student readiness to learn as they commute to school.

Sociability and physical activities are key performance indicators for student readiness to learn. Through being social, students have been able to wake up, engage with others, and be able to carry that over into the classroom for their lessons and engage with the materials. Furthermore, today's educational philosophies that steer teacher's lessons and assessment strategies. Such philosophies include co-operative learning, peer-to-peer learning, and exploratory learning. By giving students additional opportunities to be social, students are not only ready to learn when it comes to learning but their social skills are well developed. Similarly, being physically active is widely accepted to positively influence learning, mental health, and overall wakefulness. Students that use active modes of transportation may improve their readiness to learn because of the increased oxygen, blood, and natural chemicals to the brain and ability to wake up earlier and maintain alertness throughout the morning and the day. Students that walk to school were rated as the most ready to learn. Walking is the only mode of transportation that has both key performance indicators. While walking, students can be both social as they engage with the world around them, the built environment, and others as they walk together. Likewise, while walking, students are getting physical exercise and being physically active. Teachers identified that students who took the bus were slightly more ready to learn over students that were dropped off. However, these students were rated to equally ready to learn in the morning. Busing is incredibly social for students as that talk to one another while riding the bus. Although the students may have to walk to their bus stop, which is being physically active, the students may not get any further physical activity to promote readiness to learn. In many instances, students that get to school by car are not physically active and may have limited social interaction and engagement. Finally, much like the

bus, riding a bike is physically active but the social aspect of commuting can be easily lost. While biking, it is difficult to maintain social interactions with others and to really engage with the environment around them due to the speed of travel. Although readiness to learn demonstrated some dependence on mode of transportation, conclusions regarding perceived academic achievement and mode of transportation used were less explicit.

Many teachers recognized the role particular modes of transportation play in aiding students to be ready to learn in the classroom. Furthermore, it was outlined that students can learn better and achieve higher if they are ready to learn. However, because a student is merely ready to learn, it does not ensure academic achievement. Teachers were less ready to articulate or identify modes of transportation aiding in academic achievement. Achieving academically can occur for a variety of reasons. All students learn differently from one another, all students have different favourite subjects, and there could be different teachers for different subjects which can influence student learning and achievement. This research explicitly targets student readiness to learn and academic achievement during the first learning of the day; however, as identified by many teachers, their first two learning periods are preferably numeracy and literacy. Some students may not thrive in these core subjects and it may not be until the end of the day where physical education and the arts tend to be placed. It is difficult to specifically determine how modes of transportation influence student learning. Furthermore, there were some limitations regarding this research.

Modal choice is dependent on many variables, such as weather, the built environment, infrastructure, the travel distance to the destination, and even one's sense of place about the environment through which they must travel. Families use the same set of variables when deciding which mode of transportation student's use as they commute to and from school. This research was conducted in suburban St. Catharines and Thorold. The areas surrounding these schools are

primarily middle-class neighbourhoods with complete and well maintained infrastructure to promote multiple modes of transportation. Likewise, the catchment areas for most of these schools are quite limited, which means the distance from residence to school is small. This research outlines a specific set of conditions; however, changing one or more of the variables that influence modal choice could change the results of the research. Urban and rural settings present a different reality and set of decisions making parameters which meets the needs of the families and students as the commute to school. Students may be more likely to walk or ride a bike to school in urban areas such as Toronto because of the congestion on roadways, home and school in close proximity, and the fact that some families do not own a car. Similarly, when conducting research in Toronto, additional modes of transportation must be included, such as public transit and the subway because they may be more prevalent in the city whereas there is no subway in Niagara. Moreover, if the setting is changed to a rural setting, due to the extended catchment areas and lack of infrastructure for alternative modes of transportation, students may be bussed or ride their bikes to school. The general commuting trends in different settings may be different; as such, the effects on readiness to learn and academic achievement may be influenced differently.

