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# STUDENT PERSPECTIVE TOWARD ENERGY CONSERVATION IN UNIVERSITI UTARA MALAYSIA

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## ABSTRACT

Climate change and global warming, driven by $CO_2$ emissions from fossil fuel consumption, are critical issues. In Malaysia, while the energy mix is sustainable, the industry and transportation sectors heavily rely on fossil fuels. To address this, energy conservation is essential to modify behaviors and reduce energy usage, as reliance on conventional energy sources is no longer viable. This study aims to determine the current energy conservation practices among Universiti Utara Malaysia (UUM) students and investigate the relationship between these practices and students' energy conservation perspectives. Focusing on UUM students from academic session A221 (semesters 1 to 7), researchers used quantitative methods, distributing a questionnaire via Google Forms on social media and gathering responses from 377 students. Data analysis using SPSS revealed that the mean attitude score of 31.87 is higher than the levels of awareness, energy conservation knowledge, and subjective norms, indicating that attitude significantly influences students' perspectives on energy conservation. Additionally, there is a positive correlation between awareness levels, energy conservation knowledge, attitudes, and subjective norms. Based on these findings, energy-saving intervention strategies are proposed for student accommodations. The government is urged to implement educational programs and campaigns to enhance awareness and promote energy conservation practices among students. The study highlights the importance of attitudes in shaping energy conservation behaviors and the need for comprehensive educational efforts to foster sustainable practices.

**Keywords:** Energy conservation, actual behavior, energy sustainability, university

## INTRODUCTION

Malaysia has a sustainable power mix including oil, coal and natural gas and also renewable energy such as biofuel, solar, wind and hydro. These resources are processed on a regular basis to provide energy and electricity for buildings, industries and so on which are necessary for the country's growth. Although Malaysia have abundant resources, but the industry and transportation sectors still rely on fossil fuels (Shafie, Othman, & Hami, 2018). Fossil fuels such as natural gas, coal, diesel oil, and fuel oil were used to create electricity with totals 13647 ktoe in 2019 (Malaysia Energy Information Hub, 2020). However, natural resources will be gone in the near future, with a life of fewer than 100 years (Aldhshan et al, 2021). Humans cannot longer rely on conventional energy sources and need to move more environmentally friendly energy sources, particularly energy from nature. Fossil fuels have contributed for more than 80% of energy consumption in recent decades, leading in several issues related to their usage like greenhouse gas emissions and pollution (Environment and Energy Study Institute (EESI), 2021). Human must have public awareness to achieve the aim of energy conservation implementation in order to ensure the sustainability of energy life cycle.

In 2019, coal contributed for 1706 ktoe of the fuels used to produce power (Malaysia Energy Information Hub, 2019). The global have facing the serious climate emergency and all governments must do possible to keep the temperature of surface planet below 1.5°C above level of pre industrial levels, but Malaysia are currently at 1°C higher. It is downright irresponsible to rely on coal at this time (Tan et al., 2021). Air pollution, climate change, water and warm contamination are all natural issues specifically tied to vitality generation and utilize. Vitality utilization is the essential cause of life imperiling the natural issues on earth like climate changes, air pollution, global warming and emissions of greenhouse gases (Farabi et al., 2019). Since the industrial revolution, there has been a growth in greenhouse gases (GHG) emissions caused by humans, especially $CO_2$, which is the most common and dominant of these GHGs (Aldhshan et al., 2021). $CO_2$ emissions are caused by a variety of factors, such as discharge from residential buildings, electricity production, transportation industry and industrial plants. In 2021, average emissions of $CO_2$ of Malaysia were 251.6 million tonnes (World Data Atlas, 2021).

There are 75 percent of this people is expected to live in cities (Rafal Hejne, 2011). This means that as more trendy home equipment, such as air conditioners and refrigerators are used, the rate of energy consumption will rise (Shafie et al., 2011). Furthermore, after air conditioning and refrigerators, lighting is the second largest consumer of electric power (Rozana et al., 2013). Malaysia as tropical country with temperature can up to 35°C, higher consuming air condition in the building (Abualreja & Udin, 2017). The electricity consumption is often highest when all households and companies use air conditioner. Buildings bring 14.3 percent of total energy in Malaysia while the industrial and residential sectors bring 53 percent of electrical energy (Shaikh et al., 2021). The International Energy Agency (IEA) reported in 2015 that showed energy burning activities particularly in the transportation industry are leading to emissions of $CO_2$.

