ASSESSMENT OF ECO-DRIVING CONCEPPTS WITHIN UMP COMMUNITY

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ASSESSMENT OF ECO-DRIVING CONCEPTS WITHIN UMP COMMUNITY

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This thesis is submitted in partial fulfilment of the requirement
for the award of the degree of
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Dedicated especially to my beloved Father, Mother, Siblings, Lecturers, Friends and the ones who give me inspiration and support that made this work possible.

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ABSTRACT

Increased road transportation activities have resulted in increased burden on the environment. In particular, transportation generate pollution in the form of greenhouse gases associated with global warming. Eco-driving is the concept used to reduce fuel consumption, greenhouse gas emission and crash rates. This study was concerned on the assessment of eco-driving concepts within UMP community. The study aimed on to determine the understanding of eco-driving and how far UMP drivers adopt the eco-driving concepts. This study limits its study area to University Malaysia Pahang Campus Gambang. Based on the study, data for understanding of eco-driving, practicing of eco-driving and how often they practicing eco-driving in their journey were obtained from 240 participants at University Malaysia Pahang Campus Gambang. Results shows that a majority of UMP community understood about eco-driving concepts but there is a few number of participants still do not understand about eco-driving concepts where most of them are students. This is because the information about eco-driving is not fully conveyed to the students. Study concluded that 80% of UMP communities understood about the eco-driving and 162 of respondents out of 240 they do not ready to adopt the eco-driving concepts in their journey.

Keywords: Eco-driving, Greenhouse Gases, Understanding, Practicing, UMP Community

ABSTRAK

Aktiviti pengangkutan jalan raya meningkat telah menyebabkan peningkatan beban kepada alam sekitar. Khususnya, pengangkutan menghasilkan pencemaran dalam bentuk gas rumah hijau dikaitkan dengan pemanasan global. Eco-memandu adalah konsep yang digunakan untuk mengurangkan penggunaan bahan api, pelepasan gas rumah hijau dan kadar kemalangan. Kajian ini adalah berkenaan mengenai penilaian konsep eko-memandu dalam masyarakat UMP. Kajian ini bertujuan untuk menentukan pada pemahaman eko-memandu dan sejauh mana pemandu UMP mengamalkan konsep eko-memandu. Kajian ini menghadkan kawasan kajian kepada Universiti Malaysia Pahang Kampus Gambang. Berdasarkan kajian ini, data untuk memahami eko-memandu, mengamalkan eko-memandu dan berapa kerap mereka mengamalkan eko-memandu dalam perjalanan mereka diperolehi daripada 240 peserta di Universiti Malaysia Pahang Kampus Gambang. Keputusan menunjukkan bahawa majoriti masyarakat UMP memahami mengenai konsep eko-memandu tetapi terdapat beberapa beberapa peserta masih tidak faham tentang konsep-konsep eko-memandu di mana kebanyakan daripada mereka adalah pelajar. Ini kerana maklumat mengenai eko-memandu tidak disampaikan sepenuhnya kepada pelajar. Kesimpulan dari kajian menunjukkan bahawa 80% daripada masyarakat UMP difahami tentang eko-memandu dan 162 responden daripada 240 mereka tidak bersedia untuk menerima pakai konsep eko-memandu dalam perjalanan mereka.

Kata kunci: Eco-memandu, Gas Rumah Hijau, Memahami, Beramal, BUMP Komuniti

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LIST OF ABBREVIATIONS

UMP	University Malaysia Pahang
CO_2	Carbon Dioxide
GHG	Greenhouse Gas
IEA	International Energy Agency
UK	United kingdom
US	United States
SPSS	Statically Package Social Science

CHAPTER 1

INTRODUCTION

1.1 General

Eco-driving is the concept used to describe the less energy use of vehicles. It is a great and easy way to reduce fuel consumption, greenhouse gas emission and crash rates. Eco-driving provided so much benefits for drivers; reduction in transport emission, road crashes, motoring costs. Nowadays, the technology of engine cars has improved, where the most of the cars out with eco-driving mode which is help reduce the fuel consumption and emissions. Eco-driving represents as driving culture which make more suit to modern engines and providing more benefits to the environment, fuel cost saving as well as greater safety and comfort. The eco-driving helps to improve human driving skills which preventing sudden breaking and accelerating for non-reasonable (Sabooh, 2009). Most of the countries implement the eco-driving concept in their highway and transportation system to make free greenhouse effect besides having a steady traffic flow (ECOWILL, 2013).

1.2 Problem of Statement

In 21st century, environmental issues getting more serious in the society and contributor to climate change. The unwanted gases such as carbon dioxide (CO_2) and other greenhouse gas (GHG) still producing by motorize vehicle without limited. Hence, it makes the environment more to the critical stage. The drivers make the situation worst by modified their vehicles from the original specification.

It has been known for several decades that driving style and habits have an impact on fuel consumption. The type of eco-driving behavior falls into 3 categories; driving behaviors, trip planning and vehicle maintenance. These are the behavior most UMP drivers less concentrated on. The basic of eco-driving is a change of habit by drivers in order in drive in a manner that minimizes fuel consumption.

1.3 Objective

I. To determine drive's understanding on eco-driving concept and how far drivers adopt the eco-driving.

II. To identify how far UMP driver's ready to adopt the eco-driving concept.

1.4 Significant of Findings

Generally, this study is to find the understanding of eco-driving among drivers of which it carries its concept in reducing fuel usage and also reducing carbon dioxide emission. Furthermore, this study is also to find how far the drivers adopt the eco-driving in their traveling.

1.5 Scope of Study

This research limits its study area to university Malaysia Pahang Campus Gambang. It focusses to ump community in the campus among staff and students.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Over the years, numerous research literatures and studies have been conducted regarding the eco-driving benefits and importance of eco-driving in highway and transportation sector. This chapter discuss about implementation and evaluation of eco-driving program. It also includes discussion related to eco-driving as a function on transportation in pollution, crash rates and driver behavior pattern.

2.2 What is eco-driving?

Eco-driving encompasses driver behaviors, vehicle maintenance and non-driving actions to reduce fuel consumption and emission levels. Eco-driving is defined as a way of driving designed to reduce fuel consumption, greenhouse gas emissions and crash rates. In the words of one report: “Eco driving is about driving in a style suited to modern engine technology: smart, smooth and safe driving techniques that lead to average fuel savings of 5-10%.”(ECO-DRIVE, www.ecodrive.orn, 2012).