Students that travel to school may be social and physically active; however, different levels of readiness and academic achievement are dependent on the level of sociability and physical activity. social. In urban and rural settings, students may need to negotiate and interact with a wide range of conditions which can positively and negatively influence readiness to learn and academic achievement. Students that live in rural settings may need to go through neighbourhoods that they feel uncomfortable while they pass through, areas of contested space, or simply have so much going on around them they may not interact with their settings and others as they may have in other settings. Likewise, in rural settings the distance on the bus may present increased opportunity

for interactions with peers; however, students can be tired by the time they arrive at school due to the increased travel time. Furthermore, the amount of social interaction and physical activity it takes to maximize student readiness to learn should also be studied further. These are a few examples that demonstrate how the change in setting and the conditions around the research area may influence the results of the same research questions and design.

This research demonstrates that generally, students are taking the bus or walking as they commute to school in nice weather. Furthermore, students that walk to school are rated to be the most ready to learn during the first learning period of the day, followed by both taking the bus and getting dropped off by car. The influence of a student's mode of transportation on academic achievement is less conclusive because there is a large set of external and internal characteristics that impact academic achievement. This research does identify that walking, on average, does enable students to be more ready to learn in comparison to the other identified modes of transportation. It is suggested the school boards and communities that resemble the District School Board of Niagara and St. Catharines and Thorold implement walking programs. These walking programs promote sustainability while also helping students to be ready to learn as they enter the classroom. Helping students be ready to learn in the morning can help students achieve the learning goals of the day. Other strategies that should be implemented include giving time at the start of each day for students to be social and physically active. This could include walking programs once school has started. Giving all students the opportunity to interact and be social with their peers as well as be physically active ensures that each and every student can increase their readiness to learn regardless of the mode of transportation used to commute to school.

## References:

- Active Healthy Kids Canada. (2012). *Is Active Play Extinct? The Active Healthy Kids Canada 2012 Report Card on Physical Activity for Children and Youth*. Toronto, ON.
- Basch, C. E. (2011). Breakfast and the Schievement Gap Among Urban Youth Minority. *Journal of School Health, 81(10)*. 635 – 640.
- Bonwell, C.C. & Eison, J.A. (1991). *Active Learning: Creating Excitement in the Classroom*. ASHE-ERIC Higher Education Reports 1. Washington, DC.
- Boone-Heionen, Janne., Evenson, Kelly., Song, Yang. & Gordon-Larsen, Penny. (2010). Built and socioeconomic environments: patterning and associations with the physical activity in U.S. adolescents. *International Journal of Behavioural Nutrition and Physical Activity, 7(45)*. 1 – 16.
- Brock University Map Library. *Niagara Region Municipal Boundaries*. St. Catharines, Ontario: Brock University Map, Data & GIS Library. Available: Brock University Map, Data & GIS Library Controlled Access. [http://www.brocku.ca/maplibrary/maps/outline/local/Niag\\_boundary.pdf](http://www.brocku.ca/maplibrary/maps/outline/local/Niag_boundary.pdf).
- Buliung, R., Mitra, R. & Faulkner, G. (2009). Active school transportation in the Greater Toronto Area, Canada: An exploration of trends in space and time (1986 – 2006). *Preventive Medicine, 68*. 507 – 512.
- Burdette, H.L & Whitaker, R.C. (2005). Resurrecting free play in young children: Looking beyond fitness and fatness to attention, affiliation, and affect. *Archives of Pediatric and Adolescent Medicine, 159*. 46 – 50.
- Byrne, B. (2012). Qualitative Interviewing In Seale, C (Eds). *Researching Society and Culture*. Sage Publications. London, England.
- Cerin, E., Leslie, E. & Owen, N. (2009). Explaining socio-economic status difference in walking for transport: An ecological analysis of individual, social and environmental factors. *Social Science & Medicine, 68*. 1013 – 1020.
- Chillion, P., Evenson, K.R., Vaughn, A., & Ward, D.S. (2011). A systemic review of interventions for promoting active transportation to school. *International Journal of Bahviour, Nutrition, and Physical Activity, 8*. 1 – 17.
- Chin, G., Van Niel, K., & Giles-Corti, B. (2008). Accessibility and connectivity in physical activity studies: The impact of missing pedestrian data. *Preventive Medicine, 46*. 41 – 45.
- Clark, A., Bent, E. & Gilliland, J. (2015). Shortening the trip to school: Examining how children’s active school travel is influenced by shortcuts. *Environment and Planning B: Planning and Design, 1*. 1 – 16.

