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**Purpose.** This study was conducted to obtain the characteristics of respondents and travel modes that are still dominated among private vehicle users. **Methodology.** This analysis was done using Microsoft excel and SPSS Ver. 25 for Windows. **Findings.** The results showed that the factors affecting the use of transportation modes for students journeys at one time to and from school are as follows: a) sex (X1), b) age (X2), c) monthly pocket money (X3), d) distance (X6), e) long trips departure (X7), f) leave travel expenses (X8), g) the frequency of the return trip (X10), h) the distance of the return trip (X11), i) the long way home (X12) and j) the cost for going home (X13). The opportunity of providing school bus may get good responses because the students would prefer to choose a mass transportation integrated with the school and giving good service, safety, less cost and its affectivity. In fact, it is not only in pedestrian offenders who have close travel distance and short-time travel of leaving for school and back home. **Originality.** There have been many studies discussing public transportation. However, this study limits only in discussing the use of school bus regarding students' transport modes. **Practical value.** Generally, this study contributes positive outputs in some aspects, such as: economics, management and safety. Indeed, the existence of school bus will help students who have some difficulties, including distance, economical problem and so on.

*Keywords:* transport modes; characteristic of travel; school bus plan; public service; data processing

**Introduction**

With a growing population resulted in an increasing number of transport movements, it is interesting to do further research on the behavior of an undertaken journey. Hence, this study will discuss the movement's intention in the world of education, especially the use of transport modes. Nowadays, a lot of researches on transportation have been done. Students have a variety of trips using the mode of transportation and it is used as a part of college activity [1].

The characteristics of a journey undertaken by university students are very important to be an issue of the research because it can affect the performance improvement of roads, especially in the city of Palembang in a particular time. This will become an issue in the future if no solution was carried out. Government efforts were to regulate the movement of university students in education in Palembang, like students' clustering in the area surrounding the neighborhood, but they were not

very effective in solving the problem for the long term, because still many students use private vehicles as a means to and from school. Moreover, students currently have started to travel more independently.

Then, students currently begin to experience changes in their activity as a stand-alone activity other than the fulfillment of educational activities [2]. Therefore, there exist needs to be another attempt to suppress the student movement as the availability of school buses which helps students to undertake the learning activities should be supported by good accessibility. The ease of getting transportation is to facilitate university students in traveling to and from school [3]. However, one should take into consideration factors in the environment that such as socio-economic factors related to the characteristics of the trip and the use and accessibility mode will be examined as long as you want to plan an adequate mass transportation like bus.

In the connection with this study, the presence of State Senior High School (SMA Negeri) 10 Palembang located on the road Sriyaya country has diverse student residence and creates the need for increased mobility of modes transportation to and from school. It needs a deep research on the journey undertaken by students by means of surveying directly using interview techniques in the form of a questionnaire distributed to the students as the object of study. It is done to obtain the characteristics of user behavior mode of students' travel at SMAN 10 Palembang, factors that affect the perceptions of students when bus transportation is provided for students at SMAN 10 Palembang.

The purposes of this study are as follows: a) to obtain characteristics of respondents and transportation mode of students in SMAN 10 Palembang, b) to identify the factors that affect the modes of transportation on students of SMAN 10 Palembang, and c) to identify the perception of students at SMAN 10 Palembang of the school bus plan.

In addition, Agustien (2015) observed the scheduling time over working time in the city of Palembang whose respondents are workers with fixed working hours and activities such as shopping activities, social activities and entertainment. The observed activity time schedule is divided into three time periods *before*, *at work* and *after work*. The analysis was performed using questionnaire formed by the stated preference method assuming a combination of changes in travel time. The results showed that the utility of the activity is influenced by the types of undertaken activities [4].

According to a research of Tri Basuki Joewono et al. (2014), there is a difference in motorcycles and cars in terms of distance and travel time. The decision of choosing transport modes was influenced by sex, time, and frequency. As the frequency of travel and financial capability affect the time on trips of the students.

According to Juliane Stark who examined the travel patterns of four high school students in Austria and Germany, discovered that their mobility behavior is analyzed by looking at the diary of a journey undertaken to obtain the travel characteristics of the mode by Structural Equation Modeling (SEM) and nonlinear binary response variables to assess the effect of factors on the choice of travel mode. The results showed that the capital selection

of children was affected by the length of the trip and the quality of service of motorized modes [5].

