# A Study on Students' Travel Behavior in Perspectives of School Bus Service

**Nasim Khan, Saurav Barua, Anik Das**

***Abstract*— Many areas within Dhaka city have been experiencing the rapid development of private schools over the past twenty years. Dhanmondi is one of them. The roadways near the schools consistently get congested during peak hour. School-related traffic congestion poses to the safety of the students, teachers, parents, residents, and motorists in and around school locations is a significant problem in Dhaka. The main purpose of this research work is to provide valuable information regarding traffic congestion and safety around schools in Dhanmondi area. This study is mainly based on questionnaire survey. Ten schools were selected and three hundred students were interviewed based on random sampling. Students were provided with close ended questionnaire and analysis was performed based on their feedback. Analyzed data show that various reasons contribute to traffic congestion near schools during peak period. Among these reasons, use of private car is one of the main reasons of congestion near the schools of Dhanmondi area. Significant portion of student thinks school buses are too crowded, school buses are not safe enough and bus do not arrive or leave in time. Car users can be attracted to the school buses by providing proper service and safety. Along with door-to-door peak up and least travel time; majority of student also suggested for air condition and GPS tracking in school bus. Most of the students have residence along some particular routes. If bus routes are introduced equipped with necessary facilities and services according to the demand of the students, then it will attract a large amount of students to use this service which will ultimately reduce congestion near the schools during peak period.***

***Index Terms*— congestion, questionnaire survey, School bus, traffic.***

## I. INTRODUCTION

School traffic congestion is a source of nuisance for students, school staff, and residents in and around schools. Dhaka is not free from this problem so as the Dhanmondi Area. Residents have to leave home very early, sometimes even hours in advance, to be on time for their appointments. Additionally, the excessive noise, heat, and air pollution generated by vehicles deteriorates the quality of living. Significant portion of those vehicles is parents' dropping off and picking up their children from school. The rate of increase in car transportation of children to school has been significant, often creating serious traffic congestion problems [6]. Other factors include changes in school purposes and populations, new school construction, the addition or elimination of busing, and the overall physical infrastructure, street layout, and traffic signs and signals surrounding a school. Most of the schools do not have an established school bus system, and since they all follow the same schedule, the roadways are consistently gridlocked with commuters during peak hours [3].

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## II. STUDY AREA

The study zone consists of schools in Dhanmondi and adjacent areas. Major schools are Dhanmondi Government Boys' High School, Government Laboratory High School, Oxford international school and Mastermind school. The area is facing the most severe congestion during starting and ending period of schools. The study area is mainly encircled by two major roads- Mirpur road and Satmasjid road and two link roads-Dhanmondi road-2 and Asad Avenue road.

## III. DATA COLLECTION METHOD

Cross sectional questionnaire survey was used to collect data. This method is more practical. Proper data analysis requires large amount of data from school student. And only questionnaire survey can provide large amounts of information from a large number of students in a short period of time and in a relatively cost effective way [5]. Close ended questions were used for survey. It is easier and quicker for respondents to answer. School going student are not that much mature. Open end question may sometime create difficulty for them to response in a proper way. The response choices can clarify question meaning for respondents. Even primary level student can easily answer close end questionnaire whereas open end questionnaire might not be properly answered by a primary level student.