Driver behavior includes focusing on driving smoothly and always alert with traffic changes. Other driving strategies include shifting gears as early as possible to maximize fuel economy and avoiding hard braking and acceleration (Treatise, 2005). The driver should have regular vehicle maintenance, checking tyre pressures and car servicing

(Symmons, Rose 2001). Non-driving actions encompass reducing unnecessary idling and the use of peripherals such as air-conditioning, removing excess weight and optimizing the aerodynamic profile of the vehicle (Symmons, 2011). Timing of travel and mode shift to reduce vehicle kilometers travelled and the frequency of driving in congested traffic are also considered relevant eco-driving strategies (James, 2009).

2.3 Benefits of eco-driving

Eco-driving offers numerous benefits: It not only saves fuel and money, but it also improves road safety and the quality of the local and global environment. The most important personal and immediate benefit of eco-driving is the saving of fuel costs. Experience shows that eco-driving can help drivers save as much as 15 % of their regular fuel costs (Smit, 2012). Furthermore, eco-driving reduces the emission of greenhouse gases as well as local air pollution by reducing fuel consumption. Therefore, if eco-driving becomes the norm rather than the exception, it has the potential to significantly reduce emissions from road transport. Eco-driving is not only reducing the fuel costs, but also costs for maintenance and costs for repairing cars (Symmons, 2011). Eco-drivers cause less wear and tear on car parts (tyres, brakes and engine) and are less prone to accidents. Passengers of eco-drivers enjoy a more comfortable experience due to a smoother driving style (smooth use of the accelerator, steering, transmission and brakes). Benefits for both drivers and passengers also include increased safety on the roads and less noise generated (Rose, 2011). All the benefits mentioned can be achieved in equal or reduced travel time.

There are few researchers have been considered how to measure the benefits of eco-driving. Measuring the direct emissions of the vehicle fleet can be difficult given the variations in size, engine displacement and age of the fleet (Ian Jeffreys, 2012). Smit, Rose and Symmons examined the potential of using emissions modelling with simulators and direct measurement to understand the impact of eco- driving in the Australian context, using Australian drive cycles and replicating the types of vehicles in the Australian fleet. An alternative to direct emissions modelling is to measure the savings in fuel used. There is

a direct relationship between fuel consumption and carbon dioxide emissions. Eco-driving reduces carbon dioxide (CO_2) emissions by reducing the amount of fuel used for a given vehicle trip, thus reducing the emissions intensity of vehicle transport per kilometer (James, 2009).

The world-wide benchmark for CO_2 tailpipe emissions per liter of fuel consumed (www.environment.gov.au/settlements/transport/fuelguide/environment.html, 2012). This is provided in table 2.1.

Table 2.1: Benchmark for CO2 Emissions

Fuel	**CO_2 emissions**
Petrol	2.3 kg/l
Diesel	2.7 kg/l

Measuring the benefits of individual driving strategies is useful as a learning tool. The Australian Automobile Association (James, 2009) identified some specific effects of individual strategies. Limiting air-conditioning can reduce fuel use by up to 17.5%; low tyre pressure can increase fuel use by 2% to 4%; gentle acceleration and engine braking can reduce fuel use by 11% and 2% respectively; and a 'sporty' driving style increases fuel use by 20%.

2.4 Emission Rates

According to a report released by the Malaysian Department of Environment (2010), Malaysian CO_2 emissions are mainly caused by transportation activities (97.1%). Sources include emissions from motor vehicles both individually owned vehicles as well as

public vehicles. There are over 19 million registered vehicles in the country with the total estimation of emission released of over 1.4 million metric tons in 2008 (MDOE, 2010). The breakdowns of vehicles in the country are as follows:

Table 2.2: Total Motor Vehicle by Type in Malaysia, 2009 (RTD, 2009)

Type	**Amounts (units)**
Passenger car	8940230
Motorcycles	8506080
Bus	66581
Taxi	16579
Hired cars	79149
Goods transporter	936222
Others	471941
Total	19020000

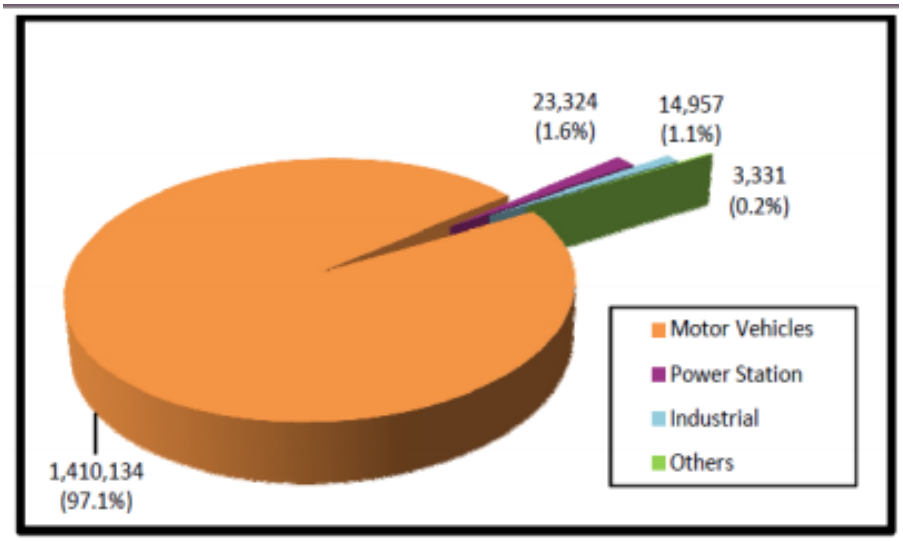

Figure 2.1: The Rates of Emission (CO_2) in Malaysia, 2008

The International Energy Agency (IEA) is an autonomous body established in 2004, to promote energy security in the 16 European, UK, US and Asian member countries. It aims to facilitate a collective response to physical disruptions in oil supply and to advise countries on sound energy policy (Barkenbus, 2010). In 2008, the IEA proposed a number of energy efficiency initiatives, with transport recommendations incorporating regulation on fuel efficiency standards and fuel economy labelling for both heavy and light vehicle segments, tyre energy efficiency standards and implementation of eco-driving initiatives. These initiatives have been only partially implemented in some jurisdictions, with very limited implementation in Malaysia and other countries outside the main vehicle-manufacturing regions (IEA, 2010:51). However, the inclusion of eco-driving provides an opportunity for Asian countries especially Malaysia to implement some of the recommendations of the agency, even though it has a small vehicle-manufacturing sector.

