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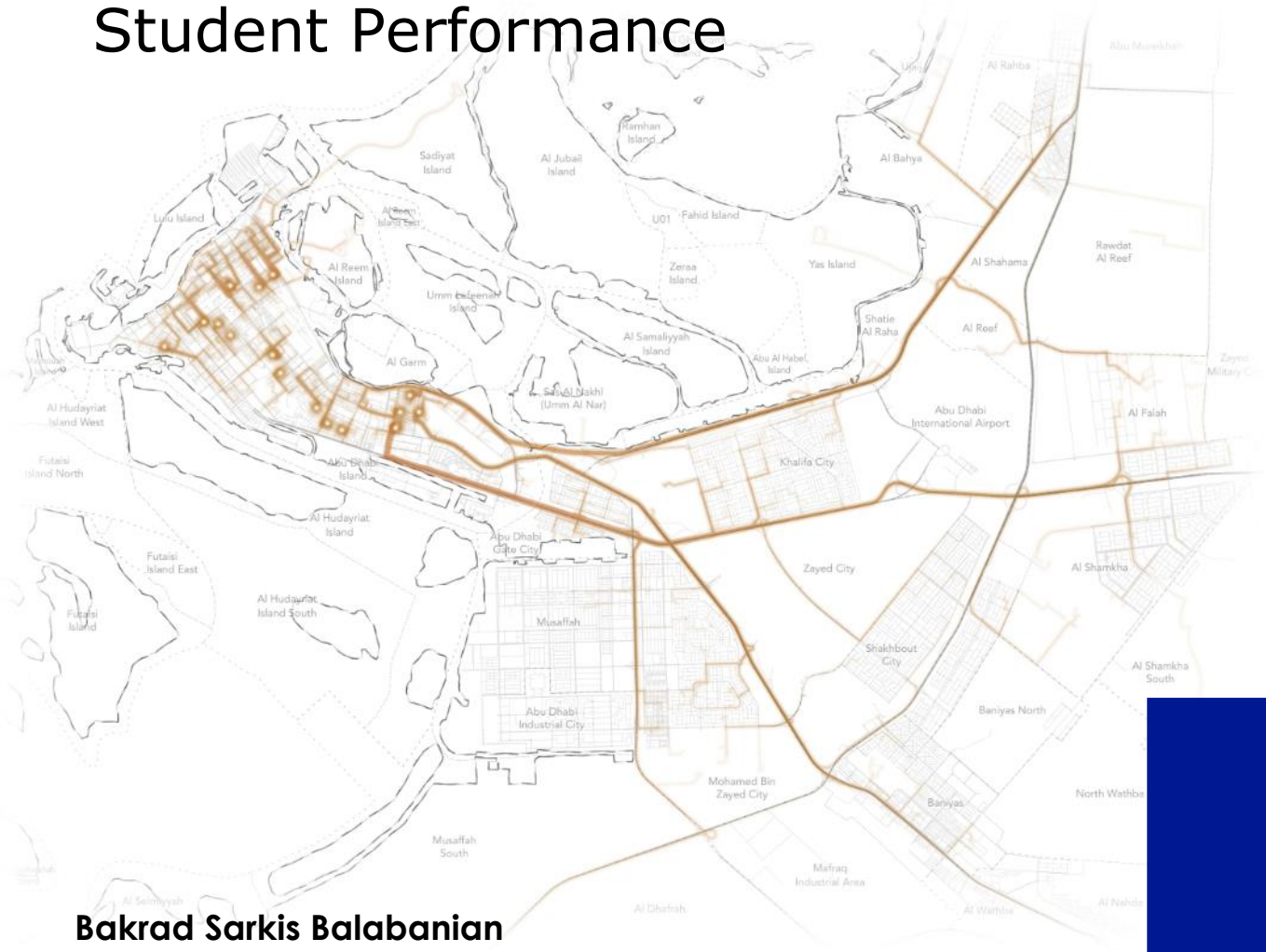
Transportation and Its Effect on Student Performance



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ABSTRACT

This thesis investigated the phenomenon of pupils' transportation in Abu Dhabi and studied the relationship between their transportation, stress levels and school performance. This study combined standard and geospatial statistical tools with a quantitative survey of 982 grade 6 to grade 9 students from 40 classrooms of 17 public and private schools in Abu Dhabi Island. The thesis tested five hypotheses concerning the effect of the choice of a transportation mode, school distance and commuting time on school performance, pupil's total stress level and school performance, the average traveling time and total stress levels, and the choice of a transportation mode and total stress levels.

The findings suggest that transportation distance and time is correlated with pupils' school performance and has no correlation with their stress levels. Furthermore, the author identified geographic clusters (hot spots) of pupils who have significantly high-performance grades and short travel time. Based on the empirical data, the author analyzed the phenomenon of pupils' transportation in light of the existing academic literature, explored its effects on pupils' stress levels and school performance, and generated practical recommendations for pupils' parents to take into consideration while selecting schools for their children. The research also highlighted directions for possible reforms in Abu Dhabi's school bus system.

Four hypotheses were rejected in the empirical part of the research, whereas two others were not. It was found that the average traveling time as well as commuting distance to school negatively affects pupil's school performance. At the same time, no significant correlation found between the transportation modes (bus, car, walking) or stress levels with student's school performance, also no correlation was found between transportation time and student stress levels.

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CHAPTER I. INTRODUCTION

1.1. Background to the study

A number of students across the globe depend on the transportation system to get to their destination to and from the school. In many countries, such as the United States and Canada, a significant portion of the student body depends on school buses instead of public transportation. For instance, in the United States, approximately 25 million students use this transportation mode to travel to and from school on a daily basis (American School Bus Council 2020). However, despite the advantage of providing an easy access to schools for a significant number of students, the transportation mode has essential disadvantages. Firstly, it is very stressful (Legrain et al. 2015). Secondly, many scientists believe that long rides in school buses negatively affect students' school performance (Belle 1998; Spence 2000). Thirdly, its safety causes significant concerns among specialists since the existing data on this matter does not support a common opinion that school buses are always safer than other transportation modes (The Office of the Auditor General in Ontario 2013). In this situation, it seems natural that reforms in the system of school buses remain a topical objective of discussions among stakeholders.

Selection of an optimal transportation mode for students is an important issue in modern education. The academic literature indicates that the way in which students arrive at school influences their health, behavior, and school performance. Such issues as a significant waiting time at a bus station or unexpected stops may impose a negative psychological impact on them (Legrain et al. 2015). Because of inadequate transportation, children might not get enough sleeping time, which severely damages their health and reduces their performance (Hanover Research 2013). The findings reported by analysts make local governments and school administrations revisit the problem of students' transportation.

The problem under investigation varies across different countries. In North America, the system of school buses is well developed. Many students employ it on a regular basis. In accordance with the academic literature, the main problem associated with this matter is connected to the absence of schools in many rural areas (Belle 1998). As a result, a significant number of students spend more than one hour per day to get to and from their schools. Those children who spend much time on transportation are at a disadvantage. They find themselves tired and sometimes even exhausted, which negatively affects their grades (Belle 1998). In Africa, the situation is even more complicated. Some countries, such as Kenya, Uganda, and Lesotho, ensure that all the public schools have school buses (Spence 2000). However, in many other states, including Tanzania, students are forced to rely on their own in the field of transportation. As a result, many of them either use public transportation, taking a risk to be late at school, or ask strangers on a road to give them a ride, exposing themselves to safety threats (Mugoro 2014). This example illustrates that the problem of transportation has many aspects relevant to the sphere of education.

In the United Arab Emirates, the transportation system is also an essential factor influencing the educational system. Specialists point out that it is not natural for local governments and schools' administrations to promote active commuting, such as walking or biking (Badri 2013). Accordingly, school buses and private cars are the

most popular modes of student transportation. The popularity of school buses and private cars in the UAE may be due to several reasons, such as harsh environment conditions, the lack of infrastructure for active commuting and the general culture in the country. Simultaneously, the available findings in this field are inconsistent. Therefore, more research is required to investigate the phenomenon of students' transportation in the UAE.

1.2. Statement of the Research Problem

Since 2007, Abu Dhabi Emirate has been gradually transforming the system of school transportation (Badri 2013). The government has recently introduced several changes with the aim of attaining better development within the school transportation system, which includes upgrading the vehicles and hiring renowned Emirati to monitor the buses that are used by students. Unfortunately, these changes have not received a sufficient amount of attention in the academic literature. The number of studies dedicated to students' transportation in Abu Dhabi or even in the UAE is low. Moreover, while there are some researches investigating the phenomenon of safety (Naser and Hawas 2012) or the selection of transportation modes (Badri 2013), there are currently no investigations that would explore the impact of transportation on students' school performance in the Emirate. This fact indicates an essential research gap in the existing literature. This thesis seeks to address this gap and aims to determine the effects of transportation on students' school performance. In addition to addressing a theoretical gap, this study seeks to generate practical recommendations for policymakers and other stakeholders.

1.3.Research Aim and Hypotheses

1.3.1.Research Aim

The aim of the research is to explore a relationship between the students' transportation as they commute to school and their school performance. This thesis focuses on school buses, private cars and walking as the main transportation modes available for students in Abu Dhabi.

1.3.2.Research Hypotheses

Achievement of the chosen research aim requires testing the following hypotheses

(i) The choice of a transportation mode significantly affects pupils' total school performance;

(ii) The average traveling time has a strong negative impact on pupils' school performance;

(iii) Distance from home to school has a strong negative impact on pupils' school performance;

(iv) The choice of a transportation mode significantly affects pupils' total stress level.

(v) The total stress level of pupils negatively influences their school performance;

(vi) The average traveling time has a strong positive impact on pupils' total stress level;

1.4. Significance of the Research

The phenomenon of students' transportation is becoming a topical problem in different corners of the globe. An increasing population in most cities creates significant challenges for stakeholders, such as the need to overcome traffic jams and provide more buses to serve the enlarged number of students. In this situation, it is important to understand how any changes in this area may affect students' health, behavior, and school performance.

The problem of students' transportation is significantly dependent on local specifics. For example, local governments of many European cities work on creating a safe environment for those students who prefer walking or biking to schools whilst these transportation modes are almost non-existent for students in the UAE (Badri 2013). Thus, scholars' findings regarding the students' transportation in European or American countries may be not applicable to the case of Abu Dhabi. This argument illustrates the significance of the research problem investigated in this thesis.

1.5. Definition of Terms

Several terms are of paramount importance for this study. Therefore, it seems justified to define them in this subsection in order to eliminate the threat of possible confusion.

***Transportation*:** The term applies to the movement of people or goods from one region to another. In this research, the notion primarily refers to the means used by students in moving to and from school. The article analyzes such transportation modes as walking, driving a car, and using a school bus.

***Public School*:** The term applies to government-owned schools that accommodate students from various demographic groups. The public schools follow the curriculum set by the state and comply with all the rules and regulations as per the education system within the country.

Private School: The term applies to learning institutions that operate in the private sector. The curriculums at such schools can be set based on the administration's judgment. Therefore, they may take diverse forms.

School bus: a bus that is used for transporting children from and to school that has been designed for the protection of pupil passengers (Sakellariou et al. 2017).

School Performance or Student Achievement: An evaluation of students' performance that is calculated based on the results of tests or end of year exams for different topics and subjects. In this study, school performance is measured through

the indicator of a total achievement score, which, in turn, is an average of pupils' achievements in four subjects: Social studies, Mathematics, Science, and Language.

Stress: "a dynamic condition in which an individual is confronted with an opportunity, constraint or demand related to what he/she desires and for which the outcome is perceived to be both uncertain and important" (Robbins et al. 2007).

Chronic stress: "an oppressive, unremitting long-term aversive state that can accumulate and lead to poor psychological and physical health" (Epel et al., 2018). The chronic stress level of pupils is measured in this study with the help of the perceived stress level scale for children introduced by White (2014).

CHAPTER II. LITERATURE REVIEW

2.1. Introduction

The chapter focuses on the ideas and perceptions raised by different authors in relation to the research subject. The section aims to identify some of the theories that may be relevant to the study, the key issues, and the conceptual framework that would be pertinent in contributing to the main points within the research.

2.2. About The United Arab Emirates

The UAE is a constitutional federation of seven emirates and is one of the six Gulf Cooperation Council (GCC) countries having Abu Dhabi city as the capital of the country. UAE is located in the North East of the Arab Peninsula and covers approximately an area of 71,023sq km; Abu Dhabi accounts for 84 per cent of the country's total landmass.

UAE's population as of December 2016 was 9,121,167 with 69% males and 31% females. 90% of the UAE's population are consisted of expatriates, Indians forming the largest foreign community followed by Pakistanis, Bangladeshis, and other Asians, Europeans, and Africans (Government of United Arab Emirates 2018). As per the Ministry of Education of UAE, in the academic year of 2017/2018, there were 1,226 public and private schools in the UAE. 36% of them were located in the Abu Dhabi Emirate (Ministry of Education of UAE 2017).

It can be observed from Figure 2.3 that Private schools are mainly concentrated in urban areas, whereas the public schools are also present in rural areas, as it is a mandate of the government to provide all children in the UAE with an equal access to education.

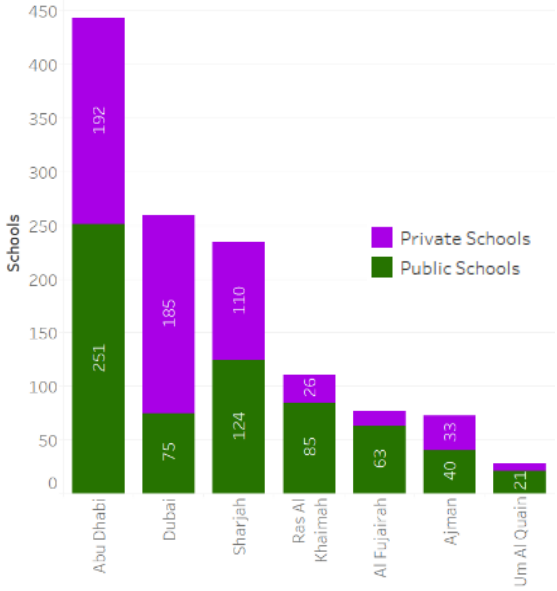

Figure 2.2. Number of Schools per Emirate 2017/2018

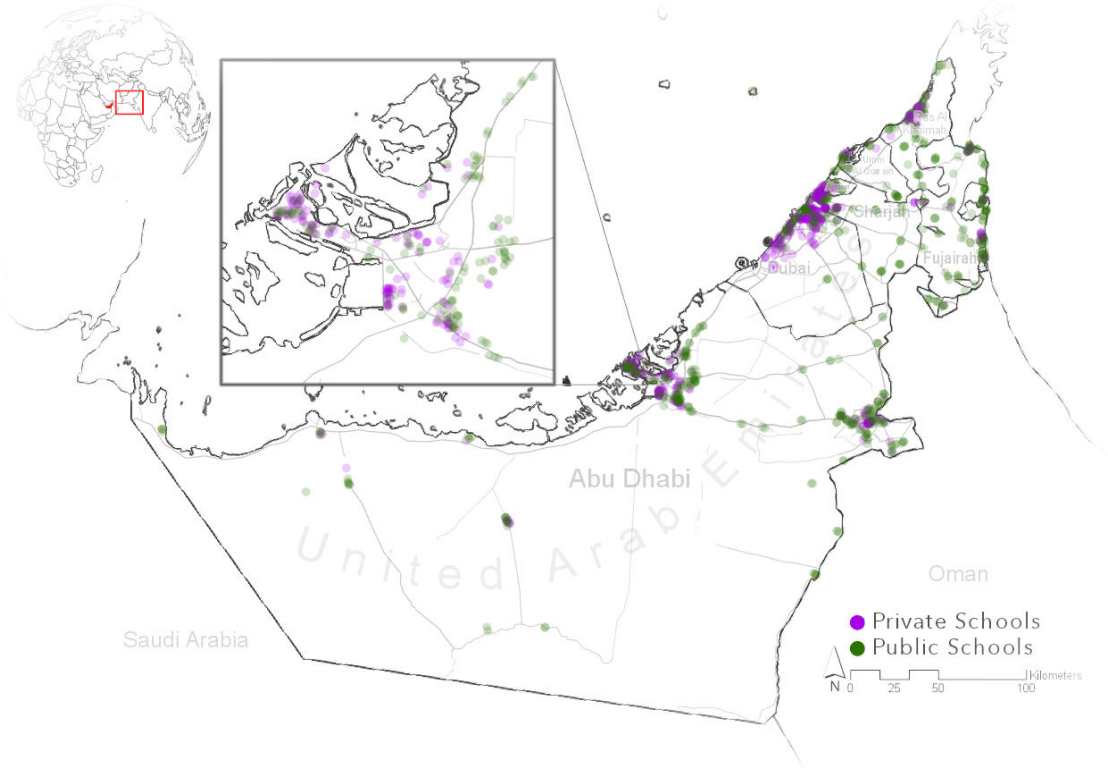

Figure 2.3. Public and Private Schools' Distribution

2.3. Stress

The term “stress” is a well-known notion that could be found in a variety of scholarly and non-scholarly sources. In the most general view, stress could be defined as a “dynamic condition in which an individual is confronted with an opportunity, constraint or demand related to what he/she desires and for which the outcome is perceived to be both uncertain and important” (Robbins et al. 2007). From the psychological perspective, stress is associated with the feeling of tension or mental press. High stress levels might lead to severe psychological and social problems in various demographic groups, including adults, adolescents, and children (Tucker et al. 2006). Therefore, it is traditionally believed that individuals should try avoiding stressors.