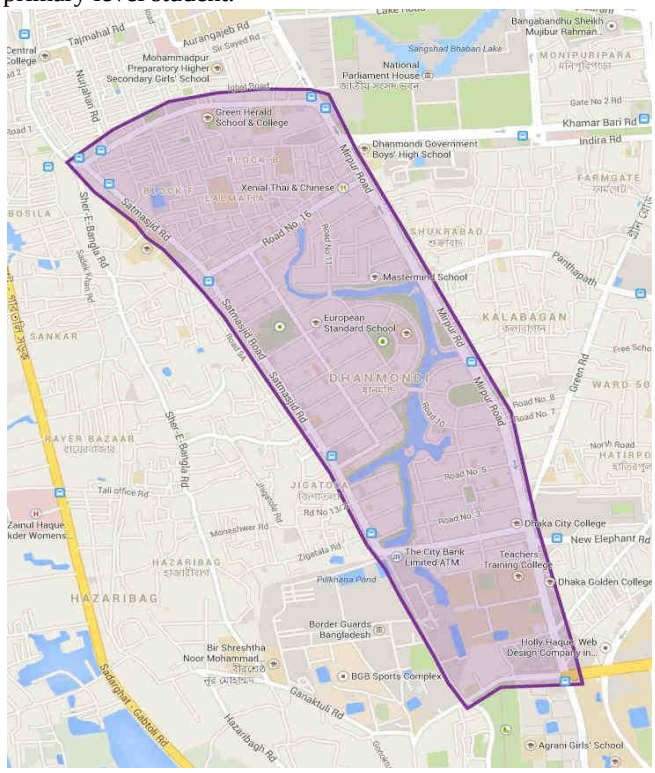


**Fig-1**: **Study Area**



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**Fig-2: Location of schools**

### A. *Pilot Survey*

In this phase of conducting a survey, the questionnaire is administered to a percentage of the total sample population, or in more informal cases just to a convenience sample. Pilot is actually a questionnaire pretesting. After the preparation of questionnaire, a pilot was also conducted. The questionnaire was given to all of twenty school going student. The result obtained from pilot survey was satisfactory. So no further modification of questionnaire survey was required.

### B. *Pilot Survey*

After the preparation of questionnaire and successful pilot survey, sampling methods was selected. The target population of this thesis was all school students in Dhanmondi area. There are around 50 schools situated in Dhanmondi area. So the target population is very high. The schools were selected randomly keeping in mind that the sample schools cover the whole study area. Random sampling method, in some cases, judgment sampling method was used in this work. 10 schools were selected with 30 data from each school. So a total 300 data was collected. There are variations of age level among the school students. Giving equal weight to each class or age level would not give representative data. The total time duration of the survey was around 6 months, starting from May 5, 2014 to October 24, 2014. Data form all the questionnaire survey was grouped manually with hand tally. Then the grouped data was analyzed.

## IV. TRAVEL BEHAVIOR STUDY

Data show that Major portion of students comes from Dhanmondi, Mohammadpur, Kalabagan, Sukrabad and Mirpur area. A significant portion also comes from Sukrabad and Shantinagar.

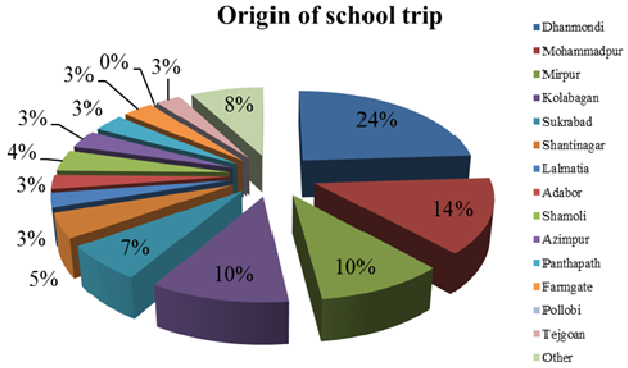


**Fig-3(a): Origin of school trip**

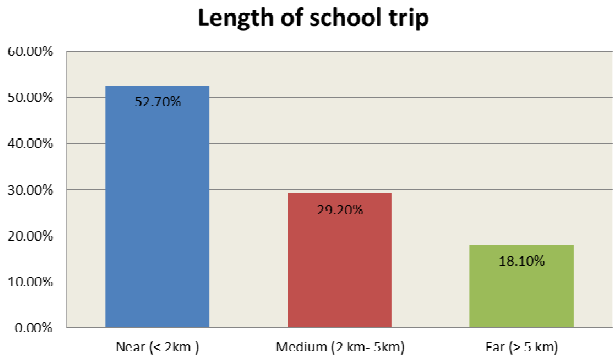


**Fig-3 (b): Length of school trip**

For better understanding of the origin, the data are then grouped into three categories near, medium and far. About 18% of the students come from distance greater than 5 km. A significant amount of the student coming from distance greater than 5 km is from Mirpur and adjacent area. Data also show that currently rickshaw, foot and private car are the three major modes of transportation used by the student to travel to and from school. Among these cars are mainly responsible for congestion in Dhanmondi area during starting and ending period of school. Most of the reputable schools in Dhanmondi charge tuition that only middle and upper-class families can afford, so it is likely that the majority of the students' families are affluent enough to own at least one car. Car uses larger amount of roadway width with minimum of occupancy [1].