2.5 Behaviour Change

It has been known for several decade that drivers behavior and drivers performances have an impact on road safety. Driver performance relates to the driver's knowledge, skill, perpecptual and cognitive abilities. Driver behavior is what the driver's choose to do with these attributes. The literature relates to behavior change, particulary the attitudinal preconditions motivating individuals to drive in certain ways and the importance of educational strategies that tap into those motivators (Symmons, 2012).

The theory of driver performance it can be investigateed by many methods, including experiments using laboratory equiment, driving simulators, and instrumented vehicles traveling on test tracks (Summala, 1976). As driver behavior is what drivers actually do, it cannot be investigated by such methods. As a consequence, we have less an information about driver behavior than about driver performance. Particularly important, but difficult to quantify, are relationships between driver behavior and crash risk (Summala, 1976).

According to Shinar D. Psychology, the behavior changes based on the gender and age of individual group. “It would appear that the driving hazards and the high accident record are simply one manifestation of a method of living that has been demonstrated in their personal lives. Truly it may be said that a man drives as he lives. If his personal life is marked by caution, tolerance, foresight, and consideration for others, then he would drive in the same manner. If his personal life is devoid of these desirable characteristics then his driving will be characterized by aggressiveness, and over a long period of time he will have a much higher accident rate than his stable companion” (Shinar D, 2000). It was the first study to provide specific evidence of a strong link between broad personality characteristics and crash involvement, and introduced the concept a man drives as he lives.

The theory of planned behavior has been used widely in public relations and social change management. It has been used to measure and influence drivers’ normative beliefs about speeding to support the development of road safety initiatives. There are examples of this seen in some of the Victorian Traffic Accident Commission advertisements seeking to influence peers (Cameron, Haworth, Oxley, Newstead, and Tri, 1993). Consequently, the training modules in the EcoDrive study attempted to influence individual participants’ views on possible motivations for change (i.e., reduced costs, stress, improved safety and reduced GHG emissions).

2.6 Summary

Eco-driving encompasses driver behaviours, vehicle maintenance and non-driving actions to reduce fuel consumption. Eco-driving is defined as a way of driving that reduces fuel consumption, greenhouse gas emissions and crash rates.

Eco-driving offers numerous benefits: It not only saves fuel and money, but it also improves road safety and the quality of the local and global environment. The most important personal and immediate benefit of eco-driving is the saving of fuel costs.

The emission level in Malaysian getting higher to 97.1% mainly caused by highways and transportation sector. After impletation of eco-driving program in some others countries the emission and greenhouse gas been reduced.

It has been known for several decade that drivers behavior and drivers performances have an impact on road safety. Driver performance relates to the driver's knowledge, skill, perpecptual and cognitive abilities. Driver behavior is what the driver's choose to do with these attributes.

Finally, this study is to find the understanding of eco-driving among drivers of which it carries its concept in reducing fuel usage and also reducing carbon dioxide emission. Furthermore, this study is also to find how far the drivers adopt the eco-driving in their traveling.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter discuss on methodology which consist of methodology study and data analysis. It can be said that, research methodology is defining the activity of study to achieve objectives stated in Chapter 1. An eco-driving questionnaire will be distributed and collected from ump staffs and students to produced data analysis on the understanding of eco-driving concepts.

3.2 Flow chat of the methodology study

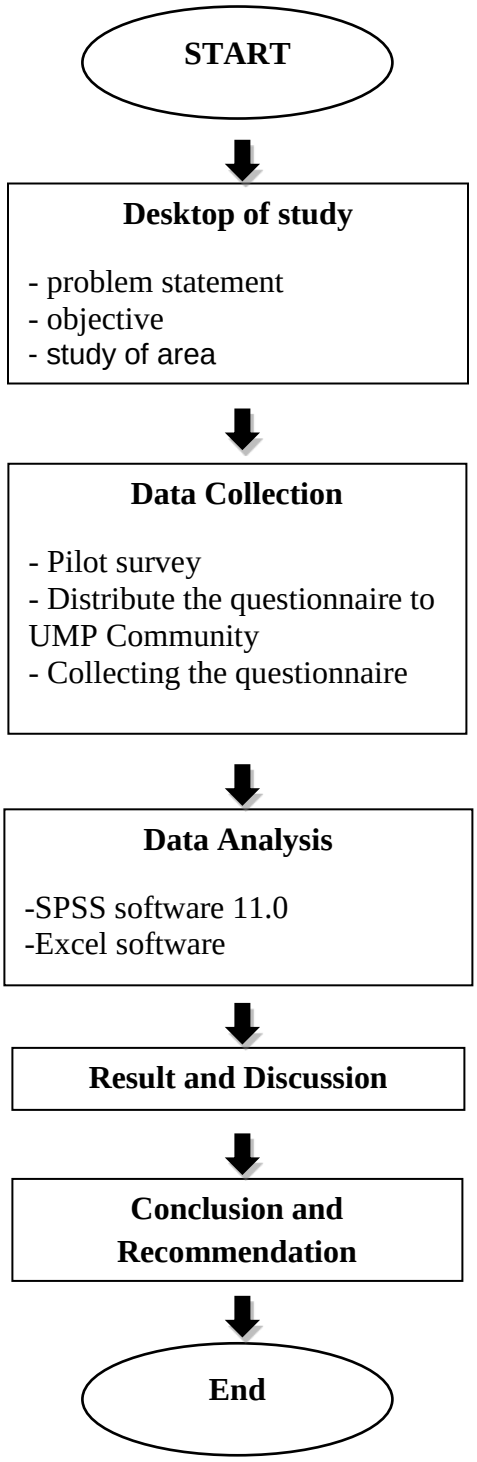

Figure 3.1: Research Flow Chart

The methodologies of this study can be viewed from **Figure 3.1** where it started with the identification of objectives and scopes of study before survey design. During the survey design, the interview section will be carried out to develop the questionnaire of eco-driving before distributing to the UMP staffs and students. After survey design, the data collection process will be carried out, where the questionnaire will be collected from UMP staffs and students to produce data analysis from this study. After at all, the data analysis process of survey form will be conducted, the questionnaire will be rearranged according to gender and occupation. The data are recorded, the result will be drawn a graph to see the differences between gender and occupation. Then, the result will be analysed to come out with discussion, conclusion and recommendation based on the data collected.

3.3 Survey

Survey in the social research is a widely acknowledged method of data collection, which yields “rich insight into people’s biographies, experiences, opinions, values, aspirations, attitudes and feelings” (John Wiley, 2001). A very simple questionnaire will be distributed to produced a data about the understanding of eco-driving concepts among UMP communities and also to obtain the data on how fav UMP community adopt eco-driving concepts.

