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Study on Student's Perception on The Knowledge and Usage of Air Conditioning from the Electricity Aspect

Nurul Hidayah Liew Abdullah[1]*, **Muhammad Fathurrahman Roslan**[1]

[1]Faculty of Technical and Vocational Education,
Universiti Tun Hussein Onn Malaysia, Parit Raja, Johor, 86400, MALAYSIA

*Corresponding Author Designation

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Abstract: Nowadays, air conditioning is widely used, especially in tropical and hot climates countries, including Malaysia. Thus, has increase on demand for air conditioning needed, it results that problems occur uncontrolled and excessive usage of air conditioning that leads to an increase in electricity costs. Therefore, this study was conducted to identify the perceptions of Air Conditioning and Refrigeration (BBG), Faculty of Technical and Vocational Education (FPTV), Universiti Tun Hussein Onn Malaysia (UTHM) students on the knowledge and usage of air conditioning from the aspect of electricity. This research is conducted in the form of a quantitative methods survey using a questionnaire as instrument for collecting data. Sample data from 63 students in years 3 and 4 BBG program, FPTV, UTHM using simple random selection. Data were analyzed using mean, standard deviation, and Pearson correlation. The results showed that the BBG, FPTV students' perception on knowledge and usage of air conditioning in terms of electricity is high. Furthermore, the results of the study also show that there is a strong and significant relationship between the perceptions of BBG, FPTV students on the knowledge and use of air conditioning from the aspect of electricity. In conclusion, the integration of knowledge and air conditioning use must be considered in order to effectively manage daily energy production and provide benefits to all users.

Keywords: Student's Perception, Knowledge, Usage, Electricity

1. Introduction

Nowadays, air conditioning is widely used especially in countries that experience equatorial and hot climates including Malaysia. Air conditioning can be used in both domestic and commercial environments. A study by Jaaffar, (2014) indicated the energy savings for air conditioning systems at Universiti Malaysia Perlis. This study looks at some ideas on how to reduce the rate of energy

Corresponding author: hidayahl@uthm.edu.my

consumption each month and at the same time save financial investment for specializing electricity bills on air conditioning systems. Air conditioning systems use 66% of the total at the peak of electricity consumption in daily activities. This information indicates that air conditioning systems are the largest contributor to electricity rates.

Survey made by Whittle and Jone (2010) in an institute of higher learning, there are several factors related to a person's perception of electricity consumption, in turn, contribute to the increase in electricity such as the delivery of information related to energy consumption by universities is not communicated with well, control of energy consumption by the university that makes students or users do not minimize or maximize the use of electricity, especially air conditioning at a time, for example, air conditioning stays on in one room even if there are no occupants, as well as the level of awareness, motivation and knowledge consumers to reduce electricity consumption is at a moderate level.

1.1 Problem Statement

The need for air conditioning has grown in line with the current rise in global temperatures. When unregulated and excessive usage of air conditioning results in an increase in power tariffs, problems occur. According to studies, when a facility uses air conditioning, it spends 35 percent to 45 percent of its budget on power (Randazzo et al., 2020)As a result, the researcher's goal in this study is to investigate students' perspectives of their understanding and usage of air conditioning from the perspective of electricity in order to discover a solution to this problem.

1.2 Objectives of Study

This study was conducted to identify the perceptions of Bachelor Degree in Vocational Education (Air Conditioning and Refrigeration) (BBG), Faculty of Technical and Vocational Education (FPTV) students on the knowledge and use of air conditioning from the aspect of electricity. And this research also aims to study the relationship between the perceptions of BBG, FPTV students on the knowledge and use of air conditioning from the aspect of electricity.

2. Methodology

The methodology section discusses the study design, population and sample of the study, the procedure of conducting the study, the study instruments used and methods of analyzing the data and conducting the actual study. The aspects described above will be explained in detail and thorough researcher and this is important because the proper methodology will turn off the success of the study. The results of the analysis conducted were to identify the perceptions of BBG, FPTV students on the knowledge and use of air conditioning from the aspect of electricity and to study the relationship between the perceptions of BBG, FPTV students on the knowledge and use of air conditioning from the aspect of electricity.