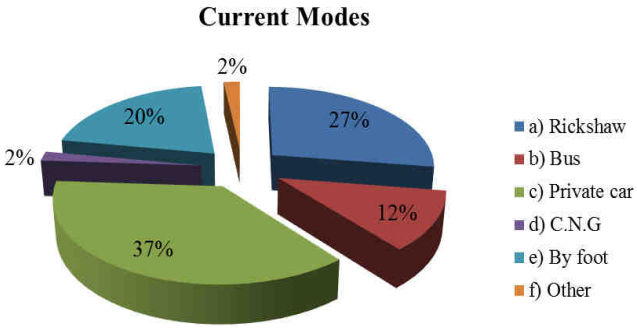


**Fig-4: Modal share of survey**



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If the use of car is discouraged through the introduction of school bus service than it would definitely relief a huge burden from the roadway which will ultimately reduce congestion in Dhanmondi and adjacent area. Another important observation is that a major portion of students travel school by foot. But the pedestrian facilities in the Dhanmondi area are not good enough. There are only three foot over bridges along Mirpur road and only one foot over bridges along Satmasjid road. Along the Mirpur road there are 15 side roads with no signal or sign at the intersection. This often creates serious safety hazards. The safety of students who walk to school can be ensured by introducing several walking bus in Dhanmondi and Mohammadpur area. Many countries in the world are now gaining benefits by introducing walking bus. So hopefully students of Dhanmondi as well as other areas in Dhaka city will get benefit if proper walking bus is introduced.

**Table I: Travel behavior study of students**

| | | | |
|---|---|---|---|
| Q1. Distance of originating place from school | Response | N | % |
| | Near (<2km) | 158 | 52.67% |
| | Medium (2-5km) | 88 | 29.33% |
| | Far (>5km) | 54 | 18% |
| Q2. Current Mode of Transport | Response | N | % |
| | Rickshaw | 89 | 27.73% |
| | Bus | 38 | 11.84% |
| | Private Car | 120 | 37.38% |
| | CNG | 6 | 1.87% |
| | By foot | 66 | 20.56% |
| | Others | 2 | 0.62% |
| Q3. Occupancy level of car | Response | N | % |
| | 1 | 94 | 31.33% |
| | more than 1 | 206 | 68.67% |
| Q4. Destitution of car after dropping student at school | Response | N | % |
| | Back to home | 162 | 54.00% |
| | Market | 4 | 1.33% |
| | Parents' Office | 90 | 30.00% |
| | Stay at school | 17 | 5.67% |
| | Other | 27 | 9.00% |
| Q5. Time required to reach school | Response | N | % |
| | 5-15min | 103 | 34.33% |
| | 15-25min | 87 | 29.00% |
| | 25-35min | 41 | 13.67% |
| | 35-45min | 28 | 9.33% |
| | 45-60min | 26 | 8.67% |
| | >1hr | 15 | 5.00% |
| Q6. Time required to return from school | Response | N | % |
| | 5-15min | 77 | 25.67% |
| | 15-25min | 99 | 33.00% |
| | 25-35min | 46 | 15.33% |
| | 35-45min | 27 | 9.00% |
| | 45-60min | 29 | 9.67% |
| | >1hr | 22 | 7.33% |
| Q7. Reason for not travel on School bus | Response | N | % |
| | Don't have any school bus in your route | 204 | 68.00% |
| | Expensive | 0 | 0.00% |
| | Service not good | 24 | 8.00% |
| | For safety reason | 18 | 6.00% |
| | Too much huddle | 14 | 4.67% |
| | Feel Travel Sickness | 2 | 0.67% |
| | Do not arrive/leave on time | 4 | 1.33% |
| | Other/do not answer | 34 | 11.33% |
| Q8. Amount of money student are willing to pay for school bus | Response | N | % |
| | 200-250 BDT | 137 | 45.67% |
| | 250-300 BDT | 69 | 23.00% |
| | 300-350 BDT | 26 | 8.67% |
| | 350-400 BDT | 5 | 1.67% |
| | 400-450 BDT | 3 | 1.00% |
| | Do not answer | 60 | 20.00% |