3.3.1 Participants

The eco-driving survey will be distributed to 240 UMP staffs and students.

3.3.2 Questionnaires

A three-page questionnaire in English will be distributed to the UMP staffs and students. Each questionnaire contained 3 demographic questions and 8 questions regarding eco-driving concept and driver's attitudes. After a short presentation regarding the purpose of the research, UMP staffs and students will be asked to fill out the questionnaires during a meeting sessions. The forms will be collected after the process of answering done and the participants will be thanked for their time. On average, UMP staffs and students will take around 5 minutes to answer the questions.

3.4 Study Area

This eco-driving survey will be conducted in Gambang campus at Universiti Malaysia Pahang. However, these eco-driving concepts will be regarding a long journey period and it is not a journey inside UMP campus. The survey form will be distributed to UMP staff and students who really had a long journey period for example Kuantan to Kuala Lumpur. In additionally, the pilot survey session will be conducted in UMP campus on some selecting staff and student who really had an interested in eco-driving concept. Every single data and the result were collected from survey will be based on the UMP communities only.

3.5 Data Analysis

Data that will be obtained from the experiment will be analysed to determine the understanding of eco-driving and pertaining to eco-driving concepts. The data will be drawn in a form of graph to show the different understanding between the age, gender and occupation. Microsoft Excel will also be used in tabulating data and also for analysis purposes.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the results of a study conducted based on the method described in Chapter 3. The data obtained throughout the survey was analyzed and interpreted in this chapter to meet the aims of the study. Eco-driving survey was conducted with the UMP community around Gambang campus from 10 March 2016 until 31 March 2016.

4.2 Data Collection

240 sets of questionnaire were distributed to the respondents by hand. As a result, all the 240 sets of questionnaire were completed and returned by the respondents. The percentage of returning questionnaire was 100% which was expected based on the survey study. All the data obtained from the survey will be used as the basic of the analysis in this chapter.

The respondents came from different gender, age and profession. Descriptive analysis and frequency are computed using Statically Package Social Science (SPSS) and Microsoft Excel 2016.

4.3 Profile of Respondents

Three demographic questions were asked in this questionnaire to profile the respondents. Tables and charts are presented to show the profile of respondents on the type of profession, group aged and gender.

4.3.1 Categories of Profession

Table 4.1: Categories of profession by gender

Gender	Profession				Frequency	Percentage %
	Local student	International student	Academic staff	Non-academic staff		
Male	30	30	30	30	120	50
Female	30	30	30	30	120	50
Total	60	60	60	60	240	100

Table 4.1 shows the categories of profession by gender. Each of the profession is divided into 2 categories which are by gender; male and female. There were 60 respondents by each category and divided equally with the number of gender, 30 numbers of female respondent and 30 numbers of male respondent. Overall, 240 of respondents participated in this questionnaire with 50% of female respondents and 50% of male respondents. The various professions will give an impact on their opinion about eco-driving concepts and the gender difference will influence their understanding on eco-driving concepts and different practices of eco-driving.

4.3.2 Age of the Respondents

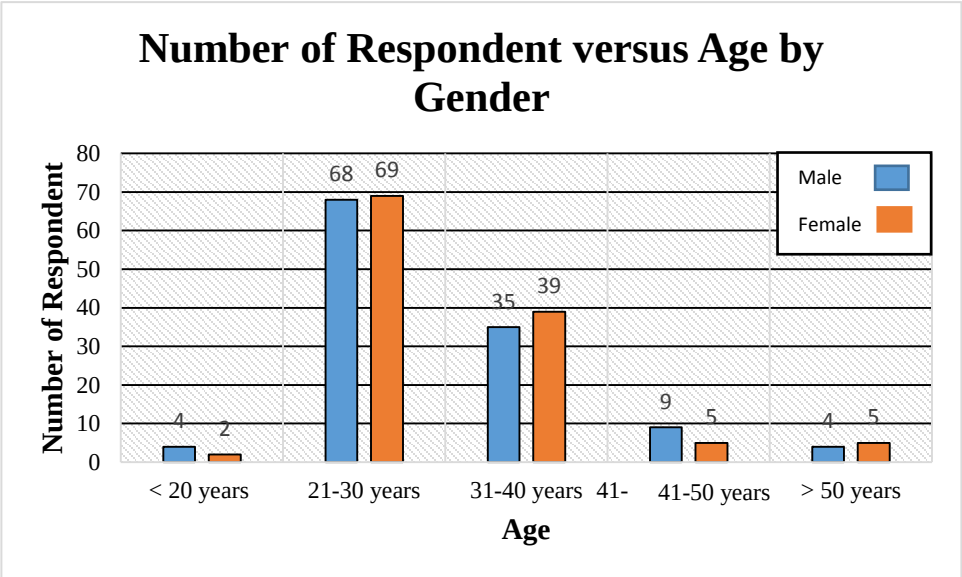

Figure 4.1: Age of the respondents by gender

Figure 4.1 shows the age range of the respondents by gender. From the chart above, most of the UMP communities are stood by a group of age between 21-30 years old were 137 out 240 of the respondents. The age group of 21-30 years old has a slightly higher number of female respondents than male respondents with the total of 69 for female and 68 for male. The second highest group of age is between 31-40 years old, where 74 respondents from academic staff and non-academic staff. Besides that, the group of age between 41-50 years old shows 14 respondents, 9 of them is male respondents and 5 are female respondents. There are 9 respondents from the group of age above 50 years old. Lastly, there are 6 respondents for the group of age below 20 years old most of them are local students. Age group below 20 years old indicated that male respondents are slightly higher than female respondents. According to psychological theory, different group of age will have a different type of personality which is reflected on the thinking skills and understanding of eco-driving concepts.

Table 4.2: Age of the respondents

Age	Gender		Total	Percentage %
	Male	Female		
< 20 years	4	2	6	2.5
21-30 years	68	69	137	57.1
31-40 years	35	39	74	30.8
41-50 years	9	5	14	5.8
> 50 years	4	5	9	3.8
Total	120	120	240	100

Table 4.2 shows the age of the respondents. Fifty-seven percent (57%) of the respondents were 21-30 years old, showing that most of them are students who have a driving license class D and regularly drive a car. Thirty percent (30%) of the respondents were between 31-40 years old. Six percent (6%) of the respondents were between 41-50 years old. On the other hand, 3.8% of the respondents are in the 50 and above status. Lastly, the 2.5% percent of respondents are in the ages below than 20 years old. The apparent diversity of maturity of the respondents reflects several implications in the study's findings.