Simultaneously, the phenomenon of stress is not related exclusively to negative implications for a person. Stress may be considered as a peculiar instrument of facilitating an individual’s performance and biopsychological health; however, this regularity is relevant only to low stress levels (Shahsavarani et al. 2015). Chronic stress, at the same time, is a strong predictor of problems with heart and blood vessels, a weak immune system, and poor brain-body communication (Marriotti 2015). Thus, positive aspects and consequences of stress cannot be linked to chronic stress.

This study primarily focuses on the notion of chronic stress. In accordance with Epel et al. (2018), this term could be defined as “oppressive, unremitting long-term aversive state that can accumulate and lead to poor psychological and physical health”. Unlike an exposure to one-time stressors, chronic stress leads to severe and sometimes even irreversible consequences for a person. For instance, the research by Marriotti (2015) states that it causes changes in modifications of neuronal networks in certain areas of the human brain. Due to such a substantial influence on health, one may assume that chronic stress might negatively influence individuals’ performance in various activities, such as education and work.

The implications of chronic stress have been researched in detail in the academic literature. On the basis of their systematic literature review, Burman and Goswami (2018) found that chronic work stress adversely affects people’s performance as well as social and family life. Shahsavarani et al. (2015), at the same time, argue that chronic stress may induce professional burnout of an employee. It seems justified to assume that stress might also negatively affect the performance of students at school. The recent study by Pascoe et al. (2019), for example, found that chronic stress undermines students’ learning capacity and school performance. In this situation, a hypothesis that the total stress level of pupils might negatively affect their total achievement scores seems justified.

2.4. Transportation and Stress

The study designed by Terzian et al. (2010) emphasizes that stress among children is a significant and disturbing phenomenon. The authors point out that if stakeholders are concerned that children are experiencing stress, they should encourage students’ involvement in sports and extra-curriculum activities, teach them relaxing methods,

improve an access to social support, and consult clinical resources in order to obtain more guidance. The selection of an appropriate transportation mode is also a relevant factor in this sphere. The scholars provide several scales that can help identify children's stress levels.

From the perspective of the problem under investigation, it is important to explore how various transportation modes correlate with the children's stress levels. The empirical study composed by Legrain et al. (2015) found driving to be a more stressful transportation mode for drivers than walking and using public transit. The authors emphasize that the stressfulness of a certain transportation mode depends on the variety of subjective and objective factors. Such indicators as travel liking and mode satisfaction constitute the subjective stressors whilst objective stressors comprise comfort, predictability, and travel time.

Driving is the most stressful mode since it implies dealing with unexpected delays. Besides, drivers tend to perceive the time of their commute negatively, even though it is usually considerably less significant than the commuting time of other modes (Legrain et al. 2015). An exposure to the confusion, annoyance, and irritation of their parents, which is a result of drivers' elevated stress levels, might lead to an increase in children's stress levels, as there is a direct correlation between parents and children's stress levels (Code 2011). Therefore, this transportation mode might cause high stress in children as well as in their parents. In public transit, the overall level of stressfulness is lower, but people using this mode experience additional stressors connected with the waiting time at a station and the objective to reach this station.

The study carried out by Ramage and Howley (2005) found that transportation could become a source of significant stressors for children. The fact that students of diverse ages use school buses makes younger pupils vulnerable towards the negative impact imposed by older students. Ramage and Howley (2005) identify profanity as one of the factors exemplifying this trend. In addition, buses are often overcrowded, which leads to the emergence of more stressors, especially if some students start conflicting with each other.

In some countries, school buses contribute to stressors because of their improper technical condition. In particular, in Bangladesh, many school buses do not have air conditioners in addition to being overcrowded (Khan et al. 2015). In its capital, Dhaka, safety issues are one of the most significant causes of stressors. Students realize that school buses are not safe because of human-related and technology-related reasons, and this makes them nervous.

Unfortunately, the existing literature offers little insights into the evaluation of children's stress levels during their transportation to schools. There is a substantial amount of information about the transportation stress of students at universities, especially commuter students. For instance, Biddix (2015) found that cars are the most stressful transportation mode for this demographic group, as high traffic congestion and difficulties with finding an available parking space contribute to students' stress. At the same time, little is known about the significance of children's stress related to transportation modes.

One of the few areas of this problem that has attracted some attention of scholars is the relationship between active and passive transportation modes. In accordance with

the findings of Martinez-Gomez et al. (2011), active commuting to school positively correlates with the variable of cognitive performance of female pupils. As a result, active commuting makes them more resilient to stress in the school environment. Apparently, such transportation modes as biking and walking positively influence children's concentration and memory, thus reducing their stress levels both during transportation and during other school and out-of-school activities (Trudeau and Shephard 2011). Similar conclusions could be also inferred from the study by Hillman et al. (2009). Therefore, it can be assumed that active transportation modes might be a less stressful option for pupils than school buses or vehicles.

There are many publications regarding techniques and methodologies to measure the stress level of the students. This study utilized the content and format of questions published by White (2014) to measure students' stress level on the basis of the perceived stress level scale for children. The results of her research and the survey questions that she has developed helped administer and effectively distinguish high levels of stress in children. A detailed justification behind the choice of this scale could be found in the methodology chapter.

2.5. Transportation and Students' Achievement

The existing academic literature does not provide consistent findings regarding the influence of transportation modes on students' performance. The investigation carried out by Floyd, et. al. (1983) deduced that the impact of transportation on students' total achievement is questionable. After applying three instruments to investigate these issues, the authors reported no significant correlation between the variables. In an attempt to explain this regularity, they put forward an assumption that the variables of students' age, social origins, and educational goals are intermediaries in a correlation between students' transportation and their grades. Therefore, even though spending a significant time on a bus often leads to decreased achievement, this rule is not universal, as the exact impact on a student strongly depends on his or her demographic and psychological features. Furthermore, such factors as the paternal influence and school activities have a much more essential impact on students' grades than transportation.

Hanover Research (2013) carried out a study in 2013, which is relevant to the problem under investigation. As the analysts believe, a later starting time at schools may be beneficial for adolescent students. This regularity is not inherent to elementary students who tend to demonstrate better performance early. Therefore, the authors recommend considering the shift in starting time only for middle and high-school students. In addition to improved safety, a decision to alter the starting time might also enhance their achievement. Moreover, the scholars also assume that it might lead to a reduced number of accidents with middle and high school students, a decreased risk of engaging in anti-social behavior, and a more active participation in extra-curriculum activities. Specialists advise schools' administrations on making corresponding changes in the schedules of school buses in order to adjust to the later starting time.

Many studies suggest that the system of school buses may have devastating effects on children. Belle (1998) found a negative correlation between the long rides in school buses (over 30 minutes) and children's grades, fitness level, and social activities. The scholar argues that school buses have an essential hidden value, imposing evident

influences on students' family relationships, social connections, and behavior. Long bus rides are also negative phenomena from the perspective of time-efficiency. Nevertheless, the author admits that there is not enough data to make far-reaching conclusions regarding the appropriateness of using school buses. More researches are required to force policymakers to take this matter seriously.

Spence (2000) made similar conclusions in his study. Long bus rides negatively affect students' grades, social activities, and even family relationships. They contribute to the amount of wasted time, depriving students from opportunities to pursue higher-level work or perform well at school. Even though the specifics of this influence depend on each student, the overwhelming majority of children enduring long bus rides show decreased learning enthusiasm and reduced grades (Spence 2000). Both Spence (2000) and Belle (1998) argue that local governments should address this issue and open new schools in rural areas so that students would not need to spend so much time at school buses.

While all the studies above support a hypothesis regarding a correlation between the time of students' transportation and their total achievement, it is important to emphasize that the existing literature on the phenomenon of school buses is limited and inconsistent. Many studies confirm the existence of a strong correlation between these variables, but some other researches reject this hypothesis. In particular, the empirical study conducted by Henderson (2009) found no correlation between these two factors. The scholar argues that school buses are a safe environment for students that do not impose any essential impact on their grades. The only negative aspect of this transportation mode is the atmosphere in a bus, as it may be tiresome sometimes.

Zoloth (1976) has made similar conclusions. Her study found no significant correlation between the amount of time that a student spends on riding a bus on a daily basis and his or her achievement test scores. Interestingly, the author identified many other determinants of students' performance. In particular, watching TV and reading magazines at home turned out to be stronger predictors of school performance and transportation time.

Lu and Tweeten (1973) came to the opposite conclusions. Their empirical findings suggest that there is an evident negative correlation between the busing time and students' achievement. This correlation is barely strong, but it exists. In particular, the authors explain that one hour per day that is spent on riding a bus reduces test scores on a scale from 1 to 100 by 2.6 points for 5^{th}-grade students whilst the same parameters for students from 8^{th} and 11^{th} grades are 4.0 and 0.5 points respectively. Like in the previous research reviewed in this chapter, this study found the time spent on watching TV at home to be a more significant determinant of students' performance than students' transportation.

The two last studies demonstrate the opposite patterns in regard to the problem under investigation. In order to clarify this situation, Lu and Tweeten (1976) launched another investigation. As they explain, Zoloth (1976) used different specification in equations, which became the main cause of differences between the studies' findings. For example, she did not consider a father's occupation as a relevant factor to students' socioeconomic background. In general, Lu and Tweeten (1976) criticize Zeloth's (1976) approach and argue that her research suffered from multicollinearity, which led to unstable coefficients and inflated standard errors. Therefore, in

accordance with the authors, her conclusions about the absence of any significant correlation between busing time and students' performance were a result of the low reliability of her study.

2.6. Students' Transportation in the UAE

The academic literature provides limited insights into the problem of students' transportation in the United Arab Emirates. The study launched by Naser and Hawas (2012) is among the few pieces of research that seek to investigate topical problems in this sphere. The authors tried to explore the safety of school buses in the country and reported an evident recent increase in the number of accidents associated with school buses (Table 2.1). This mainly happened because schools had increased the number of buses and, at the same time, decreased the number of students per bus, based on new policies and regulations set by the government in addition to the natural growth rate of students every year. It is important to note that while the number of accidents has increased over the years, the overall percentage of accidents in respect to the number of buses barely changed. Unfortunately, there is no information in the study on whether the same bus could be involved in more than one accident; therefore, these percentages might be hard to interpret.

Table 2.1. Accidents with School Buses in the UAE (Naser and Hawas 2012)

	2004	**2005**	**2006**	**2007**	**2008**
Number of Buses	2,691	2,941	3,076	3,468	3,835
Number of Accidents	694	617	748	887	908
Percentage of accidents	26%	21%	24%	26%	24%

In comparison to the United States and Canada, the UAE has significantly lower injury rates but slightly higher fatality rates (Naser and Hawas 2012). From the perspective of safety, the numbers show that the UAE system of school buses is comparable to the systems utilized in the US and Canada. Furthermore, UAE school buses are positively perceived by students and their parents (Naser and Hawas 2012). The authors of the study provide several recommendations to stakeholders. In particular, they advise schools to accumulate all the information about accidents in their own databases, conduct annual studies on school buses' performance, and increase traffic safety awareness among students and employees (Naser and Hawas 2012). Simultaneously, it seems justified to emphasize that these recommendations are not directly connected with the bus commuting experience. While schools' administrations may engage in some activities to improve the quality of their buses, such as enhancing seating and providing seatbelts, they have already managed to create an effective transportation mode for students and ensure that the quality of their busing experience is sufficient.

Another well-known study on students' transportation in the UAE was carried out by Badri (2013). This scholar investigated in detail the specifics of school travel modes in Abu Dhabi. The author found that driving or using a school bus are currently the most popular choices, whilst the mode of active travelling is almost non-existent. He deduced the significance of such factors as traffic conditions, road infrastructure, a distance to schools, walking in groups, environmental factors, and parents' preferences in accompanying children to schools. At the same time, parental decisions

regarding the choice of a transportation mode are strongly dependent on demographic factors, such as children's gender and nationality.

Unfortunately, there is no national data on the usage of various transportation modes by students in the United Arab Emirates. Nonetheless, the numbers reported by government authorities illustrate that the overwhelming majority of students use family cars as the main transportation mode. In particular, in Dubai, this number was around 88% in 2017 (Roads & Transport Authority 2017). Simultaneously, society's confidence in the school bus system has been gradually increasing. In the Emirate of Dubai, the number of students who were served by school buses has recently grown by 133% (Roads & Transport Authority 2018). Therefore, it seems justified to assume that the problem of students' transportation will become even more topical in the UAE in the nearest future.

CHAPTER III. RESEARCH METHODOLOGY

3.1. Introduction

This chapter focuses on the processes and the stages of data collection and data analysis. Moreover, the chapter describes in detail the research design utilized in this study, the sampling method, the sample's size, the data horizon, the research approach, and the research philosophy selected by the author. The final part of the section discusses ethical considerations and limitations associated with the study.

3.2. Motivation of Research Approach

Traditionally, scholars distinguish between the exploratory, descriptive, and explanatory research purposes. A choice between them is usually made based on the existing knowledge about the problem under investigation (Saunders et al. 2012). Scientists formulate exploratory research purposes when the academic literature does not provide any meaningful insights into a research phenomenon. In such situations, they do not have enough information to create a hypothesis and then test it with the help of data. Therefore, the main purpose of scholars in exploratory studies is to generate some initial findings that could help identify promising areas for a more detailed research. Once these areas are established, scientists can utilize a descriptive research purpose and describe various aspects of research phenomena (Saunders et al. 2012) with the help of diverse research methods. Finally, those scholars who seek to establish relationships between certain variables when most other factors relevant to the problem under investigation are already well-known can employ an explanatory research purpose.