The system model representing a person's activity and associated travel as patterns of activity goes beyond one trip. The ride was set as the movement patterns of students' home to one or more locations of activities and back home again. The research results obtained time, travel destinations, travel models are influenced by patterns of activity, whereas the activity itself influenced maximum utility pattern of travel alternatives available [6].

Samira Dibaj et al. (2016) showed different statistical analyses adjusted for data survey; data includes demographic characteristics and travel. In addition to the descriptive analysis of the data, the Poisson regression model and linear regression model have been developed in a number of student activities within a day. Because AUT located in the CBD area of Tehran and for two different traffic restrictions for private cars in this area, this study confirms that walking and public transport are the dominant mode among students AUT and only 4% of students use private cars. The model suggests that off-campus students were more likely to have a lot of activities compared to the students on campus [7].

This study will be limited to conduct research for the correspondent for whom the use of school bus transportation modes is planned, namely tenth grade and eleventh grade students of SMA Negeri 10 Palembang. The identification of problems was seen from the situation and condition which was then used as the questionnaire. The survey results will be used in obtaining the descriptive characteristics of the mode of transportation for students of SMA Negeri 10 Palembang on school days and hours. The user behavior of students in terms of travel modes includes statistical characteristics of travel and the movement of students at SMAN 10 Palembang to school and from school. The data obtained will be analyzed using Ms. Excel with the help of SPSS Ver. 25 for windows.

### Mode of Transportation

The definition of the mode of transportation is a transport that gives mobility for the object to a certain movement. While public transport is a mean to help the transport of people or a group of

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people together. Transport can also be used as a means of delivery from the origin place to the desired destination area.

According to the classification, shuttles are divided into two, namely:

#### 1. Public Transportation.

Definition of public transport according to Law No. 14 of 1992, freight traffic on the road, chapters 25 and 26, states the user is charged a transport fee due to the services used for private purposes. On the concept of public transportation, not all society have personal transportation to support daily activities, thus the government provides public transport as the form of their public policy [8].

#### 2. Personal Transport.

Personal transportation is a privately owned transport. In private mode, the owners can freely determine the nature of traveling and the tracks themselves [9]. On daily activities, the use of private transport modes is exploited. This is caused by several factors including the main factors related to the driver's personal modes such as comfort, security, flexibility, and others.

### Factors affecting Mode Selection

According to Tamin (2000), the factors affecting the choice of transportation mode can be grouped into four categories [10]:

#### 1. Characteristics of Road Users.

On the road, the users' characteristics greatly influence the modal choice such as availability or personal vehicles, household structure, income,

and factors including other factors such as mandatory use of personal modes of the motor to the institute of education/school and pick-up purposes.

#### 2. Feature Movement.

The movement as the timing of the movement, the movement destination, a travel distance to the destination becomes factors affecting modal choice.

#### 3. Feature Facility Transportation Modes.

It can be grouped into two categories, as follows:

- Quantitative factors such as travel time, transportation costs (fares, fuel, and other costs).

- Qualitative factors are quite difficult to quantify include comfort, safety, reliability, regularity, and others.

#### 4. Feature town or zone.

It means that the distance from a zone or downtown population density can affect the modal choice. Therefore, a good model of modal choice must consider all these factors. It can be said that of all models of modal choice, the selection of independent variables used are very dependent on the person who chooses the model along with the type of model used and the purpose of the movement itself.

So, all the influential factors in the choice of transport mode and an understanding of how the factors influence one other can be illustrated in the figure 1 below.