4.4 Perception of the Respondents

This part of paper will provide the discussion and analysis of the respondents' perception on eco-driving concepts. 9 nine question were completed with an option were given through the survey-questionnaire to the respondents to evaluate their understanding and practicing of the eco-driving. It is the greatest way to get know whether the UMP community really understands about eco-driving concepts and whether if they are ready to adopt the eco-driving concepts to their journey.

4.4.1 Understanding of Eco-driving Concepts

Eco-driving concepts can be classified into many parts which give an impact on reducing emission level and fuel consumption. But under this case study, it is more focused on the basic of eco-driving concepts. There were 7 options included in this survey-questionnaire which was used to evaluate the UMP community on their understanding of eco-driving concepts. 6 out of the 7 options are correct term of the eco-driving concepts and one of the options was an irrelevant concept of eco-driving. The basic concepts of eco-driving are driving at constant speed, driving smoothly without sudden acceleration or deceleration, stop engine when not using, reducing emission level and fuel consumption, minimize overtaking and the last is to drive below speed limit (Energy Europe Campaign, 2011). These are the option where been include in the questionnaire, and the irrelevant concept is driving slowly. The reason for including the irrelevant concept of eco-driving is to test the understanding of UMP community on eco-driving concepts.

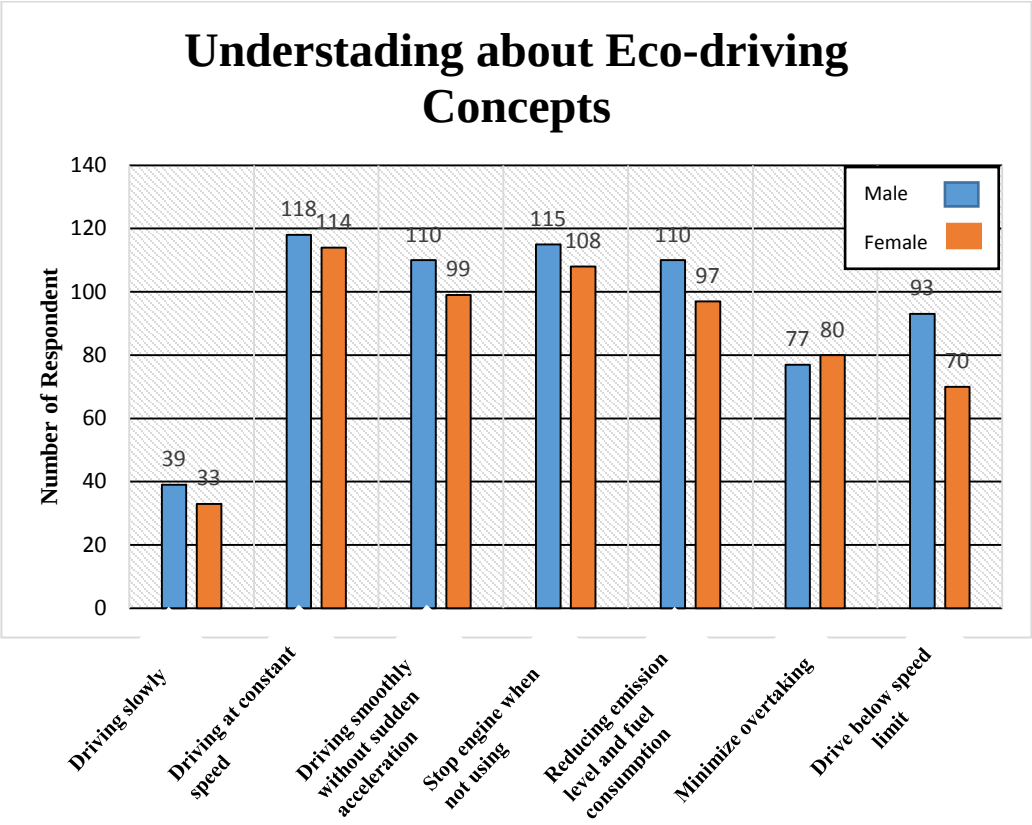

Figure 4.2: Understanding about eco-driving concepts

The figure above presents the understanding of eco-driving concepts by gender. It can be seen clearly through the graph above that most of the respondents understood eco-driving concepts. Driving at a constant speed is the highest option chosen by the 118 male respondents and 114 of female respondents. Besides that, female respondents chose minimizing overtaking as an option better than male respondents. 80 of female respondents chose minimize overtaking as option of eco-driving concepts compared to 77 male respondents. Finally, 72 respondents choose driving slowly as an option of eco-driving concepts where 39 of them are male respondents and 33 female respondents. To conclude, most of the UMP community understood the eco-driving concepts yet a number of respondents show lack of knowledge in eco-driving concepts.

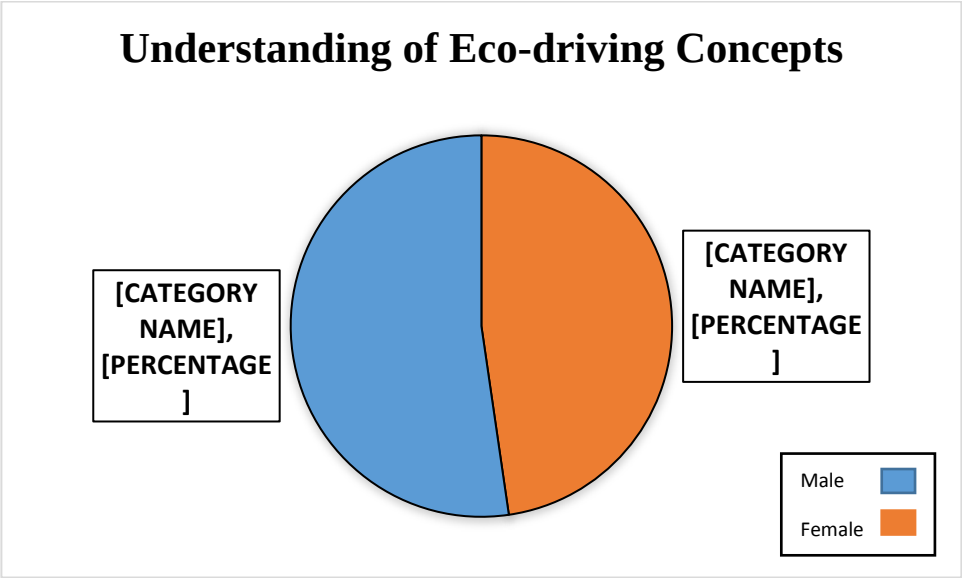

Figure 4.3: Understanding about eco-driving concepts by gender

Figure 4.3 shows the percentage of understanding eco-driving concepts by the gender. From the results above, the male respondents (fifty-two percent (52%) of male respondents) show the highest percentage of understanding on eco-driving concepts compared to female respondent (forty-eight percent (48%) of female respondents). An assumption can be made through the result above is that our male respondents engage in more driving per day, compared with female respondents. This is the reason why male respondents show the highest percentage of understanding of eco-driving concepts.