This study uses components of all the three research designs, including exploratory, explanatory, and descriptive ones. At the same time, a descriptive research approach plays a major role in the empirical part of the thesis. As it was shown in the literature review, several scientists have conducted studies focused on the impact of students' transportation on their grades. This problem has attracted scholars from various academic fields and with diverse methodological approaches. However, there are still many unclear patterns inherent to this problem. First, many findings described in the academic literature are contradictive. For example, while Belle (1998) and Spence (2000) argued that a strong correlation exists between the students' transportation time and their school performance, Zoloth (1976) and Henderson (2009) came to the opposite conclusions. Therefore, it is still unclear whether this correlation really exists. Second, it is crucial to emphasize that this study focuses on the case of Abu Dhabi, which makes findings of many scholars irrelevant because of their limited external validity. Thus, even though there are many different studies on the problem under investigation, most of them are not pertinent to the current investigation. In this situation, it seems justified to employ a descriptive research design and supplement it with components of exploratory and explanatory approaches.

3.3. Motivation of Research Philosophy

Selecting a proper research philosophy is a critical point of any academic study. Most specialists recommend choosing one of the following four options: positivism, interpretivism, pragmatism, and realism (Saunders et al. 2012). Neither positivism nor

interpretivism is a valid option for this thesis. The former implies focusing on some narrow niche, operating with large-scale samples, and eliminating any possibility of biases. At the same time, the latter takes the opposite position, relying on the subjective opinions and perceptions of stakeholders in an attempt to retrieve some valuable information about research phenomena (Myer 2008). As a rule, scholars use positivism in explanatory studies and utilize interpretivism in exploratory studies (Saunders et al. 2012). Specifics of the research problem and the available resources of this research do not meet the required criteria of these two philosophies. The article seeks to explore a possible relationship between variables, but it uses the perceptions of respondents in order to achieve this goal since there are no other ways available for the author to collect information about the required indicators.

Pragmatism is an optimal choice for those authors who intend to explore a research phenomenon from different points of view (Myer 2008). This research does not have this goal since its main purpose is to address whether causal relationships between variables are likely to be causal. In this situation, the only available research philosophy for the thesis is realism. The paradigm of critical realism is very flexible. It implies trying to investigate reality through the perceptions of humans, which is what the article seeks to achieve (Saunders et al. 2012). In light of the arguments expressed in this subsection, it was decided to select the research philosophy of realism for this study.

3.4. Research Approach

The study uses a deductive research approach. The literature review was dedicated to the identification of the main theories that could explain the chosen research problem. The next step implies applying these theories to analyze the phenomenon of students' transportation in Abu Dhabi. The empirical part of this article entails collecting empirical data, but the author did not try to use the implications of this data to make far-reaching conclusions about the impact of students' transportation on their total achievement in the modern world, in Arab countries, or even in the UAE. The Emirate of Abu Dhabi has some unique features, such as the unpopularity of walking and using a bike among students. Therefore, it is not planned to use the inductive approach and extrapolate the study's findings to some larger population. The scope of this research is limited to the trends which are inherent to students' transportation in Abu Dhabi.

3.5. Time Horizon

The selection of a time horizon boils down to choosing between cross-sectional and longitudinal paradigms (Saunders et al. 2012). The chosen research problem does not require analyzing how students' transportation has been changing over time. Thus, the article utilizes the cross-sectional time horizon. It seeks to capture the current (2016/2017 academic year) tendencies in the field of students' transportation in Abu Dhabi.

3.6. Research Methodology

An intention to address whether causal relationships between variables are likely predetermines the selection of a quantitative research methodology. Considering that there is no data available online on the students' transportation in Abu Dhabi and their grades, the only way to collect numbers for the variables is to use the opinions and perceptions of stakeholders. Surveys are widely used in the academic literature to make statistical inferences about the population (Nardi 2018). Thus, this method is suitable for the chosen research problem.

The survey has been carried out in a traditional face-to-face manner. The sample contains around 1,000 students from both public and private schools. Using the Ministry's student information system, simple random sampling of classrooms has been used (40 random classrooms, average 30 students per classroom) with approximately equal number of students from both public and private schools. All schools have been selected from the main city of Abu Dhabi Island to ensure the ease of access (Figure 3.1). The list of classrooms with related information is listed the Table 3.1 and 3.2:

Table 3.2. Data on Selected Public Schools

Public School Name	**Gender**	**Grade**	**Classroom**	**Students**
Abdul Jaleel Al Fahim School	Boys	6	6-D	28
Abdul Jaleel Al Fahim School	Boys	9	9-A	25
Al Ghazali School	Boys	8	8-C	26
Al Reem School	Girls	6	6-E	23
Al Reem School	Girls	7	7-A	27
Al Reem School	Girls	8	8-A	28
Al Reem School	Girls	8	8-B	26
Al Reem School	Girls	8	8-E	27
Al Reem School	Girls	9	9-A	26
Al Reem School	Girls	9	9-B	26
Al Reem School	Girls	9	9-D	24
Al Suqoor School	Boys	7	7-C	27
Al Suqoor School	Boys	7	7-F	28
Al Suqoor School	Boys	7	7-G	26
Al Suqoor School	Boys	9	9-A	27
Al Suqoor School	Boys	9	9-C	27
Al Suqoor School	Boys	9	9-D	27
Al Suqoor School	Boys	9	9-F	27
Zayed Al Thani School	Boys	6	6-B	25
Zayed Al Thani School	Boys	7	7-A	31
			Total	***531***

Table 3.2. Data on Selected Private Schools

Private School Name	Gender	Grade	Classroom	Students
Abu Dhabi International Private School	Co-Edu	6	6A	30
Abu Dhabi International Private School	Co-Edu	7	7C	29
Abu Dhabi International Private School	Co-Edu	8	8C	25
Abu Dhabi International Private School	Co-Edu	9	9A	22
Al Manhal International Private School	Co-Edu	7	G7-7	26
Al Manhal International Private School	Co-Edu	9	G9-3	29
Al Nahda National School - Girls	Co-Edu	6	06H	28
Al Nahda National School - Girls	Co-Edu	8	08C	30
Al Nahda National School - Girls	Co-Edu	8	08I	27
German International School	Co-Edu	9	G 9	20
International Jubilee Private School	Co-Edu	6	G6B	23
International Jubilee Private School	Co-Edu	8	G8B	12
Lycee Louis Massignon	Co-Edu	6	G6-A	24
Lycee Louis Massignon	Co-Edu	9	G9-D	25
Polaris Private Academy	Co-Edu	9	G9 GB	18
Saint Joseph's School	Co-Edu	6	6-B	32
Skh Khalifa Bin Zayed Bangladish Islamia Pvt Schl	Co-Edu	9	G9-SB	18
The American International School in Abu Dhabi	Co-Edu	7	219	17
The American International School in Abu Dhabi	Co-Edu	8	211	15
The American International School in Abu Dhabi	Co-Edu	8	217	14
The American International School in Abu Dhabi	Co-Edu	9	G9GG	12
The International School of Choueifat - Abu Dhabi	Co-Edu	6	06D	28
The International School of Choueifat - Abu Dhabi	Co-Edu	7	07C	36
The International School of Choueifat - Abu Dhabi	Co-Edu	8	08E	35
The International School of Choueifat - Abu Dhabi	Co-Edu	9	09E	38
			Total	***613***

A significant amount of relevant data was taken from the student information and GIS systems of the Department of Education and Knowledge of Abu Dhabi (ADEK). It would be barely possible to obtain some pieces of data from the survey. For example, since there is no addressing system in the country, students were not able to provide a valid address of their residence, which is an essential part of the analysis. Moreover, it did not seem justified to ask students about their grades due to the possibility of getting erroneous data. Therefore, information, such as student address, demography and assessment results, was obtained directly from the student information system of ADEK. In regard to school performance, the study utilized students' achievement scores in four disciplines: Social Studies, Mathematics, Science, and Language. Geospatial analysis such as optimized hot spot analysis and multivariate clustering tools were used to locate statistically significant geographic clusters and groups of high and low values for different variables.

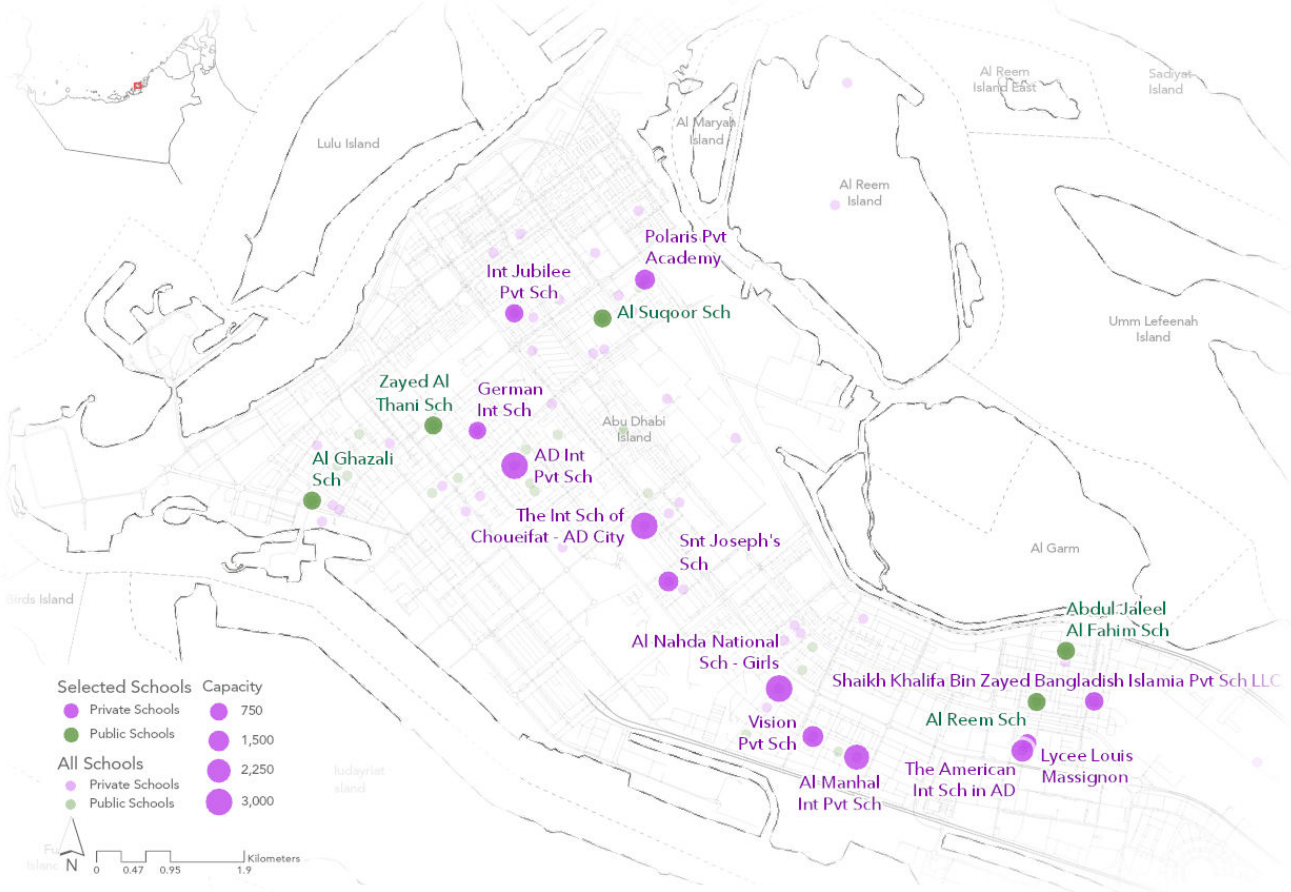

Figure 3.1. Selected Schools for Survey

The data obtained during the empirical part of this study was utilized to create numbers for independent and dependent variables. The research used two independent variables: transportation modes and transportation time. Transportation time provided by students in the surveys was compared with the corresponding calculated time for each student using network analysis tools available on the GIS software. The variable of transportation modes has three possible options: using a school bus, driving a

family car, and walking. The dependent variable of school performance (Total Achievement) was calculated as the average indicator of the students' grades in the four disciplines mentioned in the previous paragraph. Finally, the stress level variable was calculated based on Perceived Stress Scale questions listed in the survey.

Standard statistical calculations are carried out in SPSS, and the spatial analysis and maps have been done in ArcGIS Pro. The author used a linear regression analysis and one-way ANOVA in the empirical part of the study. A linear regression was used for quantifying a relationship between continuous variables. For instance, it has been utilized to explore whether the average distance between a pupils' home and school influences their total achievement scores. A linear regression is a popular statistical instrument that is widely used for studying a relationship between continuous variables that could universally applied in various settings. One-way ANOVA, in turn, was utilized in order to determine whether there is a statistically significance difference between the means of independent groups. In this study, it was applied to explore a relationship between the parametric independent variable and the continuous dependent variable. The Tukey's post-hoc test was also performed along with ANOVA to gain deeper insights into the patterns related to the comparison between different groups. The confidence level of 0.05 was chosen for testing the significance of a relationship between variables.

3.7. Pre-test Interviews

It seemed natural to conduct a series of pre-test interviews with bus drivers, bus supervisors and teachers to identify those factors that are relevant to the problem under investigation. The author conducted interviews *(check interview questions in Appendix A)* with 10 bus drivers and 10 supervisors and teachers. They provided some initial insight into the research phenomena that were required for composing an informative questionnaire. In particular, they confirmed the literature review's findings in regard to the unpopularity of walking and biking among students in Abu Dhabi and discussed students' behavioral issues in the bus. The feedback from those interviewees helped the author in shaping the main survey questionnaire.

3.8. Questionnaire

The thesis focuses on the concept of chronic stress. This type of stress could be defined as an "oppressive, unremitting long-term aversive state that can accumulate and lead to poor psychological and physical health" (Epel et al. 2018). There are currently many different instruments that measure individual stress levels. For example, the Ardell Wellness Stress Level scale is known as a holistic approach towards measuring stress that assesses various aspects of health (Asudani et al. 2014). The Standard Stress Scale includes 35 questions that are also supposed to measure stress holistically, addressing different stress situations, anxieties, and strains (Gross and Seebas 2014). The stress coping resources inventory is another popular instrument (Matheny et al. 2003). As it is clear from its name, this measure focuses on the ability of a person to cope with the stress. While all these scales are popular and credible, they are primarily used to measure stress levels of adults; therefore, their applicability to samples with children might be limited.

Due to this reason, it was decided to choose the perceived stress scale for children in the questionnaire. While the perceived stress scale is a well-known stress scale, the one designed by White (2014) is customized to the needs and capabilities of children. This customization is evident in many spheres, such as the increased visualization of potential answers to questions and their simplified formulations. The available evidence provides a compelling reason to believe that the perceived stress scale for children is supposed to be a valid instrument for measuring the stress levels of respondents in this study.

The questionnaire *(Appendix B)* is divided into two sections, where the first part records the students' transportation patterns and demographic information while the second part is based on the perceived stress scale and aims to evaluate the current stress level of students. The first three questions are dedicated to students' gender, age, and achievements. Even though none of these three variables are used in the regression analysis, it is still important to review them. If the distribution of demographic characteristics across the sample is uneven, there is a threat that the external and internal validity of the study's findings will be limited.

Questions about the distance to school, students' wake up time, their preferred transportation mode, and the time when they start their daily trips to school and back home are among the most important ones in the questionnaire. The crucial objective of the survey is to collect data on students' transportation time. Respondents provided information about the average travelling time, and this parameter was also calculated separately using GIS network analysis and addressing data collected from student information system for all the transportation modes. The key reason why the time was calculated using the network analysis is that younger students might not provide an accurate estimation of the time they spend in a bus. Results might be compared in further studies and analysis.