- Cooper, Ashley. R., Page, Angie. S., Foster, Lucy. J. & Qahwaji, Dina. (2003). Commuting to School: Are Children Who Walk More Physically Active? *American Journal of Preventative Medicine*. 25(4). 273 – 276.
- District School Board of Niagara. (2015a). *DSBN Facts*. Retrieved from: <http://www.dsbni.edu.on.ca/about/default.aspx?id=10973>
- District School Board of Niagara. (2015b). *Schools – School List by Municipality 2013/14*. Retrieved from: <http://www.dsbni.edu.on.ca/index.aspx?id=64>.
- Drummond, Katheryn. V. & Stipek, Deborah. (2004). Low-Income Parents' Beliefs about Their Role in Children's Academic Learning. *The Elementary School Journal*. 104(3). 197 - 213.
- Field, A. (2008). Why you need sleep in order to succeed. *Harvard Management Update*. January.
- Frank, L., Kerr, J., & Chapman J. (2007). Urban form relationships with walk trip frequency and distance among youth. *American Journal of Health Promotion*. 21. 305 – 311.
- Fulkner, G.E.J., Buliung, R.N., Flora, P.K., & Fusco, C. (2009). Active school transport, physical activity levels and body weight of children and youth. A systemic review. *Preventative Medicine*. 48(1). 3 – 8.
- Fulton, Janet. E., Shisler, Jessica. L., Yore, Michelle., M. & Caspersen, Carl. J. (2005). Active Transportation to School: Findings from a National Survey. *Research Quarterly for Exercise and Sport*. 75(3). 352 – 357.
- Giles-Corti, B., Wood, G., Pikora, T., Learnihan, V., Bulsara, M., Van Neil, K, Timperio, A., McCormack, G. & Villanueva, K. (2011). School site and the potential to walk to school: The impact of street connectivity and traffic exposure in school neighbourhoods. *Health & Place*. 17. 545 – 550.
- Giles-Corti, B., Kely, S., Zubrick, S. & Villanueva, K. (2009). Encouraging Walking for Transport and Physical Activity in Children and Adolescents: How Important is the Built Environment? *Sports Medicine*. 39(12). 995 – 1009.
- Government of Ontario. (1990). *Education Act – Regulation 298 Operation of Schools – General*. Toronto, ON.
- Hillman, C. H. (2014). An Introduction to the Relation of Physical Activity to Cognitive and Brain Health, and Scholastic Achievement. (eds.) Hillman, C.H. & Bauer, P. J. The Relation of Childhood Physical Activity to Brain Health, Cognition, and scholastic Achievement. *Monographs of the Society for Research in Child Development*. 315. 79(4).
- Hopmann, Stefan. (1999). The Curriculum as a Standard of Public Education. *Studies in Philosophy and Education*. 18. 89 – 105.