2.1 Research Design

Research design is a method used as a guide by researchers to obtain data and information. The study design was a survey of a quantitative approach using a questionnaire form to collect data. Questionnaires were distributed to BBG, FPTV students. Questionnaire technique is used to achieve the objectives of the study. According to Najib, (1999), due to time constraints, the questionnaire method is most suitable to use because the data analysis is also easy to do compared to the direct observation method which requires trained skills and requires a long time. To determine the required sample size, the researcher referred to the Sample Size Determination Table (Krejcie & Morgan, 1970). With this, the sample size required by the researcher was 52 people or more. Larger sample sizes can reduce the error of samples not being selected or not having population characteristics. The researcher chose a total of 60 people as the sample for this study according to the Central Limit Theorem, where

the larger the sample size, the shape of the sample distribution is more like a normal distribution or more gives a picture of the real situation.

The next step is to involve the selection of a simple random sample from year 3 and year 4 students. Simple random sampling is the process of extracting from each layer of the population of year 3 and 4 students who follow the BBG program have the opportunity to be the study sample. So each student who will be sampled is selected without involving emotions, sentiments and so on. The data will be more comprehensive and reliable. The justification for the selection of samples from years 3 and 4 is because they are already exposed to knowledge related to air conditioning in the classroom.

2.2 Research Procedure

This study involved students of BBG, FPTV program in identifying perceptions on the knowledge and use of air conditioning. At an early stage the researcher identifies the problem to be studied and determines the title of the study. Then, the highlights of the study were conducted for the preliminary study and obtain information for the purpose of supporting the objectives of the study and further determine the objectives of the study in Figure 1.

Once the findings from the document analysis have been obtained, the researcher will construct a research instrument. Then, the questionnaire was developed by the researcher and then the researcher obtained validation from 3 experts. Once the developed questionnaire form is validated by experts, the researcher will conduct a pilot study to determine the validity and reliability of the questionnaire. The actual study will be conducted on the respondents to obtain data. Data were analyzed to answer the research questions. Then the researcher will complete the writing of the study report. Figure 1 shows the flow chart of this study.