Even though the research hypotheses of this thesis do not involve investigation of demographics' role in shaping students' transportation behavior, an inclusion of the demographic section in the questionnaire was important, as it could show whether there was an unequal distribution of some demographic characteristics among respondents that could negatively influence the sample's representativeness. By reviewing respondents' demographic characteristics, scholars can predict possible limitations of the eventual findings. For example, if females accounted for more than 90% of the sample, it would have been justified to conclude that the transportation modes of walking and biking are severely underestimated since Emirati males are more likely to walk or bike to schools than females. Therefore, the main goal of including and then analyzing the demographic section was to identify such potential limitations.

3.9. Total Achievement and Stress Levels

Student examination results were collected after the end of the 2016/2017 academic year from the Student Information System of Department of Education and Knowledge (ADEK). The average values of the final assessment grades of Mathematics, Science, Language and Social Studies of each student were used for creating the dependent variable named Total Achievement. This approach is standard for studies that measure children's total achievement scores at school. Along with

reading, Math, Science, Language, and Social Sciences are the key subject areas related to student achievement (Piasta et al. 2014). Therefore, it seems justified to assume that the use of these four dependent variables will allow analyzing the implications of stress for students' total achievement in a holistic manner.

Based on the sample questionnaire of White (2014), 22 questions related to stress perceptions and emotions were listed in the questionnaire. Areas of interest included feelings of worrisome and stress, bullying, friendships, and the attitude in the bus. Six questions were developed with reverse wording and scoring to increase the chances of sincere responding. All questions related to stress and their results are presented in Figure 4.9, where the last six highlighted questions are the reversed ones. Each question was on scale 1 to 4, in which a higher value reflected higher stress perception. The sum of the answers was calculated and reflected the perceived stress level of the student and have been compared with the mean of all values. The students also got an opportunity to share their thoughts about the possible ways to improve the school buses' system in Abu Dhabi. This aspect was important for the recommendations' section of the thesis.

While the instrument of reverse questions was used in this study, it did not cover all the points of the questionnaire, which may become a possible source of bias. In other words, it is possible that the research does not address a potential limitation related to the possibility that some respondents might have a tendency to give higher or lower scores to questions than their peers. This issue is unlikely to translate into a source of systematic bias, but it may contribute to the noise and uncertainty in data.

The choice of the perceived stress scale for children was based on several factors. First, as stated above, the scale is customized to children in a variety of ways. In addition to using simple language and visualization, it also includes questions that are only relevant to children, such as the number of times their parents have made them feel better in the last week. Second, it has been successfully validated in the study by White (2014). Third, it represents an attempt to measure stress in a systematic manner without focusing on some isolated aspects of this phenomenon, such as school-related stress or the specifics of coping strategies. It is also crucial to emphasize that the perceived stress scale for children measures chronic stress, which is considered in this study as an "oppressive, unremitting long-term aversive state that can accumulate and lead to poor psychological and physical health" (Epel et al., 2018). An emphasis on chronic stress is based on a premise that in accordance with the literature review's findings, it seems justified to expect that if there is any connection between transportation-related stress and individuals' stress levels, it is supposed to be linked to chronic stress, as an exposure to transportation-related stress factors is continuous.

3.10. Ethical Considerations

Addressing possible ethical issues in surveys is a crucial requirement for scholars. Specialists point out that compliance with ethical requirements is one of the most important tasks of modern scientists during the process of surveys' implementation (Blair 2013). It was planned to take necessary measures in order to make sure that this study addresses the existing ethical concerns. First, the author kept the respondents' anonymity. The tables in the data analysis chapter state their gender, class, and school, but they do not reveal their names and contact information. Therefore, it will

be impossible to identify respondents based on the data disclosed in this study. Second, both the questionnaire and the process of data collection were organized in a way that would be pleasant for participants. All the respondents were treated with respect during the survey regardless of their behavior. Third, participation in a survey was voluntary. Each student received a brief description of the study's goals and an invitation to take part in it. The author handed them questionnaires only after receiving an informed consent form.

An important ethical consideration is to permit respondents not to answer some questions. The survey contains several questions that can make respondents feel uncomfortable. For example, pupils may be unwilling to share information about the bullying incidents in school buses because they are ashamed of them. At the same time, an inclusion of the information about this aspect is important for the research because it contributes to an understanding of the bus commuting experience. Considering these arguments, it was decided to allow respondents to omit some questions. While it might decrease the number of responses, this decision made students who participate in this survey less nervous.

3.11. Data Collection and Digitization

The survey was conducted during the 4th quarter of the 2016/2017 academic year (May to June 2017). Several students from the UAE University volunteered to digitize the surveys using "Survey123" ArcGIS application provided by ESRI and uploaded the data to a central cloud database. Figure 3.2 presents the number of surveys digitized over a period of 4 weeks.

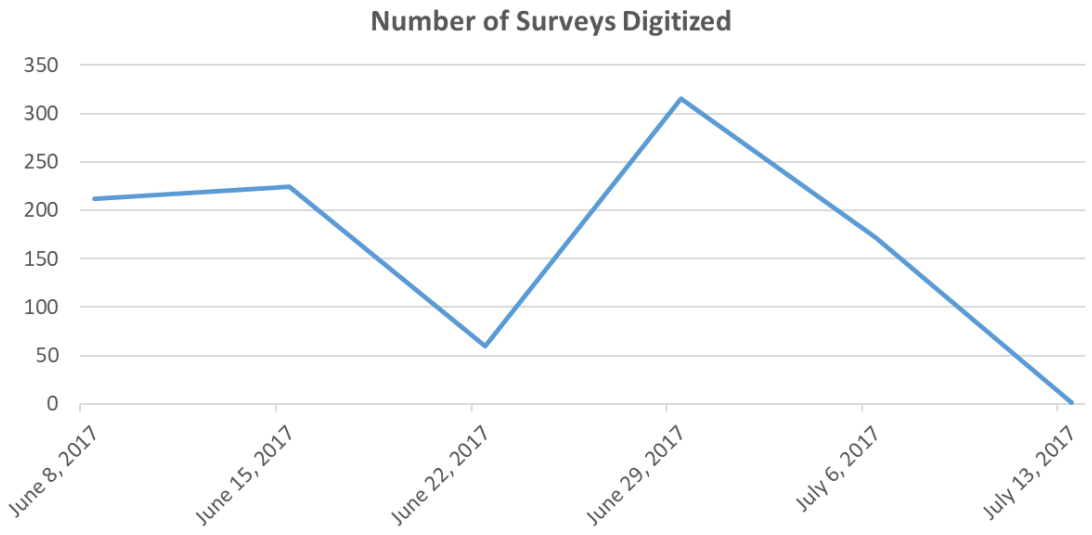

Figure 3.2. Survey Digitization Process

CHAPTER IV. RESULTS

The eventual sample of the survey comprised of 982 students (out of 1,173 students). For practicality reasons, random schools were selected from Abu Dhabi Island; hence, most of the students are from the island, with a small fraction coming from the mainland. As it can be observed from the map in Figure 4.1, the majority of students are concentrated in the downtown area (north of the island)

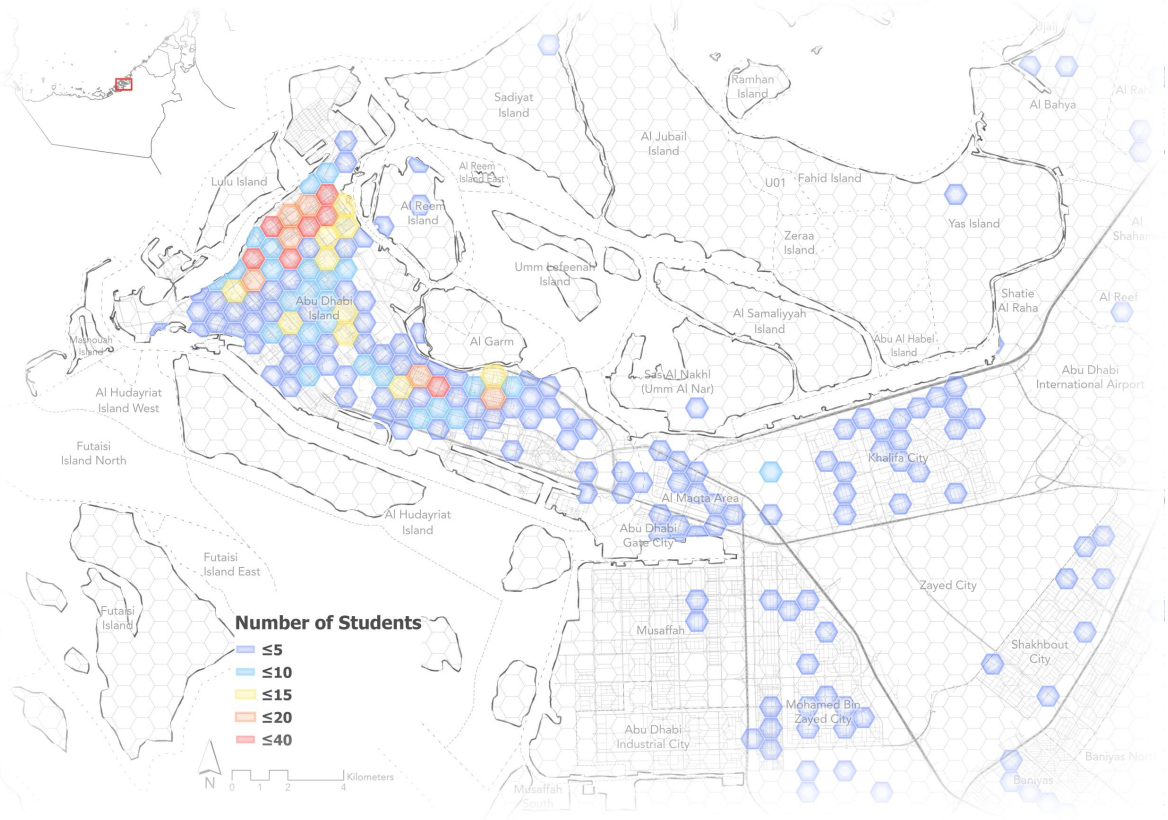

Figure 4.1. Surveyed Students' Geographic Distribution

The Table 4.1 and Table 4.2 illustrate respondents' demographic characteristics.

Table 4.1. Respondents' Age

Age	Number of Respondents	% of Respondents
9	3	0.3%
10	77	7.8%
11	172	17.5%
12	219	22.3%
13	250	25.5%
14	219	22.3%
15	38	3.9%
16	2	0.2%
17	1	0.1%
18	1	0.1%
TOTAL	*982*	*100%*
Average age	*12.49*	

Table 4.1 shows that the overwhelming majority of students are between 11 and 14 years old.

Table 4.2. Students' Nationality

Nationality	**Number of Respondents**	**% of Respondents**
UAE	414	42.2%
Egypt	70	7.1%
Jordan	70	7.1%
Syria	49	5.0%
India	48	4.9%
Lebanon	40	4.1%
Yemen	36	3.7%
Palestine	28	2.9%
Sudan	25	2.6%
Canada	24	2.4%
France	24	2.4%
Pakistan	22	2.2%
Bangladesh	18	1.8%
USA	16	1.6%
Germany	12	1.2%
Saudi Arabia	11	1.1%
Oman	8	0.8%
Morocco	6	0.6%
Iran	5	0.5%
Iraq	5	0.5%
Algeria	4	0.4%
Britain	4	0.4%
Sri Lanka	4	0.4%
Others	39	4.0%
TOTAL	*982*	*100%*

The sample provides students with diverse nationalities (Table 4.2). It includes pupils from western as well as students from different Asian countries. Nonetheless, the majority of respondents are from the United Arab Emirates and other Arab states. Data from the Table 4.2 suggest that there may be certain differences between students' transportation patterns caused by national specifics. For example, German, French, and Canadian students, who account for the combined 8.1% of the sample, are supposed to demonstrate different attitudes towards transportation than UAE pupils because of the popularity of walking and biking in these three countries.

The data on students' ethnicity in Table 4.3 shows similar results. The majority of pupils are Emiratis, and more than a third of them come from the Arab countries outside the Gulf Cooperation Council, such as Syria, Palestine, and Egypt. The percentage of pupils from GCC states without the UAE accounts for less than 2.5% of the sample. Approximately 9.9% of respondents came from Western countries, and 10.8% of them are from Asian states, such as India or Bangladesh. These numbers confirm the existence of ethnic and national diversity among respondents. It is interesting to observe that although Asian country nationals constitute the majority of expatriate communities as mentioned in the introduction, but most of these expatriates are bachelors, with no families and children, working in blue-collar industries such as construction or manufacturing jobs.

Table 4.3. Students' Ethnicity

Ethnicity	**Number of Respondents**	**% of Respondents**
Emirati	414	42.2%
Arabs	337	34.3%
Asian	106	10.8%
Western	97	9.9%
GCC (Without Emirati)	24	2.4%
Others	4	0.4%
TOTAL	*982*	*100%*

Gender characteristics of students in Table 4.4 demonstrate a relatively equal distribution pattern. The number of females exceeds the number of males in the sample, but the difference between the two subgroups is minimal.

Table 4.4. Students' Gender

Gender	**Number of Respondents**	**% of Respondents**
Males	471	48.0%
Females	511	52.0%
TOTAL	*982*	*100%*

The distribution of students across the five grades in Table 4.5 shows that almost all of them are studying at fifth, sixth, seventh, eighth, and ninth grades.

Table 4.5. Students' Grades

Grade	**Number of Respondents**	**% of Respondents**
5	30	3.1%
6	161	16.4%
7	205	20.9%
8	264	26.9%
9	322	32.8%
TOTAL	*982*	*100%*

The study uses students' school performance as a dependent variable. Therefore, this aspect was crucial for the research. Unfortunately, there were some students whose assessment information was not available in the student information system. Consequently, the survey's results do not contain any information about the achievements of 51 students. However, the survey collected data for the rest of the sample and showed pupils' grades in such subjects as mathematics, science, language, and social studies. The eventual number of respondents with the available total achievement results is 931 (Table 4.6).

Table 4.6. Students' School Performance

Subject	**Number of Respondents**	**Average Mark**	**Std. Deviation**
Mathematics	931	72.0	19.8
Science	931	72.7	19.5
Language	931	74.7	16.5
Social Studies	931	80.3	16.4
Total Achievement	*931*	74.9	16.7

Students' distances from schools have two different sources and set of values: one from the survey, where students estimated and provided the distance they travel every day, which can be inaccurate, and one that was calculated using the GPS coordinates of the students' address stored in the student information system (Table 4.7 and Figure 4.2).