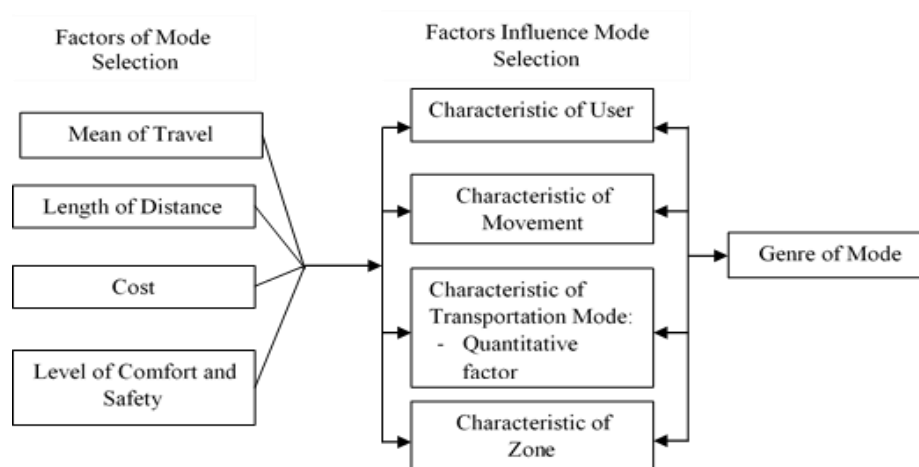


Fig 1. The Factors of Determining Transport Mode

Based on the figure displayed above, the instigator of a trip in the transportation planning process is analogously depicted as people who choose to conduct movable and immovable activities. If the movable activity is selected, then people will decide the transport modes or keep moving on foot. When the user selects the mode, the user is required to choose between two options namely, private transport or public transport.

### Methodology

This research uses descriptive quantitative approach. To determine the amount of data surveyed, the first step is done using SPSS Ver. 25 for windows as a descriptive statistical analysis. The next stage determining the characteristics of the user modes with different variables will be analyzed by means of cross-tabulation (crosstab).

The chi-square is applied to determine whether there is or not a variable attachment relationship between the X variable (dependent) and Y (independent) [11]. The calculating value of chi-square that is obtained from the data analysis will be compared with chi-square value tables that have become consensus whether the dependent variable affects the other existing variables.

To know how significant the dependent variables to independent variables, they should meet the significance value (probability). After that, the comparison of those variables will show whether the probability value obtained from the results of data analysis using SPSS Ver. 25 for windows senses significantly to the existing provisions of probability value. In the significance, the test uses variables value with confidence level  $> 95\%$ . In other words, the significance value is  $< 0.05$ . If in an equation that one of variables has a significant value greater than  $0.05$ , the equation cannot be used.

In this study, chi-square analysis serves as a statistical technique used to obtain the factors that influence the use of student travel mode of SMA Negeri 10 Palembang. To test data using a list of questions or a questionnaire in this study is an indicator of the perception of students at SMAN 10 Palembang in analyzing the chances of student bus plan. It is necessary to validate reliability testing on the item such questionnaire, so it can determine if the survey form is feasible and can be used

in analyzing the perception of students on school bus opportunities based on the use of modes of transportation.

### Results and Discussion. Testing Crosstab

The test is performed in order to analyze the effect of reliance free variable with the dependent variable. The dependent variable in this study is the mode of transportation used by students of SMAN 10 Palembang in travel. The independent variables are gender, age, pocket money per month, settlement/residence, frequency of trips departure, distance of trips departure, long trips departure, travel expenses departure, activity trips departure, the frequency of the return trip, the distance the return journey, a long journey home, the cost of the return trip, and the activities of the return journey. This stage will be analyzed using SPSS Ver. 25, and the data will be processed by cross-tabulation or crosstab to view dependency to obtain the effect of variables.

### Chi-Square Analysis of Mode Usage

The analysis in this research is the analysis of Chi-Square. This analysis is used to find the relationship testing modes of transportation used by SMA Negeri 10 Palembang students at a time to and from school with the independent variables obtained by performing the alignment test whether the observed variables are in accordance with the conditions set. The following table analyzes Chi-Square test variable dependency-free with the dependent variable that can be seen chi-square value in the table 1 below.

With the initial hypothesis ( $H_0$ ) considered that each independent variable (independent variable) is considered to have no effect on the dependent variable (dependent variable), and based on the test results by comparing the calculating chi-square and chi-square table, it can be seen that the initial hypothesis ( $H_0$ ) for the variable consists of gender, age, monthly pocket money, settlement/residence, frequency of trips departure, distance of trips departure, long trips departure, travel expenses departure, activity trips departure, the frequency of the return trip, the distance the return journey, a long journey home, travel costs home, and the activities of the return journey. Thus, these variables of sex ( $H_1$ ), age ( $H_2$ ), monthly pocket money ( $H_3$ ), dis-

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tance of trips departure ( $H_6$ ), long trips departure ( $H_7$ ), travel expenses departure ( $H_8$ ), the frequency of the return trip ( $H_{10}$ ), the distance of the return trip ( $H_{11}$ ), the long way home ( $H_{12}$ ), the cost of the return trip ( $H_{13}$ ) is rejected. It means that these variables affect the variable use of modes of transport trips to school and back home carried out by students of SMAN 10 Palembang.