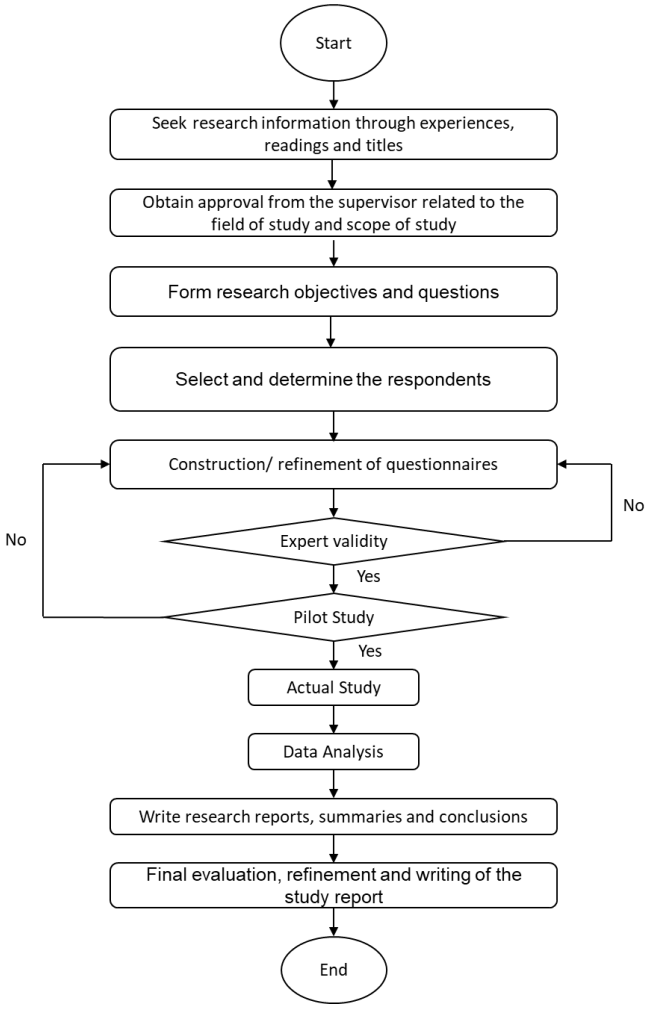

Figure 1: Study Flow Chart

2.3 Research Instrument

The study instrument is a tool used to obtain data from the study sample. In this study the instrument produced was a questionnaire. Researchers use questionnaires as research instruments because they can save cost, time and energy in collecting data (Sayed Mahussain & Mustaffa, 2010). This questionnaire was developed by the researcher and distributed to obtain the information needed in a study. To facilitate data analysis, the questionnaire was divided into 3.

Table 1: Division of items in the questionnaire form

Section	Item	Number of Items
Section A	Respondent Information	2
Section B	Perception of Air Conditioning Knowledge	14
Section C	Perception of Air Conditioning Use	13
	Total	29

Based on Table 1, the table states the questionnaire that will be produced to assist this research. The questionnaire that will be produced by this researcher has a total of 29 questions. There are 3 parts that need to be answered by the respondents in the questionnaire of this study, namely Part A, Part B and Part C. Part A has items based on the demographics of the respondents. Next, section B has an item on

the Perception of Air Conditioning Knowledge and Part C, on the other hand, covers items about the Perception of Air Conditioning Use.

3. Results and Discussion

The researcher chose to use a questionnaire based *Likert* scale. The Likert scale is a scale used to measure perceptions, attitudes or opinions of a person or group regarding social events or phenomena, based on the operating definition set by the investigator. Chua (2011), stated that the choice for the answer used is the Likert scale because it is easy to manage and its reliability is high compared to other scales. In this study, the researcher used a 5-point Likert scale to obtain the level of agreement measurement from the respondents.

3.1 Results

The data that has been collected in percentage and cumulative frequency for Part A. While for Part B and Part C, the data were collected in mean and standard deviation. The results of the study obtained are as follow.

Table 2: Demographic Analysis for Gender and Year of Study

Item	Frequency	Percentage (%)
Gender		
Boys	39	65
Girls	21	35
Total	60	100
Year of Study		
Year 3	32	53.3
Year 4	28	46.7
Total	60	100

Based on the results of the analysis obtained as shown at Table 2, it was found that the total number of respondents was 60 people. There were a total of 39 male respondents (65%) and 21 female respondents (35%) who answered this questionnaire. Furthermore, for the school year, a total of 32 respondents representing 53.3% were year 3 students and respondents from year 4 were 28 people (46.7%).

Table 3: Distribution of Mean Scores of BBG, FPTV Students' Overall Perception of Air Conditioning Knowledge from The Aspect of Electricity

No.	Item	Mean	Standard Deviation	Interpretation
1.	The rate of electricity consumption for air conditioning is influenced by the function of a room such as server room, computer lab, lecture room and others.	4.48	0.770	High
2.	The distance of copper piping used affects the rate of electricity consumption for the air conditioner to operate.	3.82	1.16	High
3.	The types of air conditioners used will affect the rate of electricity consumption.	4.15	1.33	High