Energy conservation is the choice and behavior to use energy with minimum amount without ignoring the comfort state. Reduced energy consumption is a more viable and longer- term option to energy problems because there should be a limit to the amount to which technical innovation or renewable energy use can solve the issues of energy. Besides, energy management is an active, methodical and orderly way of using energy in a building or institution to satisfy the administration's environmental and economic needs. There have been some strategies be implemented by energy management in university to reduce electricity usage at the campus such as promoting energy-saving behaviors, awareness campaign, attaching stickers, utilizing efficient types of a lamp and fan, using power control systems, establishing a monitoring organization and doing frequent spot checks (Mohd Nadzor et.al., 2020).

Nowadays, students have showed little concern about the consequences. It is shows that they are lack of awareness about environmental problems. People level of awareness is affected by the knowledge they

possess. However, the study about university students' pro-environmental behavior is lacking. This study to determine the current practices of energy conservation among UUM students and to investigate the relationship between current practices and energy conservation perspective among UUM students.

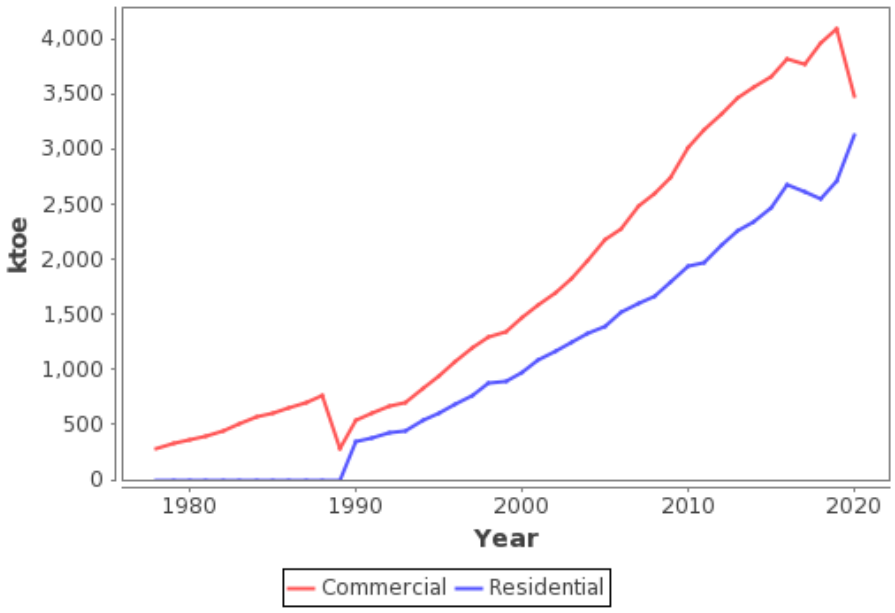
**Energy Consumption**

Over in the past few decades, there has been a steady rise in worldwide consumption of energy, and 40% of all energy use is attributed to buildings (World Energy Council, 2016). More than 40% of the greenhouse gas emissions are caused by the generation of heat and electricity in worldwide (Zulkifli, 2014). Increased energy conservation and improved usage efficiency are quick and affordable ways to minimize the risks and consequences of climate change (Allcott & Mullainathan, 2010).

Malaysia may be a tropical nation in southeast Asia near the equator. The essential causes of Malaysia's rising vitality utilization are populace increment and financial extension. In 2020, Malaysia's vitality utilization expanded to 116 million tons of oil proportionate (Mtoe). Based on figure 1, the building of residential use 3480 kilo tonnes of oil equivalent (ktoe) of power, while commercial buildings can use up to 3124 ktoe in 2020 (Malaysia Energy Information Hub, 2020). The final electricity consumption of commercial and residential is rapidly increasing from 2000 to 2020 year. In 2019, the commercial had the highest number of electricity consumption at 4086 ktoe. The electricity consumption of residential continued to rise, achieving as many as 3124 ktoe in 2020. Statistics show that, depending on the Stated Policies Scenario, the energy consumption is likewise increasing, at a pace of 2.1% annually (World Energy Outlook, 2019).