- Longhurst, R. (2010). Semi-Structured Interviews and Focus Groups In Clifford, Nicholas., French, Shaun., & Valentine, Gill. (Eds) (2<sup>nd</sup> Edition). *Key Methods in Geography*. Sage Publications. California, USA.
- Larsen, K., Gilliland, J., Hess, P., Tucker, P., Irwin, J. & He, Meizi. (2009). The Influence of the Physical Environment and Sociodemographic Characteristics on Children's Mode of Travel to and From School. *American Journal of Public Health*. 99(3). 520 – 526.
- Longhurst, R. (2009). Interviews: In-Depth, Semi-Structured. *International Encyclopedia of Human Geography*. 580 – 584.
- Longhurst, R. (2009). Embodied Knowing. *International Encyclopedia of Human Geography*. 429 – 433.
- Luker, Kristin. (2008). *Salsa Dancing Into The Social Sciences – Research In An Age Of Info-Glut*. Harvard University Press. Massachusetts, USA.
- Marin, Lisa. M. & Halpern, Diane. F. (2011). Pedagogy for developing critical thinking in adolescents explicit instruction produces greatest gains. *Thinking Skills and Creativity*. 6. 1 – 13.
- McDonald, Noreen. C. (2006). Active Transportation to School - Trends Among U.S. Schoolchildren, 1969 – 2001. *American Journal of Preventative Medicine*. 32(6). 209 – 516.
- McKenna, Mary. L. (2000). Nutrition policies for schools. *British Nutrition Foundation Nutrition Bulletin*. 25. 201 – 207.
- McMillan, Tracy. (2007). The relative influence of urban form on a child's travel mode to school. *Transportation Research Part A*. 41. 69 – 79.
- Mitra, R. & Buliung, R. (2012). Built environment correlates of active school transportation: neighbourhood and the modifiable areal unit problem. *Journal of Transportation Geography*. 20. 51 – 61.
- Muller, Sven., Tscharaktschiew, Stefan. & Haase, Knut. (2008). Travel-to-school mode choice modelling and patterns of school choice in urban areas. *Journal of Transport Geography*. 16. 342 – 357.
- Ottaway, A.K.C (2013). *Education and Society*. Routledge Publishing. New York, New York.
- Ontario Ministry of Education. (2013). *The Ontario Curriculum Grades 9 and 10: Canadian and World Studies – Geography, History, Civics (Politics)*. (Revised). Toronto. ON.
- Ontario Ministry of Education. (2011). *Learning for All – A Guide to Effective Assessment and Instruction for All Students, Kindergarten to Grade 12*. Toronto, ON.
- Ontario Ministry of Education. (2010). *Growing Success: Assessment, Evaluation, and Reporting in Ontario Schools*. First Edition. Toronto. ON.

- Ontario Ministry of Education. (2004). *TIPS (Targeted Implementation and Planning Supports): Developing mathematical literacy*. Toronto, ON.
- Panter, J., Jones, A., Van Sluijs, E. & Griffin, S. (2010). Neighbourhood, Route, and School Environments and Children's Active Commuting. *American Journal of Preventive Medicine*. 38(3). 268 – 278.
- Railsback, Jennifer. (2002). *Project-Based Instruction: Creating Excitement for Learning*. Northwest Regional Education Laboratory. Portland, OR.
- Ramsey, Philip. L. & Legg, Stephen. J. (2006), Readiness to Learn. *The Journal of Human Resource and Adult Learning*. May. 67 – 77.
- Rosenberg, Dori. E., Sallis, James. F., Conway, Terry. L., Cain, Kelli. L. & McKenzie, Thomas. (2006). Active Transportation to School Over 2 Years in Relation to Weight Status and Physical Activity. *Obesity*. 14(10). 1771 – 1776.
- Rothman, Linda., To, Tessa., Buliung, Ron., Macarthur Colin. & Howard, Andrew. (2014). Influence of social and build environment features on children walking to school: An observational study. *Preventative Medicine*. 60. 10 – 15.
- Schlossberg, M., Greene, J., Phillips, P., Johnson, B. & Parker, B. (2006). School Trips. *Journal of the American Planning Association*. 72(3). 337 – 346.
- Sorhaindo, Annik. & Feinstein, Leon. (2006). *What is the relationship between child nutrition and school outcomes?* Wider Benefits of Learning Research Report No. 18. – Learning Institute of Education. London, England.
- Spreitzer, G.M. & Grant, T. (2012). Helping Students Manage Their Energy: Taking Their Pulse With the Energy Audit. *Journal of Management Education*. 36(2). 239 – 263.
- Thomas, Eleanor. M. (2006). Readiness to learn at School Among Five-year-old Children in Canada. *Child and Youth Research Paper Series – Statistics Canada*. Ottawa, ON.
- Timperio, A., Ball, K., Salmon, J., Roberts, R., Giles-Corti, B., Simmons, D, Baur, L. & Crawford, D. Personal, Family, Social, and Environmental Correlates of Active Commuting to School. *American Journal of Preventive Medicine*. 30(1). 45 – 51.
- Timperio, A., Crawford, D., Telford, A. & Salmon, J. (2004). Perceptions about the local neighbourhood and walking and cycling among children. *Preventive Medicine*. 38. 39 – 47.
- Transport Canada. (2011). *Active Transportation in Canada – A Resource and planning guide*. Ottawa, ON.
- Tudor-Locke, C., Ainsworth, B.E., & Popkin, B.M. (2001). Active commuting to school: An overlooked source of children's physical activity? *Sports Medicine*. 31(5). 309 – 313.