4.	The technology available in air conditioning affects the rate of electricity consumption.	4.75	0.47	High
5.	Regular air conditioning maintenance affects electricity consumption.	4.50	0.93	High
6.	The type of refrigerant used affects the rate of electricity consumption.	4.22	1.08	High
7.	Large spaces require the use of higher horsepower compressors (horsepower) which increases the rate of electricity consumption compared to the use of low horsepower compressors.	4.57	1.00	High
8.	The rate of solar radiation entering the space will increase the working process of the cooling air conditioning compressor increasing the rate of electricity consumption.	3.93	1.30	High
9.	The number of users in a room affects the rate of electricity consumption because it increases the work process of the compressor for the air conditioning process.	4.43	1.00	High
10.	. The air conditioning remote control works to control the consumption of electricity	3.47	1.56	Modest
11.	Air conditioning campaigns can help raise awareness on the use of electricity	4.53	0.75	High
12.	Air conditioning use campaigns can help increase consumers' knowledge on saving electricity.	4.68	0.50	High
13.	The electricity consumption rate of air conditioning compressors is higher than that of refrigerators.	4.13	1.08	High
14.	Bacteria found in the air can be filtered using molecular air filter technology found in air conditioners.	4.08	1.15	High

Table 3 shows the distribution of mean scores of overall perception of air conditioning knowledge from the aspect of electricity. The item "Technology available in air conditioning affects the rate of electricity consumption" has the highest mean score of 4.75 (SP = 0.47). The second highest item with a mean score of 4.68 is "Air conditioning campaign can help increase consumer knowledge on saving electricity". The item that obtained the highest moderate reading was the item "The type of refrigerant consumption affects the rate of electricity consumption" with a mean score of 4.22 (SP = 1.08). Meanwhile, the item "Air conditioning remote control works to control the use of electricity" got the lowest value but still at a moderate level with a mean score of 3.47 (SP = 1.56). The results of this study found that 13 out of 14 items submitted had a high mean score value while only 1 item obtained a moderate level.

Table 4: Distribution of The Overall Mean Score of BBG, FPTV Students' Perceptions on The Use of Air Conditioning in Terms of Electricity

No.	Items	Mean	Standard Deviation	Interpretation
1.	Electricity consumption increases if air conditioning is used during peak hours compared to other times. For example, at 12 noon.	3.78	1.50	High
2.	The use of air conditioning will increase the consumption of electricity.	4.48	0.85	High
3.	The rate of electricity consumption is influenced by the pattern or manner of use of air conditioning	4.47	0.72	High

4.	The use of air conditioners with inconsistent temperature setting affects the rate of electricity consumption.	4.50	0.87	High
5.	The use of air conditioning over a long period of time will increase the rate of electricity consumption.	4.55	0.91	High
6.	The use of new technology air conditioning can save electricity consumption in the long run.	4.73	0.52	High
7.	The rate of electricity consumption is higher when using 1.5 horsepower air conditioners compared to the use of electrical appliances such as generating other heat of refrigerators, rice cookers or others.	4.02	1.08	High
8.	I would choose to use air conditioning according to the appropriate horsepower requirements to ensure efficient use of electricity.	4.78	0.49	High
9.	I turn off the air conditioning switch when not in use to reduce electricity consumption.	4.43	1.00	High
10.	I set the temperature at 24 ° C or higher to reduce electricity rate consumption.	3.35	1.51	Medium
11.	I would use a timer (sleep mode) to turn off the air conditioning automatically at night.	3.67	1.45	Medium
12.	I would open the door to remove hot air from the room before using the air conditioner.	3.85	1.31	High
13.	I would choose an air conditioner that has the Energy Star logo to save on electricity consumption even though the price is more expensive.	4.53	0.77	High

The item for "I will choose to use air conditioning according to the appropriate horsepower requirements to ensure efficient use of electricity" got the highest mean score of 4.78 (SP = 0.49) as show at Table 4. The second highest item with a mean score of 4.73 (SP = 0.52) is "The use of new technology air conditioning can save electricity consumption in the long run". The medium-high item is "The rate of electricity consumption is influenced by the pattern or manner of use of air conditioning" with a mean reading of 4.47 (SP = 0.72). Meanwhile, the item "I set the temperature at 24 ° C or higher to reduce electricity consumption." with a mean score of 3.35 (SP = 1.51) and “I will use the timer (sleep mode) to turn off the air conditioning automatically at night” with a mean score of 3.67 (SP = 1.45) got the lowest value but still at a moderate level. The results of this study found that 11 of the 13 items presented got the highest value while only 2 items obtained a moderate level.