Table 1

## Variable Value of Mode

Variable	Chi Square (Calculate)	Chi Square (Table)	Means of Conclusion
Sex ( $X_1$ )	13.233	7.81	$H_0$ rejected
Age ( $X_2$ )	29.896	21.03	$H_0$ rejected
Monthly Pocket Money ( $X_3$ )	62.601	12.59	$H_0$ rejected
Settlement/Residence ( $X_4$ )	43.000	43.77	$H_0$ accepted
Frequency of Trip Departure ( $X_5$ )	4.046	7.81	$H_0$ accepted
Distance of Trip Departure ( $X_6$ )	24.458	21.03	$H_0$ rejected
Length of Trip Departure ( $X_7$ )	30.469	21.03	$H_0$ rejected
Travel Expenses Departure ( $X_8$ )	46.829	12.59	$H_0$ rejected
Activity of Trip Departure ( $X_9$ )	4.046	7.81	$H_0$ accepted
Frequency of Return Trip ( $X_{10}$ )	13.404	7.81	$H_0$ rejected
Distance of Return Journey ( $X_{11}$ )	29.443	16.92	$H_0$ rejected
Long Way Home ( $X_{12}$ )	38.155	21.03	$H_0$ rejected
Cost of Return Trip ( $X_{13}$ )	106.916	16.92	$H_0$ rejected
Activity of Return Trip ( $X_{14}$ )	14.850	21.03	$H_0$ accepted

Source: Primary Data

It can be seen by analyzing the calculation result that value of chi-square is greater than the value of chi-square table (chi-square test), and chi-square table  $\rightarrow H_0$  is rejected. It means that there is a relationship which may affect independent variables and the dependent variable, while the initial hypothesis ( $H_0$ ) for the variable «settlement/residence», «frequency of trips departure», «the activity of the trip departure», and «the activity of the return trip» was accepted. It means that those variables do not have influence of determining the transport modes.

### The Analysis of Significance Value of Mode Usage

After knowing the chi-square value based on the analysis results and provision chi-square table that has been set, the next step was observing the significant value variable (independent variable on the dependent variable) consisting of gender, age, pocket money per month, settlement/residence, frequency of trips departure, distance of trips departure, long trips departure, travel expenses departure, activity trips departure, the frequency of the return trip, the distance the return journey, a long journey home, the cost of the return trip, and the activities of the return trip on the use of modes of transport. In the process of analyzing the significance of value, cross-tabulation mode is used to the variable to be tested and to observe how the variable entanglement with the conditions is set. The following probability value analysis results obtained with SPSS for Windows version 25, and which has a consensus that can be seen in Table 2 below.

At Table 2, it can be seen that the results of the analysis of significant value are tested. It is known that if the value of the significance is below  $\alpha 0.05$ , the studied variables are said significant, but if the value of the significance is above  $\alpha 0.05$ , the studies variables are not significant. Based on the test, it shows that the variables of gender, age, pocket money per month, the traveling distance set off, long trips departure, travel expenses set out, the frequency of the return trip, the distance the return journey, a long journey home and the cost of the return trip is a variable having a significant value that can influence the behavior of the mode of travel used by students of SMAN 10 Palembang to

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see the standard of provision of significance  $\alpha$  value 0.05 which is smaller than the value obtained from the analysis.

Table 2

**Significant Value of Variables**

Variable	$\alpha$	Probability	Note
Sex ( $X_1$ )	0.004	0.05	Significant
Age ( $X_2$ )	0.003	0.05	Significant
Monthly Pocket Money ( $X_3$ )	0.000	0.05	Significant
Settlement/Residence ( $X_4$ )	0.059	0.05	Not Significant
Frequency of Trip Departure ( $X_5$ )	0.257	0.05	Not Significant
Distance of Trip Departure ( $X_6$ )	0.018	0.05	Significant
Length of Trip Departure ( $X_7$ )	0.002	0.05	Significant
Travel Expenses Departure ( $X_8$ )	0.000	0.05	Significant
Activity of Trip Departure ( $X_9$ )	0.257	0.05	Not Significant
Frequency of Return Trip ( $X_{10}$ )	0.004	0.05	Significant
Distance of Return Journey ( $X_{11}$ )	0.001	0.05	Significant
Long Way Home ( $X_{12}$ )	0.000	0.05	Significant
Cost of Return Trip ( $X_{13}$ )	0.000	0.05	Significant
Activity of Return Trip ( $X_{14}$ )	0.250	0.05	Not Significant