### *A. Effect of congestion on travel time*

Dhanmondi is a very busy area. Versatile land use pattern in Dhanmondi make it a congestion prone zone. Most of the schools start and end at some particular time. For morning shift, it is 8:00 AM to 12:00 AM and for day shift, the school time is 12:30 PM to 4:30 PM. As a result during those periods, Dhanmondi area faces highest congestion. So to minimize congestion in Dhanmondi area segregation of starting and ending time is necessary. If starting and ending period of schools are segregated according to their relative distance along the route then it would undoubtedly reduce congestion in Dhanmondi area. Segregation of starting and ending time is more compatible with School bus service. Again greater benefit would be attained if other land use patters like office time, peak marketing period etc. are considered.

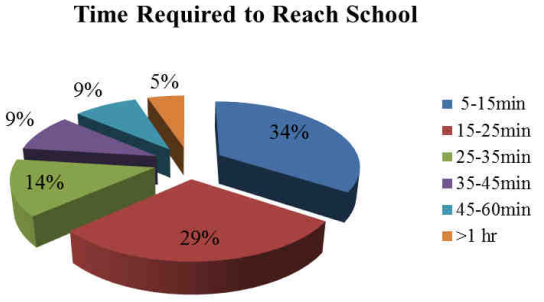


**Fig-5(a): Time required to return school**

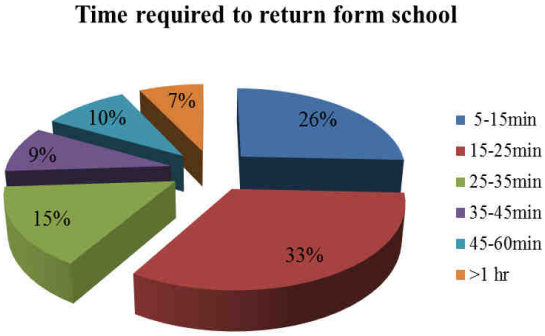


**Fig-5(b): Time required to return from school**

In the morning about 34% of students need 5-15 minutes to reach school, this percentage reducer to 26% when they return home. Again in the morning only 5% of students need more than 1 hour to reach school, this percentage increased to 7.33% when they return home. This indicates congestion is relatively less in the morning with respect to the noon.



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### B. Perception about School Bus

Five out of the ten schools we surveyed do not have any school bus. Again school buses are used by only a minor number of students. Several questions were asked to find out the reasons behind this. The main reason of student not using the school bus is that most of the schools do not have any school bus in their route. Another reason is that they think the service of school bus is not good enough. Other reasons are school buses are too much crowded, school buses are not safe enough and bus do not arrive or leave in time.