Table 4.3: Understanding of eco-driving concepts in profession

Option	Profession				Frequency	Percentage %
	Local student	International student	Academic staff	Non-academic staff		
A	21	21	13	17	72	5.7
B	54	60	60	58	232	18.4
C	48	49	60	52	209	16.5
D	47	57	60	59	223	17.7
E	48	51	60	48	207	16.4
F	31	43	49	34	157	12.4
G	35	34	52	42	163	12.9
Total					1263	100

A- Driving slowly
B- Driving at a constant speed
C- Driving smoothly without sudden acceleration or deceleration
D- Stop engine when not using
E- Reducing emission level and fuel consumption
F- Minimize overtaking
G- Driving below speed limit

Table 4.3 presents the data of understanding on eco-driving concepts based on professions. Eighteen percent (18%) of the respondents chose driving at constant speed as an option of eco-driving concepts, showing that most of the respondents are academic staff and international student. For the second highest, stop engine when not using option show the seventeen percent (17%) of respondents chose as their understanding of eco-driving concepts. Sixteen percent (16%) of the respondents chose driving smoothly without sudden acceleration or deceleration and reducing emission level and fuel consumption as the option of understanding on eco-driving concepts respectively. Lastly, for the option driving slowly shows six percent (6%) of respondents chose as option of eco-driving concepts. Driving

slowly option shows most of the respondents are local and international students, where 42 out of 72 of respondents. From this statistic, assumption can be made that academic staff and non-academic staff mostly understood about eco-driving concepts compared with the students because they are frequently engaging in every day traveling to UMP Gambang campus. On the other side, most of the local students do not own a car and do not regularly drive which shows why they are not so familiar with eco-driving concepts.

4.4.2 Speed Profile

Speed profile of eco-driving can be categorized into two main speed limits which are short-trip and long-trip journey. According to Europe Energy saving (2006), the percentage of fuel consumption reduction for short-trip journey is up to 25% for gasoline and 5% for diesel. The speed limit for short-trip is 60-90 km/hr for single lane roads. Short-trip involves local trip; for example, the trip from Kuantan - Gambang or Gambang - Kuantan. On the other hand, the speed limit for long-trip is 90-120km/hr. The speed is maintained constantly without any sudden acceleration or braking. This long-trip speed limit is usually applied on highway which is engaged with long journeys. For instance, journey from Kuantan to Kuala Lumpur.

Table 4.4: Speed limit

Speed limit km/hr	Gender		Frequency	Percentage %
	Male	Female		
30-60	5	1	6	2
60-90	58	71	129	54
90-120	57	48	105	44
Total	120	120	240	100

Table 4.4 presents the understanding of speed limit by gender. 54% of the total respondents, who chose 60-90 km/hr as a speed limit of eco-driving. For the speed limit 90-

120 km/hr, 44% of the total respondents choose this speed as an option to reducing fuel consumption. Therefore, speed limit 30-60 km/hr shows 2% of the total respondents. As conclusion, most of the UMP community understood about eco-driving speed limit which results in less fuel usage. However, there are 2% of the total respondents who chose speed limit 30-60 km/hr as fuel reduction, maybe because they do not drive regularly or maybe they are new drivers.

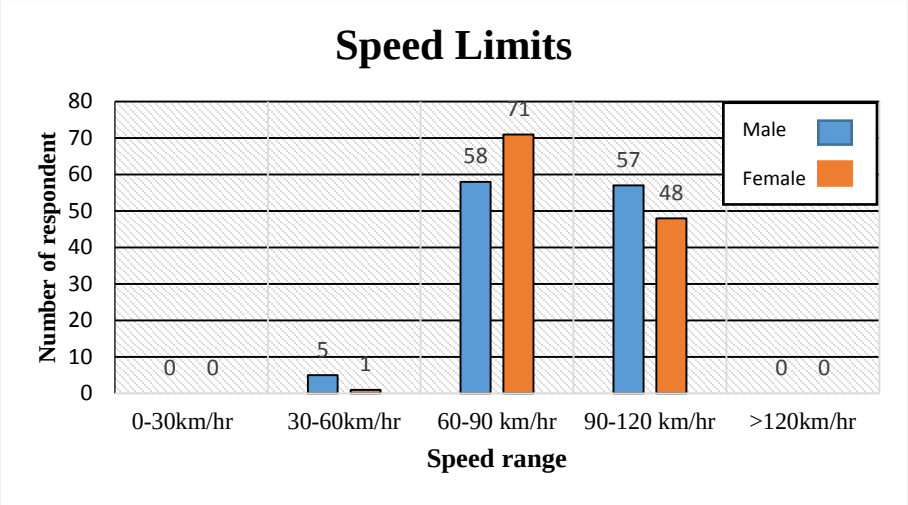

Figure 4.4: Speed limits

Figure 4.4 shows the understanding of speed limits by gender. Likewise, the respondents were asked for speed limits which can result in less fuel consumption and the report shows most both gender correctly chose the eco-driving speed limit. From the figure above the male respondents chose the speed limit of 90-120 km/hr slightly higher than female respondents. Besides that, female respondent chose speed limit for 60-90 km/hr more in compare to the male respondent. Six respondents chose 30-60 km/hr as speed limit of eco-driving. This shows there are few numbers of respondents who still do not understand eco-driving concepts. According to the survey data the 6 respondents are from the group of age below 21.