Table 4.7. Survey and Calculated Transportation Distance to schools

	Survey Results		**Calculated**	
One-way Driving Distance in km	**Number of Respondents**	**% of Respondents**	**Number of Respondents**	**% of Respondents**
1 to 10 KM	372	42.5%	687	73.3%
10 to 25 KM	291	33.2%	120	12.8%
25 to 50 KM	166	18.9%	92	9.8%
More than 50 KM	47	5.4%	38	4.1%
Total	*876*	*100%*	*937*	*100%*

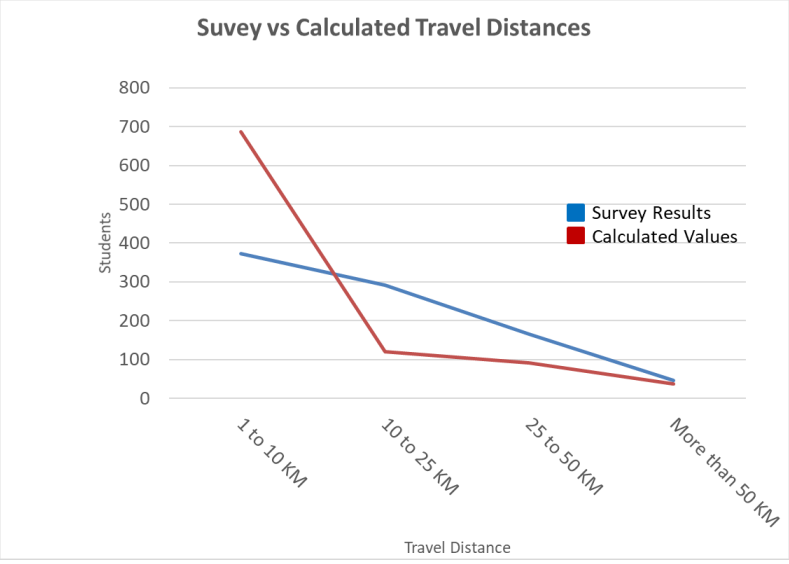

Figure 4.2. Students' Travel Distance from their schools (Survey vs Calculated)

Table 4.8. Survey and Calculated Transportation Time

	Survey Results		Calculated	
Driving Time	**Number of Respondents**	**% of Respondents**	**Number of Respondents**	**% of Respondents**
Less than 5 minutes	16	2.0%	169	18.0%
5-10 minutes	111	14.2%	319	34.0%
10-15 minutes	106	13.6%	228	24.3%
15-20 minutes	127	16.3%	59	6.3%
20-25 minutes	40	5.1%	25	2.7%
25-30 minutes	163	20.9%	14	1.5%
30-40 minutes	100	12.8%	26	2.8%
40-50 minutes	55	7.0%	48	5.1%
50-60 minutes	36	4.6%	27	2.9%
60-80 minutes	26	3.3%	10	1.1%
More than 80 minutes	1	0.1%	13	1.4%
TOTAL	781	100.0%	*938*	*100%*

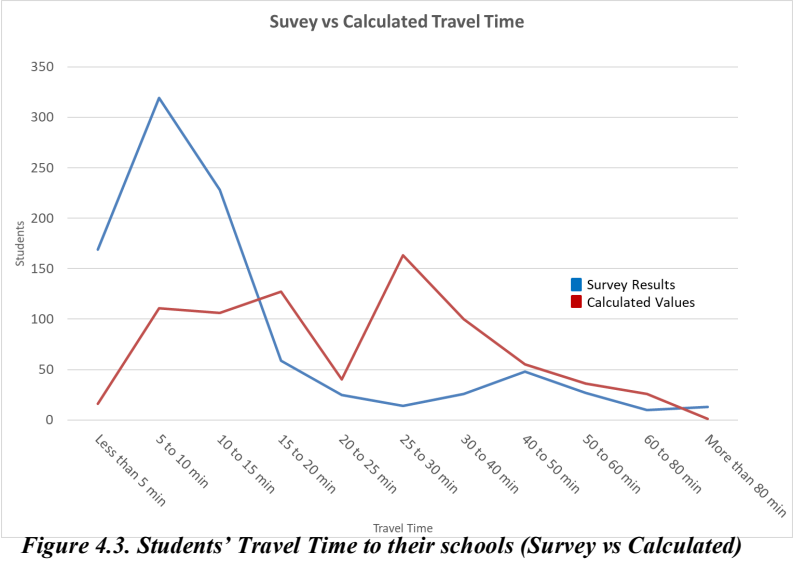

Figure 4.3. Students' Travel Time to their schools (Survey vs Calculated)

Data on respondents' driving time reveal similar trends (Table 4.8 and Figure 4.3). It was stated in the literature review that many empirical studies consider long drives to schools as an essential factor that negatively affects students' school performance and stress levels. In accordance with Belle (1998), long rides are those that take more than 30 minutes. Application of this classification leads to a conclusion that around 28% of respondents engage in such enduring transportation experiences. The regression analysis will show whether this factor really imposes a negative impact on students' grades.

It is worth mentioning that the distances and durations mentioned in the first two columns of table 4.7 and 4.8 are based on students' response and estimation. The accuracy of these estimations might be low, especially for younger pupils. That is why GIS (road network analysis) was used to calculate the driving distance between students' addresses and schools they attend and reported in the next two columns.

The following boxplot in Figure 4.4 represents the differences of time spent by students commuting to school per ethnicity.

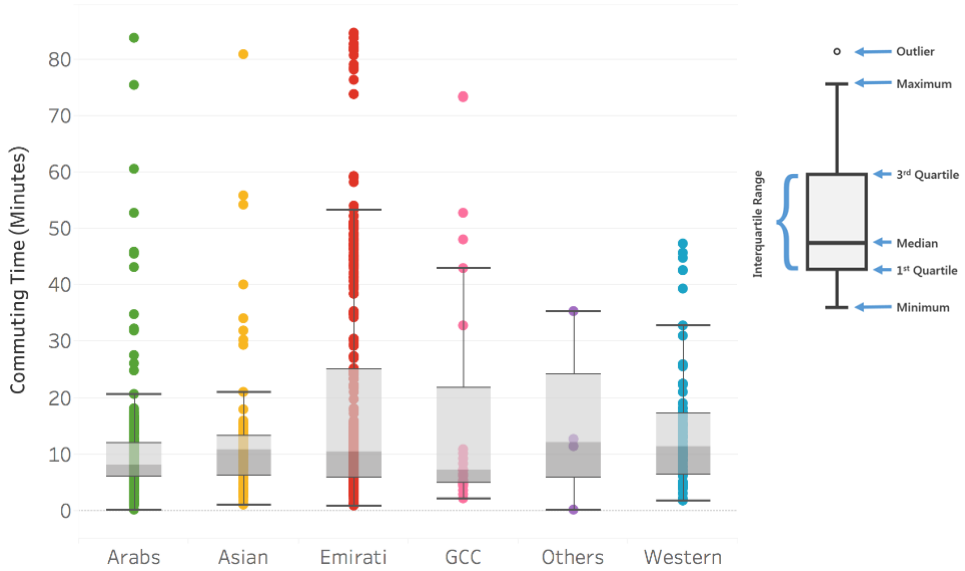

Figure 4.4. Commuting time per ethnicity boxplot

Analyzing the impact of transportation on students' stress levels is one of the key research objectives of the thesis. Table 4.9 summarizes the data for this dependent variable, where 34.2 is the Mean value of all recorded results with a Standard Deviation (SD) of 7.9. It is noticeable that 13.3% of the students have stress levels higher than 42.1 (Mean + SD), and 4% with stress levels higher than 50 (Mean + 2*SD).

Table 4.9. Students' Stress Levels

Stress Level	**Number of Respondents**	**% of Respondents**
≤ 20	7	1.5%
21-30	156	32.5%
31-40	227	47.3%
41-50	74	15.4%
51-60	12	2.5%
> 60	4	0.8%
TOTAL	*480*	*100%*

Unfortunately, only 480 students answered all 22 questions related to stress levels, which accounts for 50% of the sample. Accordingly, the regression analysis that uses students' total stress levels as the dependent variable is likely to have much fewer observations than the other regression analyses conducted in this research. The reduction in the number of respondents for the stress related questions could be due to different reasons, related to culture and school environment, where students might be

afraid or intimidated from expressing their negative feelings and opinions towards the system.

Table 4.10. Transportation Modes Chosen by Students

Transportation Mode	Travelling to School		Returning Home from School	
	Number of Students	*% of Respondents*	*Number of Students*	*% of Respondents*
Car	502	53.1%	453	47.9%
Bus	403	42.7%	446	47.2%
Walking	40	4.2%	46	4.9%
TOTAL	*945*	*100%*	*945*	*100%*

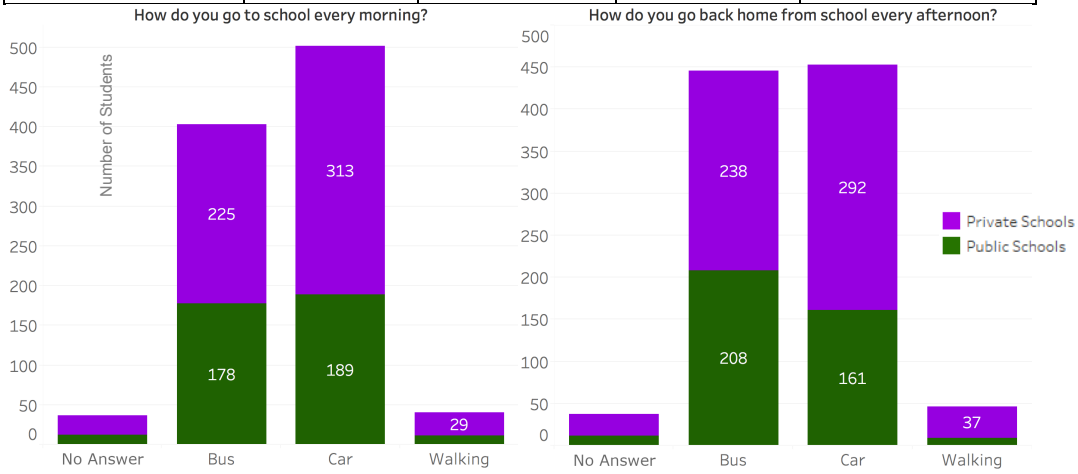

Figure 4.5. Students' Commuting modes

Table 4.11 and Table 4.12 below include a summary of the perceived safety of respondents' busing experience and their treatment in buses. The numbers in tables show that the majority of students feel unsafe in these vehicles, and their satisfaction with the busing experience is low.

Table 4.11. Perceived Safety of the Busing Experience

How safe do you feel during the trip to or from school?	Number of Respondents	% of Respondents
Very safe	20	2.3%
Fairly safe	56	6.5%
Fairly unsafe	356	41.2%
Very unsafe	432	50.0%
TOTAL	*864*	*100%*

Table 4.12. Perceived Treatment of Students in School Buses

How well are you treated during the trip to or from school?	Number of Respondents	% of Respondents
Very happy	35	4.1%
Fairly happy	88	10.2%
Fairly unhappy	475	55.2%
Very unhappy	262	30.5%
TOTAL	*860*	*100%*

The questions listed below in table 4.13 and 4.14 provided brief information about the students' behavior in school buses. Pupils' responses show that the behavior of passengers may create significant threats to their safety, imposing a negative influence on the overall level of satisfaction with the commuting experience.

Table 4.13. Respondents' Treatment in School Buses

	In the bus, are you treated well by other students?		**In the bus, are you treated well by the bus driver?**		**In the bus, are you treated well by the bus supervisor?**	
	N	**%**	**N**	**%**	**N**	**%**
Never	70	11.5%	87	14.6%	84	15.4%
A little	79	13.0%	64	10.7%	59	10.8%
Sometimes	159	26.1%	68	11.4%	110	20.1%
A lot	301	49.4%	379	63.4%	294	53.8%
TOTAL	*609*	*100%*	*598*	*100%*	*547*	*100%*

Table 4.14. Students' Behavior in School Buses

	Do students behave inappropriately in a bus?		**Do students speak disrespectfully to each other or to bus attendants or bus drivers?**		**Do students punch, kick or push other students or bus attendants or bus drivers?**		**Do students verbally assault or harass other students or bus attendants or bus drivers?**	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Never	166	27.2%	215	35.1%	353	57.6%	294	48.9%
A little	201	33.0%	171	27.9%	139	22.7%	145	24.1%
Sometimes	164	26.9%	152	24.8%	85	13.9%	114	19.0%
A lot	79	13.0%	74	12.1%	36	5.9%	48	8.0%
TOTAL	*610*	*100%*	*612*	*100%*	*613*	*100%*	*601*	*100%*

The following chart (Figure 4.6) summarizes the feedback students had regarding their commuting experience and stress level. The average of each question is calculated on the basis of the 4-point scale ranging from "never" to "a lot". Most of the answers tend to lean towards the positive nature except the questions which describe the trip to school, where students feel exhausted, unsafe, and badly treated during the trip.

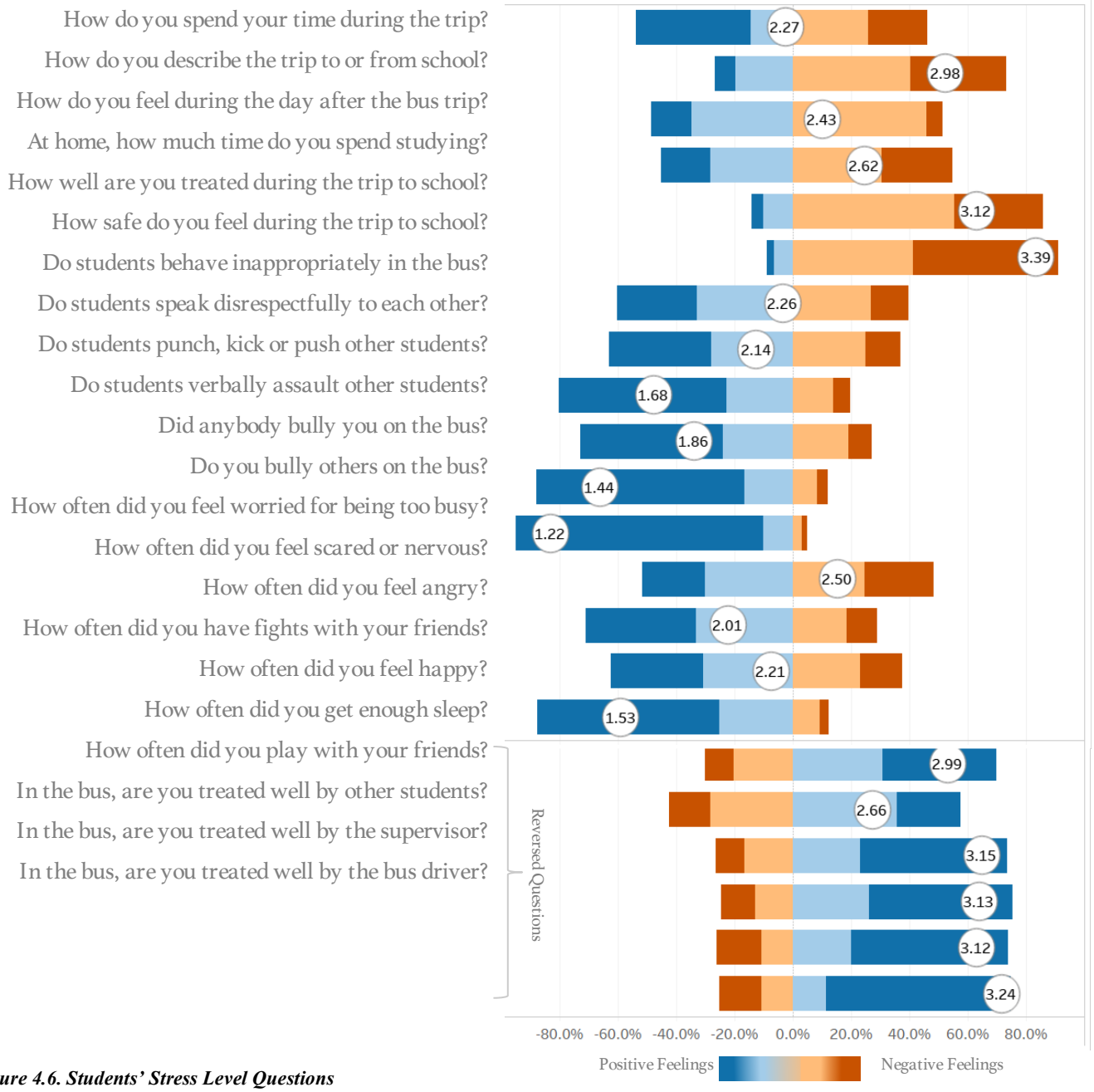

Figure 4.6. Students' Stress Level Questions

CHAPTER V. DISCUSSION

5.1. Discussion of the Descriptive Statistics

The demographic characteristics of respondents do not show any disturbing signs of the factors threatening the results' validity. The overwhelming majority of students (87.6%) are between 11 and 14 years old. While a 14-year-old student is likely to be more independent in choosing between buses and bicycles than an 11-year-old pupil, such differences are barely crucial. Children of this age still rely on their parents in the field of transportation as indicated by Badri (2013). Thus, it does not seem necessary to divide respondents into several aging groups and measure results for each group separately.