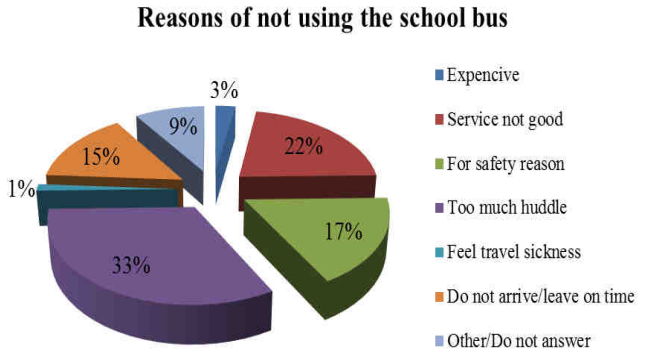


**Fig-6: Reason of not using school bus**

Based on the above observation it can be predicted that if proper routes are selected and adequate no of school buses with improved facilities are provided, than a large number of students who are now using other modes will be shifted to school bus. Another important observation is that very minor portion think thinks school bus is expensive. From this observation it can be said that fair is not a problem. If proper service is provided students are going to use it even after increasing the fare. Fare is not a reason behind the unwillingness of student to travel on school bus. Several questions were asked to know about the perception of students regarding the fare of the bus. Students are more likely to tick the option which contains lowest fare. When questionnaire was prepared this factor is considered. In the questionnaire, option which contains lowest fare has a minimum marginal value. This value is 200tk per kilometer per month. And data shows that about 80% of the student agrees to pay this amount. This value was selected considering the present fuel cost, maintenance cost, wage of drivers and some other related costs. Most of the students agreed to pay at least 200tk-350tk per kilometer per month. So if fare is selected within this range then hopefully school bus service will gain popularity and attract more students which ultimately reduce congestion.

### C. Perception about Facilities of School Bus

In the questionnaire students were asked about some facilities that they want in their school bus. These facilities are less time, door to door pick up, affordable price, recreational facilities and air condition. Students were then asked to mark these facilities among unimportant, important and very important rating. Most of the students think that 'Less time' is very important. In fact these facilities cannot be provided if the roads along the routes they are currently using are not free of congestion. Student should be persuaded that if they use the school bus then the roads will be congestion free and they will get these facilities by default. Students think 'Door-to-door pickup' is important. But providing this facility is a difficult task. Students think 'Affordable price' is very important. Recreational facilities in the school are not that much important to them. A major portion of student thinks 'Recreational facilities' is unimportant. Major portion of student think 'air condition' is very important.

**Table II: Perception about facilities of school bus**

| | Response | Unimportant | Important | Very important |
|---|---|---|---|---|
| Q1. Less time | N | 13 | 74 | 213 |
| | % | 4.33% | 24.67% | 71.00% |
| Q2. Door to door pick up | N | 29 | 154 | 117 |
| | % | 9.67% | 51.33% | 39.00% |
| Q3. Affordable price | N | 17 | 117 | 166 |
| | % | 5.67% | 39.00% | 55.33% |
| Q4. Recreational facilities | N | 138 | 93 | 67 |
| | % | 46.00% | 31.00% | 22.33% |
| Q5. Air condition | N | 40 | 114 | 146 |
| | % | 13.33% | 38.00% | 48.67% |

### D. Safety Issues

In the questionnaire students are asked about whether they face any kind of accident during their travel to and from school or not. A significant amount of students responded to yes. Large percentage of travel modes of students are rickshaw and foot. So this data indirectly indicates these two modes are not safe enough. Reason behind this high frequency of accident is because most of the road in Dhaka city does not have adequate facilities for the pedestrian and non-motorized vehicle. There are only three foot over bridges along Mirpur road and only one foot over bridges along Satmasjid road. Along the Mirpur road there are 15 side roads with no signal or sign at the intersection. In the questionnaire students were asked about their safety of their current mode. A significant portion of students responded to no. 221 out of 300 student think current mode is not safe.

**Table III: Safety issues related to school bound travel**

| | Response | Yes | No |
|---|---|---|---|
| Q1. Face accident during travel | N | 86 | 214 |
| | % | 28.67 | 71.33 |
| Q2. Is your current mode safe | N | 221 | 79 |
| | % | 73.67 | 26.33 |

### E. Facilities to Improve Safety of School Bus

In the questionnaire students were asked about some facilities that they want in their school bus to improve the safety. These facilities are-Presence of parents in school bus, Presence of teacher in school bus, Mobile facilities to contact with parents, Bus lay-by, Dedicated bus for each school and GPS tracking system. Students were then asked to mark these facilities among unimportant, important and very important rating. Significant portion of the student thinks mobile facilities, GPS tracking, bus lay-by along route are very important to improve safety of school bus.