4.4.3 Practicing of Eco-driving

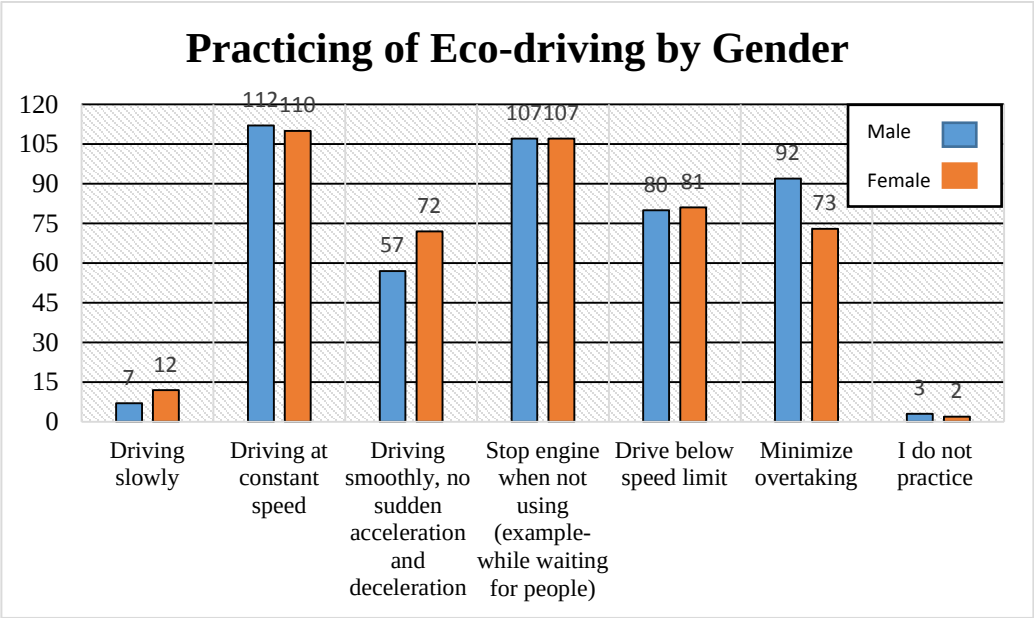

Figure 4.5: Practicing of eco-driving by gender.

The figure above presents the practicing of eco-driving concepts by gender. It can be seen clearly through the graph above that most of the respondents practice eco-driving concepts. Driving at a constant speed is the highest practiced where 112 are male respondents and 110 are female respondents. The second highest practice of eco-driving concepts by gender is stop the engine when not using, with the total of 214 respondents. Minimize overtaking concept was chosen by more male respondents than female respondents with the total of 92 for male and 73 for female. Driving smoothly without any sudden acceleration and deceleration concept was favored by female respondents than male respondents. Lastly, there are a few respondents who practiced driving slowly and 5 out of 240 of the respondents said they do not practice any one of the concepts in their driving. Overall, the results above show most of the UMP community practice eco-driving concepts in their driving, but there are few members of respondents do not practice the correct term of eco-driving.

Table 4.5: Practice of eco-driving concepts in profession

Option	Profession				Frequency	Percentage %
	Local student	International student	Academic staff	Non-academic staff		
A	0	11	5	3	19	3
B	46	60	60	56	222	24
C	21	38	33	37	129	14
D	38	57	60	59	214	23
E	34	44	49	34	161	17
F	34	34	53	44	165	18
G	4	0	0	1	5	1
Total					915	100

A- Driving slowly
B- Driving at a constant speed
C- Driving smoothly without sudden acceleration or deceleration
D- Stop engine when not using
E- Minimize overtaking
F- Driving below speed limit
G- I do not practicing eco-driving

Table 4.5 shows the practicing of eco-driving by professions. According to the table above, twenty-four percent (24%) of UMP community practice driving at a constant speed. Twenty-three percent (23%) have said that they practice stop engine when not using in their driving. Academic staff and international student mostly practice minimize overtaking concept compared with other two professions. Finally, 5 out 240 respondents have said they do not practice eco-driving in their driving. As conclusion, most of the UMP community portray they practice eco-driving while they drive.

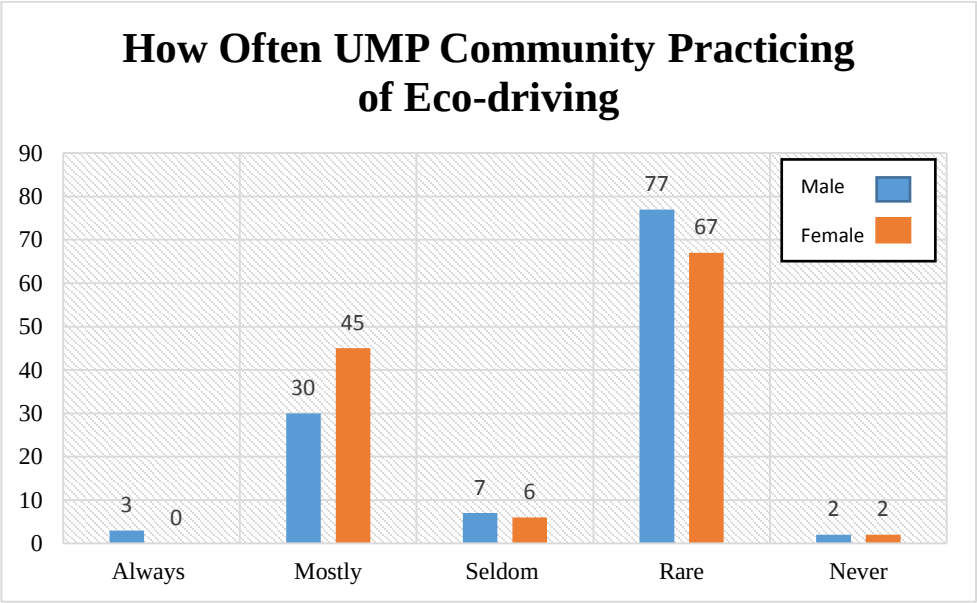

Figure 4.6: How often UMP community practicing of eco-driving

Figure 4.6 presents how often UMP community, by gender practice of eco-driving in their everyday driving. 144 of the respondents have said they rarely in practice eco-driving concepts in their driving, with most of them being male where 77 out of 144 respondents. However, a small group of UMP community have said that they mostly and always practice eco-driving concepts. Mostly female respondents than male respondents.

Table 4.6: How often UMP community practicing of eco-driving

Age	Gender		Total	Percentage %
	Male	Female		
Always	3	0	3	1
Mostly	30	45	75	31
Seldom	8	6	14	6
Rare	77	67	144	60
Never	2	2	4	2
Total	120	120	240	100

The table above shows the result of UMP community on how often they practice eco-driving concepts. 31% of the respondents have said that they mostly apply eco-driving concepts into their driving. On the other hand, half of the respondents have said they rarely practice eco-driving. 1% of the respondents have said that they always practice eco-driving in their driving where most of them are male respondents. Study can be concluded as most of the UMP community are not ready to adopt eco-driving concepts in their driving. This is because they do not see the benefit of eco-driving.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Introduction

This study was carried out to determine a driver's understanding on eco-driving concepts and how far drivers adopt the eco-driving concepts. The result of this survey was reported and analyzed in chapter 4. In the following chapter, a conclusion will be achieved based on the analysis in chapter 4 and to recognize the objective for this survey is acceptable or not. Additionally, a few recommendations will be presented in this chapter for future studies.