Source: Primary Data

Besides, it indicates that  $\alpha 0.05 >$  is the significance value obtained, the  $H_0$  is rejected. It means that between independent variables and the de-

pendent variable there is a correlation or influence. While variable residence, frequency of trips departure, travel activity to school and return home activity have no correlation or influence on the travel behavior of the student mode. It indicates that the test analysis results significant value greater than the standard provisions exist  $\alpha$  significance value of 0.05, so that indicates  $H_0$  has no correlation or influence on independent variables with the dependent variable. The frequency of trips departure, travel activity to school and return home activity have no correlation or influence on the travel behavior of students' mode.

The test analysis results showed that significant value is greater than the standard provisions of significance value that has been set which was  $\alpha 0.05$ . Therefore, it indicates  $H_0$  has no attachment or influence of independent variables with the dependent variable. The frequency of trips departure, travel activity goes to school and return home activity have no attachment or influence on the travel behavior of the students' mode.

### Opportunity Selection Student Bus Transportation

Based on the data summarized and analyzed to determine service and facilities of students' bus, the following ratings desired service of students transport mode was being simulated to utilize bus as mode of students' behavior at SMA Negeri 10 Palembang can be seen in Table 3 below.

The table above showed those students whose trip to and from school by public transport have bigger possibility of utilizing the school bus existence. The average value is known in the public transport modes by 4.73%. It indicates that respondents whose daily travels to school use public transport enable the transition to the school bus, while the smallest of the average value is the use of the car and pedestrians at 3.66. It shows the lack of the respondents' interest to use the school bus. The school bus that cannot accommodate the students' various need, especially those whose way home and to school is by cars influence their desire not to pick school bus. However, comfort, safety, cost, time travel and school schedule become the most influential factor variables that make students pick the school bus.

Table 3

**The Assessment of Respondents toward Services and Facilities Based on the Transport Modes**

Items of Variable	Score				Average
	Car	Motor-cycle	Public Transportation	Pedestrian	
The Service of School Bus	3.81	4.12	4.77	4.10	4.20
The Transition of School Bus	3.06	3.65	4.95	3.87	3.88
Travel time of School Bus	3.63	3.88	4.41	4.00	3.98
Schedule of School Bus	3.25	3.62	4.05	3.83	3.65
Cost of School Bus	3.94	4.24	5.00	3.7	4.22
Passenger's Safety	4.00	4.59	5.00	3.93	4.38
Passenger's Comfort	4.00	4.68	5.00	3.88	4.39
Average	3.66	4.11	4.73	3.92	

Source: Primary Data

**Originality and Practical Value**

There have been many studies discussing public transportation. However, this study limits only in discussing the use of school bus regarding students' transport modes. Generally, this study contributes positive outputs in some aspects, such as: economic, management and safety. Indeed, the existence of school bus will help students who have some difficulties, including distance, economical problem and so on.

**Conclusions**

Based on the survey conducted and the results of data processing, it has been identified that the characteristics of respondents are dominated by motorcycles users with 46.7% female, 32% were aged 16 years, 43.7% have monthly pocket money of <IDR. 750.000, – and 49.3% reside in the district of Ilir Barat 1. While the characteristics of trip to school and return home is dominated by the motorcycle at a leaving distance of 58.7% and return for 55.3% in the range of the travel distance of 0.1 to 4 kilometers, travel time of leaving for is 41% and 35.7% for returning home in the range of travel time 2-10 minutes, the cost of leaving for is 67.67% and a 58.3% return in the range of IDR 0–4000, and frequency of activity to school 71.7% and 64% return to home indicates that the most travel activity is simple trip without a stop other than the place of destination.

The factors that affect the use of modes of transport for students journeys at one time to and from school are as follows: a) sexes (X1), b) age (X2), c) monthly pocket money (X3), d) distance of trips departure (X6), e) long trips departure (X7), f) leave travel expenses (X8), g) the frequency of the return trip (X10), h) the distance of the return trip (X11), i) the long way home (X12) and j) cost journey home (X13).