- Secor, Anna. J. (2010). Social Surveys, Interviews, and Focus Groups In Gomez, Basil., & Jones, John. Paul III (Eds). *Research Methods in Geography – A Critical Introduction*. Wiley-Blackwell Publishing. Massachusetts, USA.
- Stewart, Orion. (2011). Findings from Research on Active Transportation to School and Implications for Safe Routes to School Programs. *Journal of Planning Literature*. 26(2). 127 – 150.
- Valentine, Gill. (2006). Tell me about...: using interviews as a research methodology In Flowerdew, Robin., & Martin, David (Eds) (2<sup>nd</sup> Edition). *Methods in Human Geography: A guide for students doing a research project*. Pearson Publishing. Toronto, ON.
- Vine, Michelle. M. & Elliot, Susan. J. (2013). Examining local-level- factors shaping school nutrition policy implementation in Ontario, Canada. *Public Health Nutrition*. 17(6). 1290 – 1298.
- Weginstock, Michael., Assor, Avi. & Broide, Galia. (2009). Schools as promoters of moral judgement the essential role of teachers' encouragement of critical thinking. *Sociology Psychology, Education*. 12. 137 – 151.
- W'ojcicki, T.R., & McAuley, E. (2014). Physical Activity: Measurement and Behavioural Patterns in Children and Youth. (eds.) Hillman, C.H. & Bauer, P. J. The Relation of Childhood Physical Activity to Brain Health, Cognition, and scholastic Achievement. *Monographs of the Society for Research in Child Development*. 315. 79(4).
- Wright, Ian. (2002). Critical Thinking in the Schools: Why Doesn't Much Happen? *Informal Logic*. 22(2). 137 – 154.
- Zhu, Yu., & Green, Francis., & Machin, Stephen., & Murphy, Richard. (2012). The Changing Economic Advantage from Private Schools. *Economica*. 79 (316). 68-679.

## Appendix A

This ANOVA test demonstrates the statistical significance of rated level of student readiness to learn by mode of transportation. This demonstrates that the rating by mode is significant and may resemble real world conditions. It is important to use this statistical analysis as a foundation for further research regarding the role mode of transportation has on student readiness to learn and academic achievement.

In this test, Treatment 1 was the readiness to learn of students that commute to school using a car. Treatment 2 was the rated readiness to learn of students that walk to school. Treatment 3 was the students' readiness to learn as rated by their teachers that get driven to by car. Finally, Treatment 4 was the readiness to learn for students that ride a bike to school.

Summary of Data						
	Treatments					Total
	1	2	3	4	5	
N	28	47	50	12		137
$\Sigma X$	73	148	135	26		382
Mean	2.6071	3.1489	2.7	2.1667		2.7883
$\Sigma X^2$	215	488	403	66		1172
Std.Dev.	0.956	0.6909	0.8864	0.9374		0.8864

Result Details				
Source	SS	df	MS	
Between-treatments	12.0586	3	4.0195	<i>F</i> = 5.63907
Within-treatments	94.8027	133	0.7128	
Total	106.8613	136		

The *f*-ratio value is 5.63907. The *p*-value is .001143. The result is significant at  $p < .05$ .