5.2 Conclusion

This research was carried out to determine the understanding of eco-driving concepts within UMP community and how far UMP drivers adopt eco-driving concepts into their driving. Data for this survey has been reported and analyzed based on the objective of this study. There are two main objectives for this survey, first is the understanding of eco-driving in UMP community and how far UMP drivers adopt eco-driving and second is to identify how far UMP drivers ready to adopt the eco-driving concepts.

According to the analyzed data, most of the profession in UMP community understood eco-driving concepts, where the profession chose the correct term of eco-driving concepts which was prepared in the option form in the questionnaire. Around 80% of profession show that they understood well the concepts of eco-driving but there are 20% of profession still a lack of knowledge in eco-driving, where a few number of profession shows chose irrelevant option given in the survey to test the understanding of UMP community. Students are the main participants to choose the irrelevant option for the understanding of eco-driving concepts could be because most of the students do not have enough experiences in driving. Furthermore, the age plays an important role in this survey where most of the students are aged between 21-30 years old. This shows that the students are still in the process of mastering the correct driving method. The information about eco-driving is not fully conveyed to the students as this is the main reason why the students have chosen the irrelevant option for this survey. Overall, the primary aim of this assessment was achieved where 80% of UMP communities understood about the eco-driving concepts.

On the other hand, the UMP communities are not ready to adopt the eco-driving concepts in their driving. Data shows that, 70% of the respondents said they do not practice eco-driving in their driving frequently. This is because the drivers still do not understand the benefit of eco-driving.

5.3 Recommendation

These are some suggestions to increase the effectiveness of the similar research in the future.

1. The methodology of the research can be improved, as collecting data through e-survey is one of the new methodologies applied. However, to prevent problem in getting back the feedback of the questionnaire, it is necessary to confirm first the e-mail address of respondents is valid to avoid insufficient condition and guarantee the effectiveness of the survey being carried out.

2. This research can be more effective when the survey area is widened and adding an interview section with UMP community. Interviewing in the social research is a widely acknowledged method of data collection, which yields “rich insight into people’s experiences, opinion, attitudes and feelings” (John Wiley, 2001). By conducting the interview section with UMP community more data can be obtained for this survey. The interview result can be used to analyze on how far the UMP drivers would adopt the eco-driving concepts into their driving, and will be accurate and easy to analyze based on the respondents’ thinking rather than what they’ll choose based on options given on questionnaire.

3. According to the previous chapter, the understanding of eco-driving is slightly poor in UMP community, mostly among students. This problem can be solved when eco-driving related lesson will be included in syllabus for civil engineering students in UMP.

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APPENDIX A

Data Collection

Question 1: What is your occupation?

PROFESSION	MALE	FEMALE
LOCAL STUDENT	30	30
INTERNATIONAL STUDENT	30	30
ACADEMIC STAFF	30	30
NON ACADEMIC STAFF	30	30
TOTAL	120	120

Question 2: Age

RANGE	NUMBER OF PEOPLE
<20 years	6
21-30 years	137
31-40 years	74
41-50 years	14
>50 years	9

Question 3: Do you regularly drive car?

OPTION	NUMBER OF PEOPLE
YES	226
NO	14

Question 4: What do you know about eco-driving?

OPTION	MALE	FEMALE
Driving slowly	39	33
Driving at constant speed	118	114
Driving smoothly, no sudden acceleration and deceleration	110	99
Stop engine when not using (example-while waiting for people)	115	108
Reducing emission level and fuel consumption	110	97
Drive below speed limit	77	80
Minimize overtaking	93	70

OPTION	LS	IS	AS	N-AS
Driving slowly	21	21	13	17
Driving at constant speed	54	60	60	58
Driving smoothly, no sudden acceleration and deceleration	48	49	60	52
Stop engine when not using (example-while waiting for people)	47	57	60	59
Reducing emission level and fuel consumption	48	51	60	48
Drive below speed limit	31	43	49	34
Minimize overtaking	35	34	52	42

LS- LOCAL STUDENT

IS- INTERNATIONAL STUDENT

AS- ACADEMIC STAFF

N-AS- NON ACADEMIC STAFF

Question 5: How often do you practice eco-driving?

OPTION	MALE	FEMALE
Driving slowly	7	12
Driving at constant speed	112	110
Driving smoothly, no sudden acceleration and deceleration	57	72
Stop engine when not using (example- while waiting for people)	107	107
Drive below speed limit	80	81
Minimize overtaking	92	73
I do not practice	3	2

OPTION	LS	IS	AS	N-AS
Driving slowly	0	11	5	3
Driving at constant speed	46	60	60	56
Driving smoothly, no sudden acceleration and deceleration	21	38	33	37
Stop engine when not using (example- while waiting for people)	38	57	60	59
Drive below speed limit	34	44	49	34
Minimize overtaking	34	34	53	44
I do not practice	4	0	0	1

LS- LOCAL STUDENT

IS- INTERNATIONAL STUDENT

AS- ACADEMIC STAFF

N-AS- NON ACADEMIC STAFF

Question 6: How often do you practice eco-driving?

OPTION	NUMBER OF PEOPLE
Always	3
Mostly	75
Seldom	13
Rare	144
Never	4

Question 7: Which of the speed will result less fuel usage and low emission?

RANGE	NUMBER OF PEOPLE
0-30km/hr	0
30-60km/hr	6
60-90 km/hr	129
90-120 km/hr	105
>120km/hr	0

Question 8: Is there any eco-driving indicator in your car?

OPTION	NUMBER OF PEOPLE
YES	154
NO	86

Question 9: How often do you use eco mode in your car?

OPTION	NUMBER OF PEOPLE
Always	2
Mostly	50
Seldom	9
Rare	90
Never	2

Question 10: How useful is the eco-driving indicator?

OPTION	NUMBER OF PEOPLE
Very useful	56
Useful	87
About the same	10
Not useful/necessary	0
Disturbing	0

Question 11: What do you know about the impact of eco-driving?

OPTION	NUMBER OF PEOPLE
Reduce emission level	129
Reduce fuel consumption	207
Longer service life	94
Improve convenience/comfort	31
Increase safety	172

APPENDIX B

Sample of Questionnaire