Table 5: Correlation Between Knowledge Perception and Use of Air Conditioning from The Aspect of Electricity of BBG Students, FPTV

		Knowledge Perception	Usage Perception
Knowledge Perception	Pearson Correlation	1	0.619**
	Sig. (2-tailed)		0.000
	N	60	60
Usage Perception	Pearson Correlation	0.619**	1
	Sig. (2-tailed)	0.000	
	N	60	60

Based on the data obtained as shown at Table 5, it is found that there is a significant and high relationship between the perception of knowledge and the perception of the use of air conditioning from the aspect of electricity that is r = 0.619 at a significant level of 0.01. Therefore, the research hypothesis, Ha who stated that there is a relationship between knowledge and use of air conditioning from the aspect of electricity according to the perception of BBG students, FPTV accepted and Ho who stated that there

is no relationship between knowledge and use of air conditioning from the aspect of electricity according to the perception of BBG students, FPTV rejected.

3.2 Discussions of Student's Perception on Air Conditioning Knowledge among BBG Students

The results obtained show that overall the respondents have a high level of perception of the knowledge of air conditioning from the aspect of electricity. The findings of this study are in line with (Yoshikawa et al., 2016) which introduced some examples of research in air conditioning technology using phase change cooling system where this system helps solve the problem of excessive power consumption by air conditioning system. In another study by the University of Florida (2016), a technology that combines a water heater, a dehumidifier and an air conditioner that can result in more efficient heat transfer was built. This technology provides enhanced dehumidification control in residential buildings resulting in better comfort and significant energy savings The findings of this study are also almost in line with the results of a study by a group of researchers from the National University of Singapore has created a hybrid air conditioner that reduces electricity consumption. This technology uses solar heat as an energy source, increasing the efficiency of hybrid air conditioners as the weather gets warmer. The team believes that solar thermal air conditioning technology can help improve the energy efficiency of buildings, and is a potentially effective way for businesses and households to reduce their operating costs and carbon footprint, thereby reducing energy consumption and lower utility bills by 30% to 55%. %, depending on consumption (National University of Singapore, 2020)

3.3 Discussions of Student's Perception on Air Conditioning Usage among BBG Students

The results of the study show that overall the respondents' interpretation has a high perception of the use of air conditioning in terms of electricity. This is in line with a study by Atomiyme, (2018) who said that failure to determine the value of the heat load generated will affect the cooling capacity as well as the choice of horsepower size of an installed air conditioner. If the calculation of the heat load is not accurate will affect the efficiency of the air conditioning unit to operate in turn resulting in the rate of electricity consumption and high cost. This shows that BBG students, FPTV strongly agree that the use of air conditioning according to the appropriate horsepower requirements is important to ensure the efficient use of electricity.

3.4 The Relationship Between the Level of Knowledge and Use of Air Conditioning among BBG, FPTV Students.

The results show that there is a significant positive relationship and is at a high level between the perception of knowledge and the use of air conditioning from the aspect of electricity among students BBG, FPTV UTHM. The researcher realizes that knowledge will influence the method of use and these two things are interrelated. This to some extent affects the use of electricity for air conditioning (Syed Hussain *et al*., 2013)

4. Conclusion

In general, the study aims to identify the level of knowledge and use of air conditioning from the aspect of electricity according to the perceptions of BBG students, FPTV. The results of the study found that the perception of knowledge and use of students regarding air conditioning is at a high level. These findings show that the university is successful in imparting knowledge and applying that knowledge in the use of air conditioning. Nevertheless, although this study shows high analytical results in air conditioning, exposure to air conditioning such as seminars, programs, workshops, cooperation with industry should be given more emphasis in order to form capable students to face the coming revolution. The researcher hopes that the study conducted can help stakeholders to implement improvements or provide more detailed exposure related to air conditioning from the aspect of electricity.

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