Older students might demonstrate unique behavioral patterns. Thus, if the percentage of such respondents in the sample had been high, it would have been necessary to distinguish between the transportation of older and younger students. However, there are only four individuals in the sample who are older than 15 years old, and they constitute only 0.4% of the overall number of respondents. Therefore, their inclusion in the sample is not supposed to impose an essential influence on the survey's results.

Figure 5.1 compares both randomly selected students with the total population of Abu Dhabi Emirate students from the ethnicity point of view. Both charts have similar trends in ethnicity percentages, which is what was expected from simple random selection algorithm.

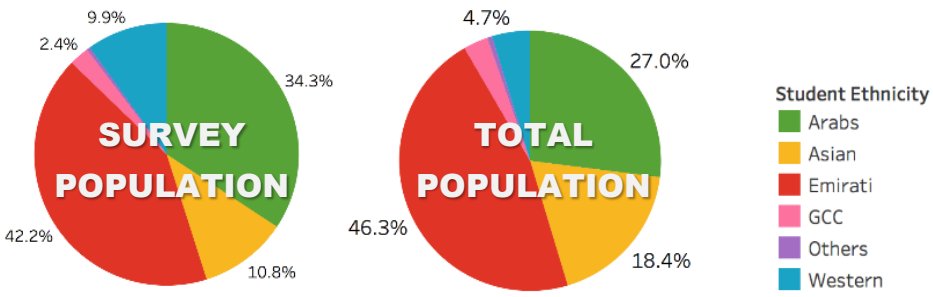

Figure 5.1. Student Ethnicities Sample Vs. Total

The following two maps (Figure 5.2 and Figure 5.3), represent the distribution of students across the island and the mainland based on their ethnicities. Figure 5.3 visualizes the directional distribution ellipses (Standard Deviational Ellipse) of student addresses, which help us to measure the trend of student distribution both in direction and concentration. Based on this map, one may notice that Arab students have the most concentrated distribution, with majority of them located in the north of the island (downtown Abu Dhabi), whereas Emirati students have dispersed distribution across the island. Furthermore, it can be inferred that the total distances covered to reach the school every day by Emirati students should be more than the total distances covered by the Arab students. The median centers also help us to locate

the area which the majority of students are located, such as the Emirati students who are located in the middle of the island and the map.

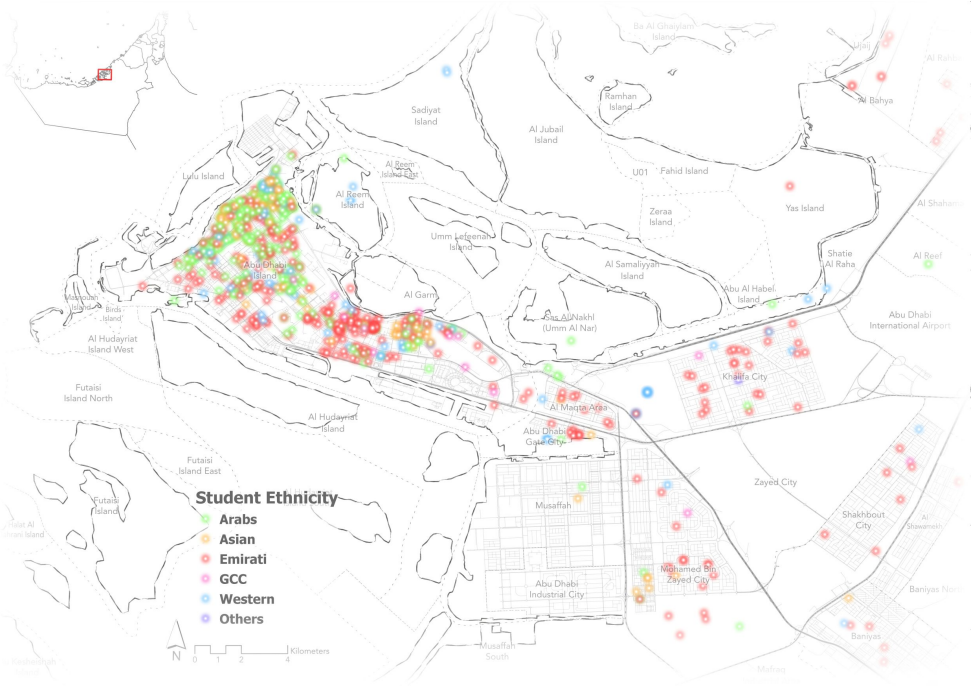

Figure 5.2. Students' Distribution by Ethnicity

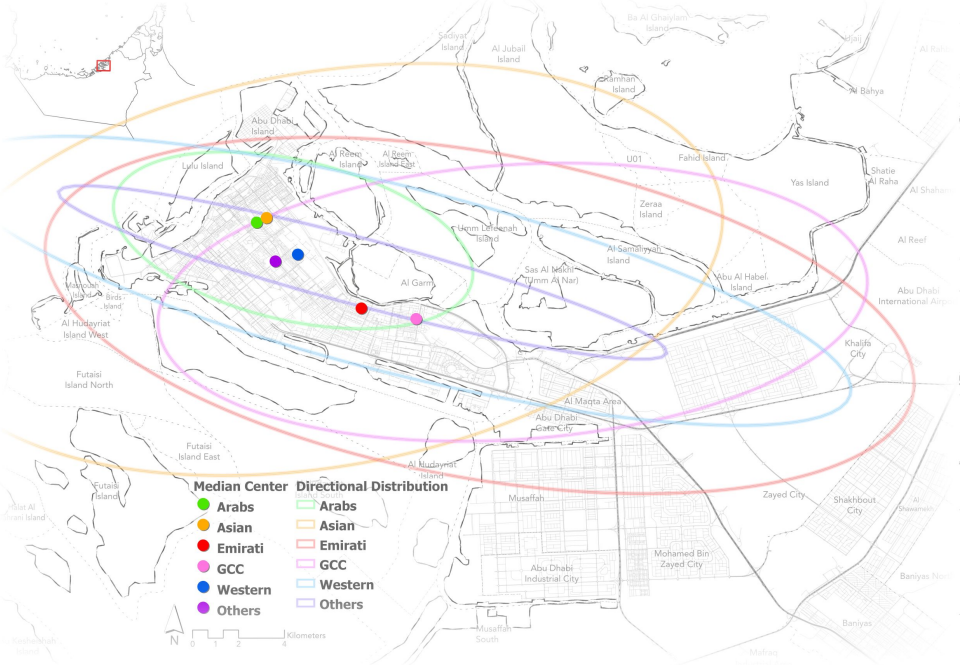

Figure 5.3. Students' Median Centers and Directional Distribution

Table 4.7 and Figure 4.2 compare these values and show the difference between students' perception of their distance from school and the actual distance. This difference might be because buses usually do not take the shortest path from a student house to the school but pass by other students and collect as many of them as required; therefore, students might travel longer distances to reach school. Another reason for the differences between these values is that students most probably are not aware of the exact distance and have inaccurate perception. Furthermore, it is noticeable that many students live quite far from their schools. Based on student's feedback, around 24% of them are forced to cover a distance that exceeds 50 kilometers daily (both ways). The literature review's findings imply that this issue places them in a less favorable position than others, who live in less than 25 kilometers from their schools.

Table 4.8 and Figure 4.3 present the difference in the duration of one-way trip to a school based on the survey and GIS network analysis. Since the calculated distances and durations had differences with the values which the students provided (surveyed), the later was used in the regression analysis. Another reason to use the surveyed results is that, as mentioned earlier, the calculated distance and times are based on direct trip from the address of the student to the school, without taking into consideration the trip the bus would make to collect other students.

As expected earlier, the boxplot in Figure 4.4 visualizes the commuting time per ethnicity, and we can clearly see that Arab students, who had a concentrated geographic distribution (smallest standard deviation ellipse), spend less time to commute than the Emiratis who had the largest geographic distribution and the widest rang in the boxplot. Furthermore, we can note that Asian students have similar small range as the Arab students, whereas GCC, Western and Other ethnicities have a bit larger range. These data points are using the calculated deriving times instead of the information provided by the students.

Numbers in Table 4.10 and Figure 4.5 are surprising since they contradict the literature review's findings. The studies and reports analyzed in the paper portrayed cars as the main transportation mode for most pupils in the United Arab Emirates. In accordance with the Roads & Transport Authority (2017), the number of students using family cars to get to school accounted for around 88% of their total population in Dubai in 2017. Even though the same organization reported a 133% increase in the number of pupils using school buses the next year (Roads & Transport Authority 2018), it seemed obvious that family cars remained the dominant transportation among them. However, the Table 4.10 does not support this statement. The number of students who get to schools by cars exceeds the number of pupils who use school buses for this purpose by 10.47%. This is a relatively high percentage; however, it is definitely lower than those numbers that were reported by the Roads & Transport Authority (2017). At the same time, the percentages of pupils who return home by school buses and by cars are almost the same (47.9% and 47.2% respectively).

These numbers seem surprising. It seems relevant to speculate about the possible reasons behind such unexpected outcomes. First, the current study is focused on students in Abu Dhabi, and the data provided by the Roads & Transport Authority (2017) were for Dubai. Maybe these two emirates have some essential differences relevant to the students' transportation system. It is possible that stakeholders have a better opinion on school buses in Abu Dhabi due to the commitment of local

government authorities to the promotion of this transportation mode. Various sources report that school buses are prioritized in this emirate. Police officers had warned the public that they would impose substantial fines on motorists and car drivers who would not give way to school buses, and this information was spread via various media outlets (Al Serkal 2018). It is possible that such news influenced parents and made them put more trust in the school buses' system.

While the number of students using school buses seems very high, the percentage of pupils who prefer walking is slight, which conforms to the literature review's findings. As explained by Badri (2013), walking and biking are unpopular transportation modes in the United Arab Emirates. Therefore, it seems natural that only 4.23% of students use this mode when travelling to school while around 4.87% of them employ it to get home. It seems justified to assume that a solid part of these respondents consists of those pupils who live in less than one kilometer from their schools. It is also important to emphasize that many pupils use cars in the morning but then switch to school buses when returning home. This pattern might be connected with the schedules of their parents who take their children to school but cannot take them home because they are at work at that time.

Considering that a significant part of the literature review was dedicated to the phenomenon of school buses, it seems pertinent to analyze how respondents feel about their bus commuting experience. Table 4.11 shows that many students feel unsafe when travelling. Unfortunately, the data do not provide a clear understanding of the reasons behind this regularity. Maybe many pupils did not get used to travelling in these vehicles, and some others are influenced by various stories about school buses' road accidents, such as the injuries of the four students in May 2018 (Duncan, 2018). Or based on the suggestions they provided to improve the transportation, most of them feel that the buses are crowded, and they do not feel comfortable or safe. However, the sole fact that 91% of respondents feel either very or fairly unsafe is disturbing.

The Table 4.13 reveals disturbing trends inherent to the way in which school buses in Abu Dhabi ensure appropriate treatment of their passengers. Only 11.5% of the students never experienced problems connected with the behavior of other pupils. This pattern seems normal since relationships between pupils are a well-known problem that can be barely solved by managers of the school transportation system. However, the fact that 14.6% of respondents argue that they are never treated well by bus drivers whilst 15.4% of them complain about the same thing in the case of bus supervisors are troubling. An inability of the school transportation system to ensure appropriate behavior of bus drivers and supervisors may be an important factor deteriorating the mood and even school performance of those students who use school buses on a regular basis.

It is relevant to emphasize that many respondents did not provide responses to the questions about their commuting experience. On one hand, it may be considered normal because the overall number of responses is still high. On the other hand, possible reasons behind such outcomes may raise significant concerns. A common student is apparently less likely to report the cases of being bullied than to tell about the absence of such problems. Therefore, it is justified to assume that the actual number of respondents who are treated badly by other students is higher than the reported percentage of 24.5%. At the same time, one possible explanation behind the

fact that so many students did not reply to these questions is that they have never taken a school bus, as they use other transportation modes.

Unfortunately, students often engage in unethical actions on school buses. As per table 4.14 Almost 40% of respondents evaluate pupils' behavior as inappropriate. A little less than 20% of them report frequent cases that involve kicking and pushing other children or bus drivers. In light of these numbers, it seems natural that most respondents are not satisfied with the way they are treated in school buses and feel unsafe when travelling in these vehicles.

5.2. Mean Values and Regression Analyses

The data collected in this study allows conducting a series of regression analyses. First, it seems important to investigate a possible connection between the transportation modes chosen by students and their total achievement. In addition to the regression analysis, it was also decided to calculate the mean values of students' responses, seeking to measure the average performance indicators of all the pupils' groups in accordance with their transportation modes.

Table 5.1. Average Total Achievement Scores of Students Using Different Transportation Modes

	Travelling to school in the morning		**Returning home from school in afternoon**	
	Mean	**Std. Deviation**	**Mean**	**Std. Deviation**
By car	75.6	16.4	76.0	16.2
By bus	74.0	16.9	73.8	16.9
Walking	77.2	19.0	78.3	18.9

Table 5.1 shows that students who use cars to get to school and then return back home are likely to have slightly higher (1.6%) average total achievement scores than those who use school buses. Interestingly, pupils who walk to and from school have even higher average total achievement scores (3.2%). It seemed justified to assume that those students who prefer walking probably lived closer to school and did not engage in long-enduring rides.

While it can be assumed based on the numbers from Table 5.1 that students who use school buses might have lower grades than pupils whose parents take them to schools by cars, it is not possible to confirm the existence of this pattern without analyzing results of the ANOVA analysis.

Table 5.2. ANOVA Results and Tukey's Test for the Relationship between the Students' Transportation Modes and Total Achievement Scores

	Sum of Squares	**Df**	**Mean Square**	**F**	**Sig.**
Between Groups	737.971	2	368.986	1.319	.268
Within Groups	250050.526	894	279.699		
Total	250788.497	896			

(I) How do you go to	**(J) How do you go to**	**Mean Difference**	**Std. Error**	**Sig.**	**95% Confidence Interval**

school every morning?	school every morning?	(I-J)			Lower Bound	Upper Bound
Car	Bus	1.65567	1.14472	.318	-1.0317	4.3430
	Walking	-1.57034	3.14605	.872	-8.9561	5.8154
Bus	Car	-1.65567	1.14472	.318	-4.3430	1.0317
	Walking	-3.22601	3.17165	.566	-10.6718	4.2198
Walking	Car	1.57034	3.14605	.872	-5.8154	8.9561
	Bus	3.22601	3.17165	.566	-4.2198	10.6718

The results in Table 5.2 show that there is no evident difference between the means of the groups. In other words, the choice of a transportation mode barely has an essential influence on a pupil's total achievement score.