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## АНАЛІЗ ОСОБЛИВОСТЕЙ ПОЇЗДОК УЧНІВ І МОЖЛИВОСТІ ЗДІЙСНЕННЯ ШКІЛЬНОГО АВТОБУСНОГО ПЕРЕВЕЗЕННЯ

**Мета.** Це дослідження було проведено з метою отримання показників респондентів (переважно серед приватних користувачів транспортних засобів) щодо способів їх пересування. **Методика.** Аналіз був виконаний з використанням Microsoft Excel і SPSS версії 25 для Windows. **Результати.** Отримані результати показали, що фактори, які впливають на використання видів транспорту для поїздок учнів в один час у школу й зі школи, такі: а) стать (X1); б) вік (X2); в) щомісячні кишенькові гроші (X3); г) відстань (X6); д) відправлення в далекі поїздки (X7); е) витрати на відрядження (X8); ж) частота зворотного рейсу (X10); з) відстань зворотного рейсу (X11); і) довгий шлях додому (X12) і к) вартість поїздки додому (X13). Можливість надання шкільного автобуса може отримати хороші відгуки, тому що учні вважатимуть за краще вибрати громадський транспорт, який інтегрований зі школою, гарантує якісне обслуговування, безпеку, меншу вартість і ефективність. Фактично це не стосується учнів, які проживають поблизу школи і можуть добиратися пішки, оскільки їхні поїздки в школу і назад додому є короткочасними. **Наукова новизна.** Було проведено багато досліджень з обговорення роботи громадського транспорту. Проте це дослідження обмежується лише розглядом можливості використання шкільного автобуса як транспортного засобу учнів. **Практична значимість.** Як правило, це дослідження дає позитивні результати в таких аспектах як економіка, управління й безпека. Насправді наявність шкільного автобуса допоможе учням, які мають труднощі з відстанню, обмежені в кишенькових грошах тощо.

Ключові слова: види транспорту; характеристика поїздок; план шкільного автобуса; громадська служба; обробка даних



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## АНАЛИЗ ОСОБЕННОСТЕЙ ПЕЗДКОК УЧЕНИКОВ И ВОЗМОЖНОСТИ ОСУЩЕСТВЛЕНИЯ ШКОЛЬНЫХ АВТОБУСНЫХ ПЕРЕВОЗОК

**Цель.** Это исследование было проведено с целью получения показателей респондентов (преимущественно среди частных пользователей транспортных средств) по поводу способов их передвижения. **Методика.** Анализ был выполнен с использованием Microsoft Excel и SPSS версии 25 для Windows. **Результаты.** Полученные результаты показали, что факторы, влияющие на использование видов транспорта для поездок учащихся в одно время в школу и из школы, таковы: а) пол (X1); б) возраст (X2); в) ежемесячные карманные деньги (X3); г) расстояние (X6); д) отправления в дальние поездки (X7); е) командировочные расходы (X8); ж) частота обратного рейса (X10); з) расстояние обратного рейса (X11); и) долгий путь домой (X12) и к) стоимость поездки домой (X13). Возможность предоставления школьного автобуса может получить хорошие отклики, потому что ученики предпочитают выбрать общественный транспорт, который интегрирован со школой, гарантирует качественное обслуживание, безопасность, меньшую стоимость и эффективность. Фактически это не касается учеников, которые проживают вблизи школы и могут добираться пешком, поскольку их поездки в школу и обратно домой являются кратковременными. **Научная новизна.** Было проведено много исследований по обсуждению работы общественного транспорта. Тем не менее это исследование ограничивается только рассмотрением возможности использования школьного автобуса в качестве транспортного средства учащихся. **Практическая значимость.** Как правило, это исследование дает положительные результаты в таких аспектах как экономика, управление и безопасность. В действительности наличие школьного автобуса поможет учащимся, которые имеют трудности с расстоянием, ограничены в карманных деньгах и т. под.

**Ключевые слова:** виды транспорта; характеристика поездок; план школьного автобуса; общественная служба; обработка данных

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ІНФОРМАЦІЙНО-КОМУНІКАЦІЙНІ ТЕХНОЛОГІЇ ТА МАТЕМАТИЧНЕ МОДЕЛЮВАННЯ

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Received: Feb. 22, 2019

Accepted: July 01, 2019