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**Table IV: Perception about facilities for safety of school bus**

| | Response | Unimportant | Important | Very Important |
|---|---|---|---|---|
| Q1. Presence of parents in school bus | N | 249 | 39 | 12 |
| | % | 83.00% | 13.00% | 4.00% |
| Q2. Presence of teacher in school bus | N | 87 | 149 | 64 |
| | % | 29.00% | 49.67% | 21.33% |
| Q3. Mobile facilities to contact with parents | N | 23 | 121 | 156 |
| | % | 7.67% | 40.33% | 52.00% |
| Q4. Bus lay-by | N | 56 | 121 | 123 |
| | % | 18.67% | 40.33% | 41.00% |
| Q5. Dedicated bus for each school | N | 22 | 119 | 159 |
| | % | 7.33% | 39.67% | 53.00% |
| Q6. GPS tracking | N | 49 | 151 | 100 |
| | % | 16.33% | 50.33% | 33.33% |

## V. OPPORTUNITIES OF SCHOOL BUS

All the analysis in the previous section indicates that car is the main reason of congestion in Dhanmondi area. So if use of car is discouraged through introducing proper school bus service along with other public bus service than it would definitely reduce congestions in Dhanmondi area. In the questionnaire the last question was – if proper school bus service is introduce would you travel on it. And the feedback was outstanding. Most of the student agrees to use bus instead of car if proper bus service is provided. About 80% of students will use the school bus if proper bus service is introduced.

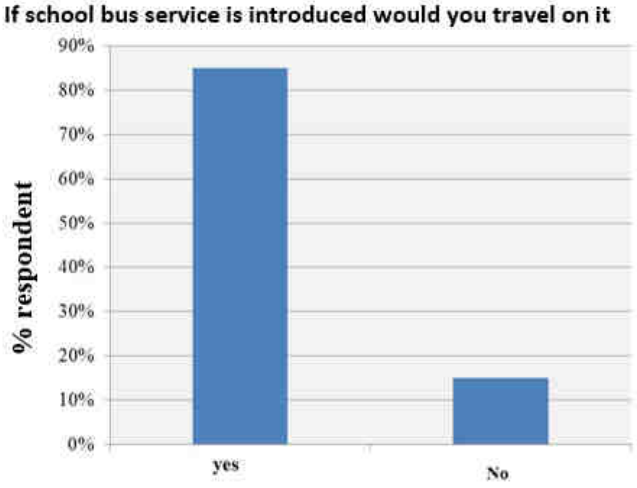


**Fig-7: Students' feedback about school bus service**

### *A. School Bus Route*

A significant amount (18%) of student comes from a distance greater than five kilometer. This is termed as far. Among the students coming from far distance come from two major places –a) Mirpur and adjacent area b) Shantinagar and adjacent area. Most of the students have their residence along some particular route. Routes are to be selected in such a way that student coming from medium or near distance can also have easy access to the school bus. Frequent bus stops will create unnecessary delay. So a particular distance between two bus stops should be provided. Based on the analysis number of feasible bus routes can be recommended. Bus stops at every 1 km outside Dhanmondi area and every 0.5 km inside Dhanmondi area can be selected [2].

## VI. CONCLUSIONS

The research deals with the effect of school bus service on congestion reduction and safety. Major portion of students who are coming from a distance greater than 5 km, are from Mirpur and adjacent areas. Significant amount of students use car to travel to and from school. Only a few students use public bus. Significant amount of students also use foot. On an average 20% of student travels to and from school by foot. Car is the main reason of congestion around the schools in Dhanmondi. Occupancy of most of the car that travel to school is one. Congestion near school is greater in noon with respect to morning. Most of the schools do not have school bus system. Students do not use bus mainly due to too much huddle in the bus, Service not good and safety reasons. 80% of students agree to pay at least 200tk per kilometer per month if proper school bus service is introduced. 26% of students think that there current mode is not safe. About 80% of students agree to use the school bus if proper service and improved safety is provided. Minimum possible travel time, door-to-door pick up and air conditions can attract students into the school bus. Mobile facilities to contact with parents, Bus lay-by and GPS tracking can be added as safety facilities into the school bus. Separate bus for each school will be beneficial.

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