Table 5.3. Results of the Regression Analysis: Distance to School and Students' Total Achievement Scores

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11702.302	1	11702.302	43.941	.000
	Residual	239153.9	898	266.318		
	Total	250856.2	899			

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	77.771	.709		109.678	.000
Student School Distance Km	-.371	.056	-.216	-6.629	.000

The Sig of only 0.000 in Table 5.3 is below the confidence level of 0.05, which indicates that the distance to school significantly influences students' Total Achievement Scores. At the same time, the beta coefficient is -0.216. A distance to school, therefore, negatively affects students' total achievement scores. From the perspective of this issue, the research conforms to the findings of some scholars, such as Badri (2003). At the same time, it is important to emphasize that in accordance with Spence (2000), it was the average time spent on a ride and not the distance to school that influenced students' achievement. It seems justified to check this hypothesis for the given sample.

Mornings (7:00 AM to 8:00 AM) are usually the peak traffic time in Abu Dhabi because workers head to their workplaces while students are trying to reach to their schools during the same period of time. After selecting travel time in the morning as an independent variable, results of the regression analysis in Table 5.4 did not radically change.

Table 5.4. Results of the Regression Analysis: Average Time Spent on Travelling to School in the Morning and Students' Total Achievement Scores

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	4050.226	1	4050.226	17.010	.000
Residual	175252.0	736	238.114		
Total	179302.2	737			

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	81.700	1.142		71.533	.000
Average Time Spent on Travelling to School in the Morning	-.166	.040	-.150	-4.124	.000

Significance is still substantially lower than the confidence level, thus illustrating a strong relationship between the variables. An increase in the time spent on getting to school in the morning negatively affects students' total achievement scores. The most obvious explanation of this regularity is that a substantial amount of time spent on traveling negatively affects children in a variety of ways, such as by reducing the amount of time that is available for studying in addition to the mental and physical fatigue due to the long rides in the harsh weather. At the same time, there is also an alternative explanation of this pattern. Children who live "centrally" in the city are likely to come from households with higher levels of income than those living far from the center. Therefore, their achievements might be higher due to a variety of factors besides a low traveling time, including an access to high-quality tutoring, effective home education, and many other factors.

Contrary to the expectations that are based on the literature review's findings, it turned out that the influence of an average traveling time on students' total achievement scores is significant, while a hypothesis concerning the existence of a connection between transportation modes and pupils' achievements at school was rejected.

The numbers in Table 5.2 show that while a distance to school has a certain effect on children's achievements at school, this variable could not be predicted by their preferred transportation mode. In this field, the thesis contradicts the results of other studies on the same problems, such as the ones carried out by Belle (1998), Spence (2000), and Lu and Tweeten (1973). In all the three studies, those students who used school buses were found to have lower grades than their classmates who employed other transportation modes. At the same time, all these authors were rather focused on discussing the variable of travelling time than on investigating the impact of transportation modes on students' school performance. One possible explanation of this regularity is that the choice of a car instead of a school bus is likely to be an indicator of a diverse socioeconomic status; thus, one may speculate that other

confounding variables could have influenced the total achievement scores of these students.

After obtaining results of the regression analysis from the Tables 5.3 and 5.4, it became possible to explain numbers in Table 5.1 Students who walk to schools probably spend much less time on this process than those who use school buses or cars. This is likely to be the main reason why their school performance is so high.

Further spatial analysis was conducted on these variables using Getis-Ord Gi* statistics to identify statistically significant hot and cold spots. Resultant Gi* statistic returned for each feature in the dataset is a z-score. For statistically significant positive z-scores, the larger the z-score is, the more intense the clustering of high values (hot spot). For statistically significant negative z-scores, the smaller the z-score is, the more intense the clustering of low values (cold spot).

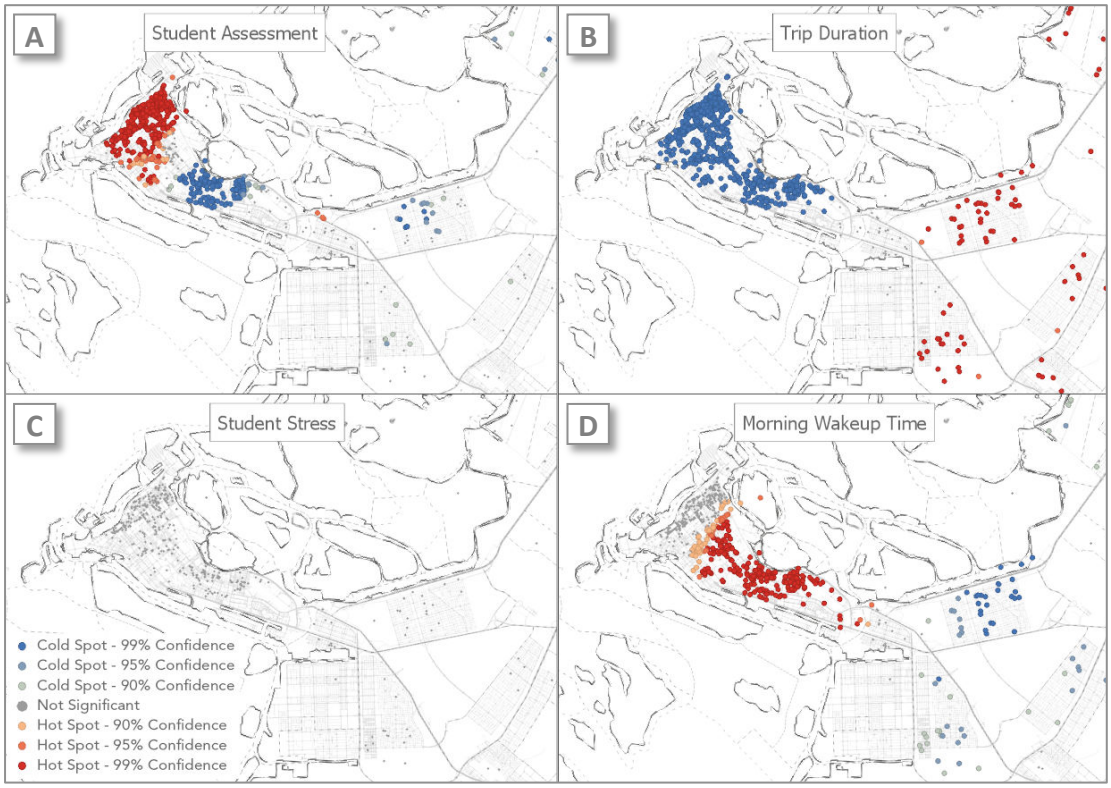

Figure 5.4. Optimized Hot Spot Analysis for student total achievement, stress levels, Trip Durations and Morning Wakeup Times

As it can be observed from the maps in Figure 5.4, there is some relationship between the Total Assessment and Trip Duration, even the Morning Wakeup Time. In map A, there are statistically hot and cold spots of assessment values on the island, and mostly cold spots (lower assessment values) in the mainland (east of the map). As presented earlier, most of the students living the presented hot spot area (west of the map) are Arabs and Asians, and the cluster of cold spots on the same map (center of the map) is highly populated by Emiratis and GCC national students. Furthermore, it is interesting to note that students who are living on the mainland (southeast of the map) have significantly lower total achievement scores. These students have mixed ethnicities.

Map B presents the trip duration cold spots, and since all the selected schools are from the island, it is natural that all students living in this area will have lower trip duration than the students living on the mainland who in turn have lower assessment values. Based on map C, stress levels have no geographic clustering; therefore, a distance from schools have no effect on the students' stress levels. It can be inferred from map D that most of the students living in the middle of the island wake up in the morning relatively later than the students living on the mainland. This pattern is natural, as the schools are located nearby, and there is no need for waking up early. As described in the previous chapter, many students are not satisfied with their commuting experience. Around 85.70% of them are either fairly or very unhappy about the way they are treated in school buses, and approximately 91.20% of them do not feel safe while using this transportation mode. The atmosphere in a bus might negatively influence students, and this factor may affect total achievements. It seemed justified to assume that the negative atmosphere in school buses in addition to harsh weather conditions could make students more stressed and tired. In turn, this would decrease their total achievement score. However, ANOVA results in Table 5.5 do not support this hypothesis.

Table 5.5. ANOVA Results and Tukey's Test: Students' Transportation Modes and Their Total Stress Level

	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	29.253	2	14.626	.237	.789
Within Groups	29196.350	473	61.726		
Total	29225.603	475			

(I) How do you go to school every morning?	**(J) How do you go to school every morning?**	**Mean Difference (I-J)**	**Std. Error**	**Sig.**	**95% Confidence Interval**	
					Lower Bound	**Upper Bound**
Car	Bus	.48311	.76882	.805	-1.3245	2.2907
	Walking	1.02532	2.56189	.916	-4.9980	7.0486
Bus	Car	-.48311	.76882	.805	-2.2907	1.3245
	Walking	.54221	2.52448	.975	-5.3931	6.4775
Walking	Car	-1.02532	2.56189	.916	-7.0486	4.9980
	Bus	-.54221	2.52448	.975	-6.4775	5.3931

The p-value of 0.789 in Table 5.5 illustrates that there is no statistically significant difference between the variables' means. Riding on a school bus can barely make a

student more stressed than travelling in a car. Furthermore, not only the use of transportation modes does not influence students' stress levels, but also their total stress level does not affect their total achievement scores.

Table 5.6. Regression Analysis: Students' Total Stress Level and Total Achievement Scores

Model	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	65.984	1	65.984	.218	.641
Residual	136033.454	449	302.970		
Total	136099.438	450			

Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	75.107	3.658		20.535	.000
	Stress Level Total	-.048	.103	-.022	-.467	.641

The significance of 0.641 in Table 5.6 is substantially higher than the confidence level of 0.05; therefore, the total stress level of students is not a valid predictor of their total achievement scores. A stressed student is not likely to display lower achievements than a pupil with a low-stress level.

Even though stress levels of students do not affect their achievement in accordance with the results of this study, this factor is still important. Experiencing disturbing stressors can have devastating consequences for pupils' health. Therefore, if some transportation issues tend to threaten pupils' psychological state, stakeholders must take radical measures to improve the situation. Surprisingly, the selection of a transportation mode in the sample does not affect students' stressfulness. In a similar way, the average traveling time also does not influence their stress level.

Table 5.7. Results of the Regression Analysis: Students' Average Travelling Time and Total Stress Level

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	58.108	2	29.054	.461	.631
Residual	24410.867	387	63.077		
Total	24468.974	389			

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	33.498	.997		33.596	.000
	How much time does the trip take to reach school every morning?	-.010	.034	-.018	-.309	.757
	How much time does the trip take to reach home every afternoon?	.027	.029	.056	.935	.350

The significance of the relationship, in Table 5.7, between the variables is low. Interestingly, this conclusion applies to the respondents' traveling time both to and from a school. The fact that no connection between the average traveling time and pupils' total stress level contradicts the literature review's findings. There are several possible explanations of this regularity. First, the majority of studies reviewed in the second chapter of this thesis are relatively old. One may assume that the patterns concerning the "stressfulness" of various transportation modes has changed over time since then. Second, most of these researches focused on samples from Western countries; therefore, the patterns discussed in them could be different from the ones that are relevant to the UAE due to the unique characteristics of the country and the emirate of Abu Dhabi. Third, it is also possible that socioeconomic characteristics that have been discussed above could be behind this unexpected finding. As people with a higher economic background are likely to have lower stress levels than their peers from households with a lower income, a relatively unpleasant atmosphere in school buses may not play a major role in their overall stress levels.

Spatially Constrained Multivariate Clustering tool was used to group clusters of students based on three parameters, Total achievement, Driving Time and Stress Level, where all the students' parameters within each cluster are as similar as possible, and all the clusters themselves are as different as possible.

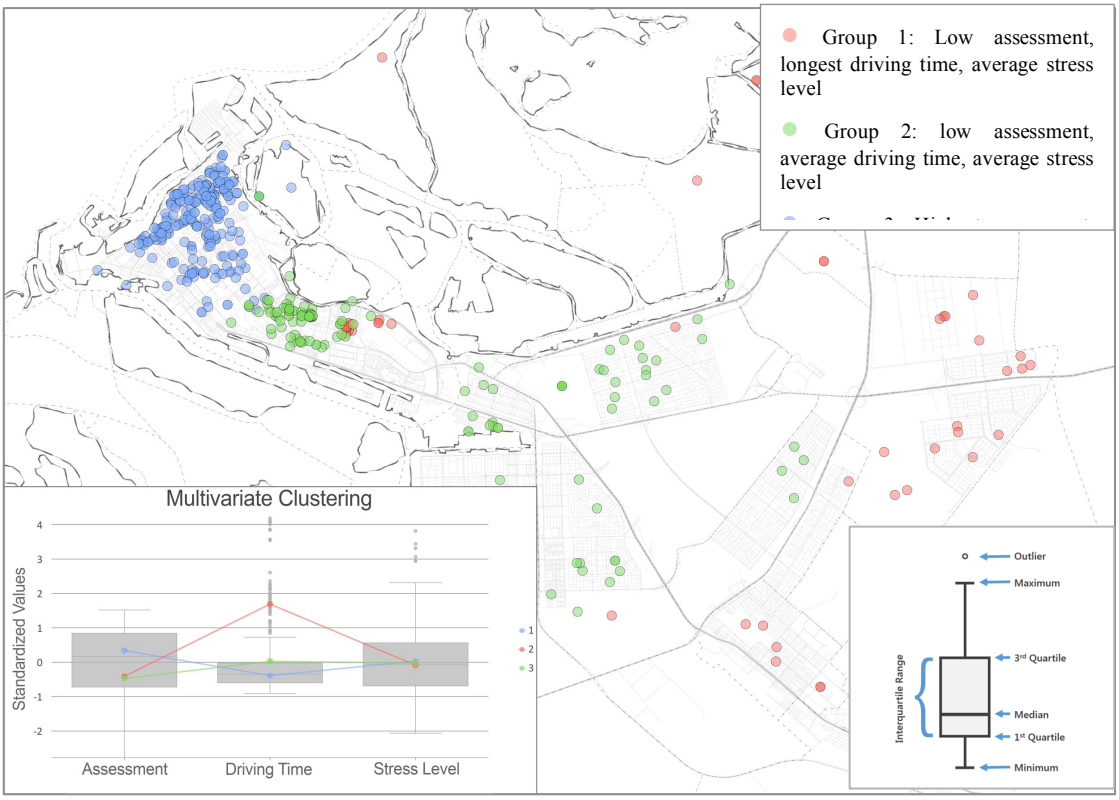

Figure 5.5 Multivariate Clustering Using Assessment, Driving Time, & Stress Level Variables

Three groups emerge on the basis of the Figure 5.5. The blue group has high assessment values and low driving time. The red group is characterized by the high driving time and low assessment values. Finally, the green group has low assessment values and relatively high driving time. Such features of the groups show that the stress level is not significantly different between the groups, which means that is has no effect on the assessment as discussed earlier. One may assume based on the maps that the main reason for the low assessment values for the red group is the driving time, whereas, the green group might have other factors affecting the assessment, such as ethnicity characteristics. This requires further research using geographically weighted regression models where coefficients of the independent variables differ by location.

The last stage of this data analysis evaluates the influence of various psychological factors associated with travelling on students' total achievement scores in order to ensure a more comprehensive understanding of the problem under investigation.

Table 5.8. Results of the Regression Analysis: Various Transportation-Related Factors and Students' Total Achievement Scores

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	11023.448	7	1574.778	5.539	.000
Residual	131075.661	461	284.329		
Total	142099.109	468			

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	73.114	5.517		13.253	.000
	How well are you treated during the trip to or from school?	.118	1.148	.005	.103	.918
	How safe do you feel during the trip to or from school?	-2.595	1.179	-.112	-2.201	.028
	Did anybody bully you on the bus?	-.994	1.058	-.045	-.939	.348
	In the bus, are you treated well by other students?	.913	.939	.055	.972	.332
	In the bus, are you treated well by the bus driver?	.818	.958	.054	.854	.394
	In the bus, are you treated well by the bus supervisor?	2.554	.999	.162	2.558	.011
	Do you bully others on the bus?	-2.810	1.383	-.096	-2.032	.043

The numbers in Table 5.8 reveal varied trends. On one hand, the variable of being treated well by a bus supervisor has a positive impact on a pupil's school performance, while bullying others on the bus and perceived feeling of safety, surprisingly, negatively affects the dependent variable. On the other hand, such variables as the overall perception of treatment during the trip, the treatment by bus drivers and students, and the chance of becoming a victim of bullying on the bus do not have an essential impact on pupils' school perfrormance. Some of these findings could be possibly explained by speculating that many students were probably not sincere about this aspect. One may feel ashamed about bullying accidents, and, as a result, such an individual might have put erroneous information when answering the question about bullying experiences.

Unfortunately, it is barely possible to explain why the perceived safety of traveling negatively influences students' performance. It seemed justified to expect that this impact would be positive, as the perceived safety would make students less stressed and, as a result, more focused on studying.

5.3. Limitations of the Study

Several factors may limit the external validity of the findings of this thesis. First, the research is targeting students of grades 6 to 9 who are relatively not mature enough, and some of them might not answer the survey questions correctly because of either difficulty in understanding questions or difficulty in expressing their feelings. Secondly, Abu Dhabi differs significantly from many other cities from the perspective of students' transportation. In particular, walking and biking are relatively unpopular transportation modes among pupils because of the harsh weather environment. Therefore, results of this study can be barely applied to explore the students' transportation trends in other cities, especially in those that are located outside the GCC region. Third, the study did not consider socioeconomic factors that could mediate a relationship between variables. Fourth, not all the questions in the questionnaire have been reversed, which may contribute to the noise in data.

5.4. General Discussion

Most inferences of this study confirmed the literature review's findings. The majority of those authors whose works were analyzed in the second chapter of this thesis made similar conclusions. In particular, it was found that a distance to school and the amount of traveling time to and from school has a significant effect on students' total achievement scores. The same conclusion was also made by Belle (1998) and Spence (2000), who found long rides to be a predictor of lower academic achievements. At the same time, it could be inferred from the results of this study that a relationship between these variables is not based on a premise to long rides contribute to increased stressfulness, which, in turn, reduces achievement scores. The reasons behind the regularity could be apparently found in students' socioeconomic background, as it is more natural for students from households with a higher social or economic background to live in close proximity to the city's center. This high factor might translate into many confounding variables, such as additional tutoring time and productive parent-child communication, which may affect achievement scores.

The variable of transportation modes' selection does not have an influence on students' achievement scores. In this area, the study confirms the results of the studies by Zoloth (1976) and Henderson (2009) while rejecting the conclusions made by Belle (1998) and Spence (2000). This study does not provide explicit reasons behind this regularity. At the same time, the fact that the majority of students who use a school bus are not satisfied with their experience shows that these reasons are not connected with the superiority of school buses in Abu Dhabi as compared to those from other cities and countries. Apparently, there are some confounding variables that mediate a relationship between the busing experience of pupils and their achievements.

In general, results of the study show that the use of a school bus as the main transportation mode is unlikely to make a negative impact on a pupil's school performance. Even if it can affect this variable in some way, the magnitude of this influence is too slight as compared to many other variables.

At the same time, while the transportation mode does not have a statistically significant effect on students' performance or perceived stress levels, it is also important to emphasize that more than 90% of the students traveling by bus feel

unsafe during the trip to and from schools and more than 85% of them feel that they are not treated well during the same trips, this factor may impose a disturbing and sometimes even an irreversible negative impact on children's health.

In light of the findings of this study, it seems justified to recommend parents to be careful when selecting schools for their children, commuting for long period of times will affect negatively on their children's performance at school.

Furthermore, schools and local authorities can undertake several initiatives to enhance the current situation, such as utilizing GIS to optimize school bus routes and reduce average travel time, implement policies for maximum travel time of students on the bus or maximum number of students in the bus, in addition to investigating and implementing effective reforms in the school bus system to eradicate the negative feelings of students. Stakeholders may achieve impressive results by enhancing the training programs for bus drivers and bus supervisors so that students would have more positive feedback about the way they are treated on the bus. Furthermore, organizing anti-bullying campaigns and adopting strict policies against bullying and violent behaviors will increase the sense of security of students. With the help of such strategy, schools and the local government may ensure an improvement in both students' performance and perception towards school buses in Abu Dhabi.

Figure 5.7 represents the frequency of student recommendations to enhance the transportation system. Overcrowded buses and hygiene issues are the most requested problems to solve, which might have direct effect on students' transportation experience.

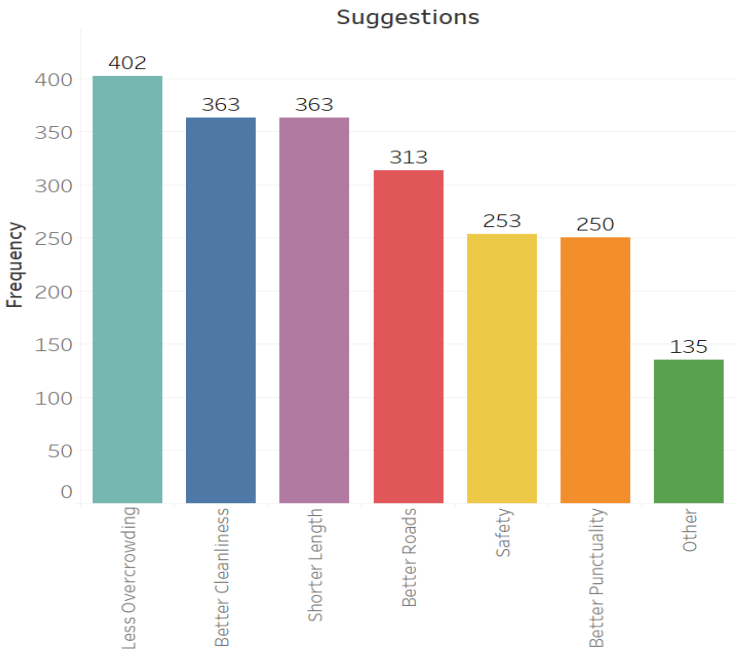

Figure 5.6. Students' Recommendations

CHAPTER VI. CONCLUSION

The thesis investigated the phenomenon of students' transportation in Abu Dhabi and studied a relationship between this variable and students' school performance. It was found that transportation of pupils in Abu Dhabi differs from the way in which students get to and from schools in many Western countries. The modes of walking and biking are not popular in this emirate, and the majority of students use family cars. The popularity of school buses in the United Arab Emirates was relatively low until 2018, and scholars paid little attention to the school bus system in this country in their investigations. However, the situation is now changing, and the topicality of the problem under investigation is rapidly increasing.

The empirical part of this study found that distance to school and the average amount of traveling time to and from school negatively influences pupils' school performance. At the same time, contrary to the literature review's findings, it was found that the choice of a transportation mode does not have a major effect on this variable.

In addition to exploring a relationship between students' transportation and academic performance, this study also elaborated insights into the transportation's implications for pupils' stress levels. The research found that the same factors that cause negative effects on students' performance has no significant impact on their psychological state. In other words, the choice of transportation mode or the duration of the trip to and from school does not affect the total stress level. Furthermore, the study found that total stress levels of students do not have a significant effect on their school performance, although stressors that exist in school buses, such as mistreatment by the bus supervisor, impose a critical negative influence on students' psychological state.

As a conclusion, parents in Abu Dhabi are recommended to choose schools that are located nearby their residence, so that students don't spend long period of times commuting to school every day. Local authorities and schools are also encouraged to optimize school bus routes to shorten the total distance traveled and regulate the transportation system by implementing policies and reforms to the existing structure.

This study discovered promising areas for further research. First, scholars may focus on a detailed investigation of school buses from the passengers' perceptive. Results of the regression analyses show that there are apparently some factors imposing a negative impact on students' total achievement besides travelling time and atmosphere-related stressors. Their list may include numerous issues. For instance, it is possible that using a bus makes many students tired and less motivated to do homework. A qualitative study that implies interviewing pupils could clarify this issue. Another possible direction that can be taken by scientists is connected with the psychological factors related to busing experience. Such variables as mistreatment by bus supervisors and a low level of safety are based on students' perceptions. Employing a more objective approach and trying to determine to what extent these perceptions harmonize with the factual data could ensure a deeper understanding of the problem under investigation.

Another interesting research problem is the transportation choices of students from various demographic groups. The study showed that students of Abu Dhabi's schools

are diverse in terms of their ethnicities, nationalities, and cultural backgrounds. In this situation, it may be interesting to explore how pupils from each demographic group behave in school buses and perceive various transportation modes. For example, scholars can focus on analyzing how transportation-related factors influence the stress levels and academic performance of students that come from different socioeconomic backgrounds.

The arguments provided above allow putting forward an assumption that this thesis made a significant contribution to the academic literature. It showed that the distance to school and the total traveling time strongly affect pupils' total achievement scores. Simultaneously, it also showed that the significance of transportation-related variables is slight in comparison with possible confounding variables. An investigation of the nature of these confounding variables and the way in which they compensate for the negative effects associated with school buses might be one of the most promising directions for further research. The research may be also considered valuable from the practical perspective since it generated valuable recommendations both to students' parents and to the local government and schools.

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APPENDICES

Appendix A: Pre-test Interview Questionnaire

Full Name: _____

ERP ID: _____

Gender ☐ Boy ☐ Girl

Position: _____

Home Address: _____ (example: Karama, Mushrif or Tourist club)

School Name: _____

What is the average transportation time per shift (morning, evening)?

What students usually do during the bus trip (read, study, play & socialize, sleep, nothing)?

How does students behave on the bus?

How often does bullying or physically abusing incidents occur between students?

Does transportation by bus affect the student behaviour, energy, or academic performance?

Any other issues or comments?

Appendix B: Student Survey Questionnaire

School Transportation Survey 2017

The School Transportation Survey asks questions about your method of commuting to school every day and the experience you have during the trips.

The collected responses will provide extremely valuable information about the transportation service, and can guide decision makers to take necessary steps to enhance the current situation either by introducing new policies or optimizing the bus routes and service areas of the schools.

The survey should not take more than 10 minutes to complete. You may skip questions that you are not inclined to answer (but we hope that you will do your best to answer all the questions that are relevant to you).

If you have any questions or concerns about the survey, please contact:

Pakrad Sarkis Balabanian
Team Leader – Knowledge Management
Abu Dhabi Education Council
Pakrad.Balabanian@adec.ac.ae

Thank you in advance for your cooperation and participation.

Student Transportation Survey

Student Full Name: _____

Student ID: _____

Student Gender ☐ Boy ☐ Girl

Student Grade: _____

Home Address: _____
(example: Karama, Mushrif or Tourist club)

School Name: _____

Morning Trip

How do you go to school every **morning**?

☐ By Car ☐ By Bus ☐ Walking

What time do you wake up in the morning usually?
(example: 6:00 am)

What time do you start the morning trip to school?
(example: 6:30 am)

How much time does the trip takes to reach school every morning? (in minutes)
(example: 40 minutes)

Afternoon Trip

How do you go back home from school every **afternoon**?

☐ By Car ☐ By Bus ☐ Walking

What time do you leave the school in the afternoon to reach your home?
(example: 2:30 pm)

How much time does the trip takes to reach home every afternoon? (in minutes)
(example: 40 minutes)

Do you sleep/nap in the afternoon when you go home after school? If yes, for how long?
(example: Yes, 20 minutes)

What time do you sleep at night usually?
(example: Yes, 20 minutes)

How far is your home from your school?

☐ 1 to 10 KM ☐ 10 to 25 KM ☐ 25 to 50 KM ☐ More than 50 KM

On a scale of 0 to 100, how do you evaluate your average grade in school?

How do you spend your time during the trip to or from school?

☐ Read/Study ☐ Play with friends ☐ Sleep ☐ Do Nothing

Student Transportation Survey

How do you describe the trip to or from school?

☐ Fun ☐ Boring ☐ Exhausting ☐ Suffering

How do you feel during the day after the bus trip?

☐ Energetic ☐ Normal ☐ Tired ☐ Exhausted

At home, how much time do you spend studying every day?

☐ 0 to 30 minutes ☐ 30 to 60 minutes ☐ 1 to 2 hours ☐ More than 2 hours

How well are you treated during the trip to or from school?

   

☐ Very happy ☐ Fairly happy ☐ Fairly unhappy ☐ Very unhappy

How safe do you feel during the trip to or from school?

   

☐ Very safe ☐ Fairly safe ☐ Fairly unsafe ☐ Very unsafe

Do students behave inappropriately in the bus?

   

☐ Never ☐ A Little ☐ Sometimes ☐ A Lot

Do students speak disrespectfully to each other or to bus attendants or bus drivers?

   

☐ Never ☐ A Little ☐ Sometimes ☐ A Lot

Do students punch, kick or push other students or bus attendants or bus drivers?

   

☐ Never ☐ A Little ☐ Sometimes ☐ A Lot

Do students verbally assault or harass other students or bus attendants or bus drivers?

   

☐ Never ☐ A Little ☐ Sometimes ☐ A Lot

Did anybody bully you on the bus?

☐ Never ☐ A Little ☐ Sometimes ☐ A Lot

Do you bully others on the bus?

☐ Never ☐ A Little ☐ Sometimes ☐ A Lot

In the last week, how often did you feel worried about being too busy?

☐ Never ☐ A Little ☐ Sometimes ☐ A Lot

In the last week, how often did you feel scared or nervous?

☐ Never ☐ A Little ☐ Sometimes ☐ A Lot

In the last week, how often did you feel angry

☐ Never ☐ A Little ☐ Sometimes ☐ A Lot

What made you angry?

In the last week, how often did you feel happy?

☐ Never ☐ A Little ☐ Sometimes ☐ A Lot

What made you happy?

In the past week how often did you get enough sleep?

☐ Never ☐ A Little ☐ Sometimes ☐ A Lot

In the past week, how often did you have fights with your friends

☐ Never ☐ A Little ☐ Sometimes ☐ A Lot

In the past week, how often did you play with your friends?

☐ Never ☐ A Little ☐ Sometimes ☐ A Lot

In the bus, are you treated well by other students?

☐ Never ☐ A Little ☐ Sometimes ☐ A Lot

In the bus, are you treated well by the bus driver?

☐ Never ☐ A Little ☐ Sometimes ☐ A Lot

In the bus, are you treated well by the bus supervisor?

☐ Never ☐ A Little ☐ Sometimes ☐ A Lot

What changes, if any, do you think should happen in public transport? Please tick all that apply

☐ Less overcrowding in the bus
☐ Better punctuality/reliability
☐ Shorter length of journey time
☐ Other (Explain please)
☐ Better roads/routes to school
☐ Better cleanliness
☐ Safety at bus stop

Thank you!

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