**Figure 1**

*Data of Energy Consumption in Building from 1980 to 2020 year*

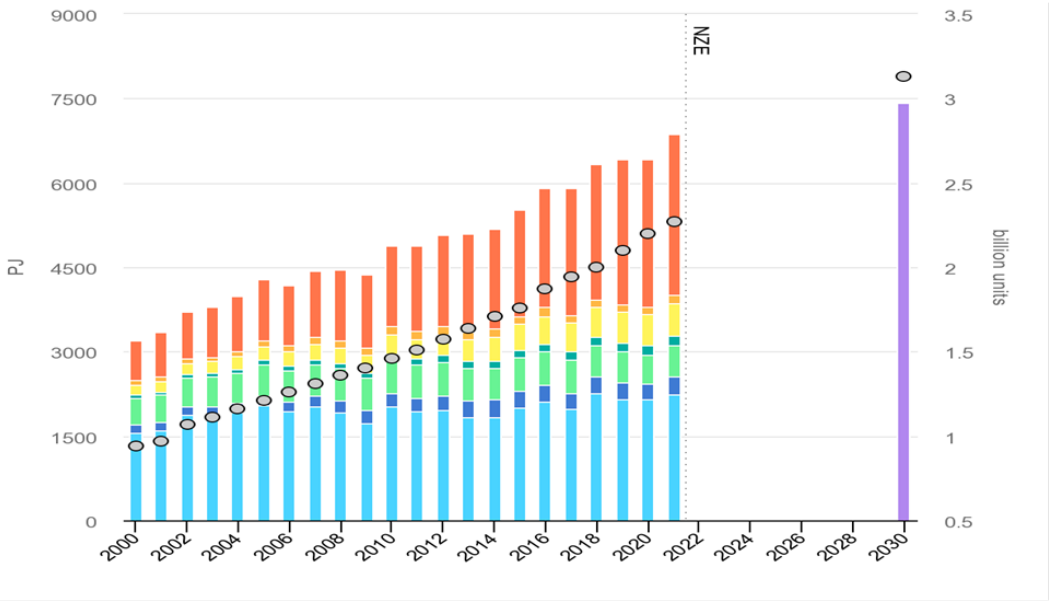



| Year | Final Electricity Consumption (ktoe) | |
|---|---|---|
| | Commercial | Residential |
| 2019 | 4086 | 2715 |
| 2020 | 3480 | 3124 |

Since 2000, the vitality utilization for air conditioners has expanded at an normal rate of 4% every year, twice as quickly as the vitality utilization for lighting or warmed water. Over 2.2 billion units will be in utilize by the year 2021, more than multiplying from 2000 levels. Most extreme vitality utilization is particularly affected by more vitality utilized for air conditioners, particularly on hot climate when gadget is worked to its most extreme capacity. In 2021, the vitality utilization for air conditioners expanded by over 6.5 % universally, with increment in Europe and Asia drawing nearer 8-9%. In spite of the fact that development variables change between countries, higher gadget utilization and warming temperatures are the essential donors. Consumer-purchased air conditioners have persistently developed over the a long time. In any case, in the event that we do not alter to the finest items presently on the advertise and improve the proficiency of the buildings in which they work as well as their environment, the require for vitality for air conditioning in buildings might develop by as much as 40% world by 2030 (Chiara & Rafael, 2022).

**Figure 2**

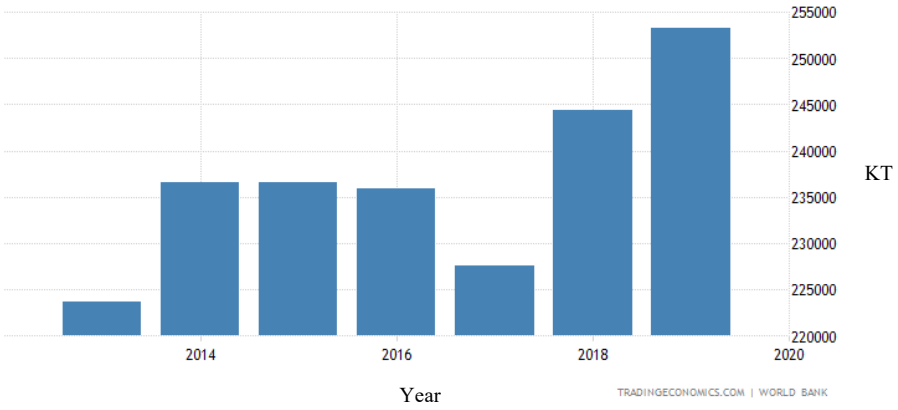
*Final energy consumption for space cooling by region and number of space cooling equipment units in operation units in operation in the Net Zero Scenario, 2000-2030*




Most greenhouse gases related to climate change and global warming come from emitted carbon dioxide. The production of cement and the combustion of fossil fuels are included in the data for emissions of carbon dioxide, but emissions related to land usage, like deforestation are not included. Compared to natural gas, oil releases around 50% more carbon dioxide, while coal releases roughly twice as much. Malaysia's $CO_2$ emissions grew from 244410 KT in 2018 to 253270 KT in 2019. From 1960 to 2019, Malaysia's Emissions of carbon dioxide averaged 89408.84 KT, hitting a whole high of 253270 KT in 2019 (Malaysia $CO_2$ emissions historical Chart, 2019).

**Figure 3**

*Data of Greenhouse Gas Emissions*



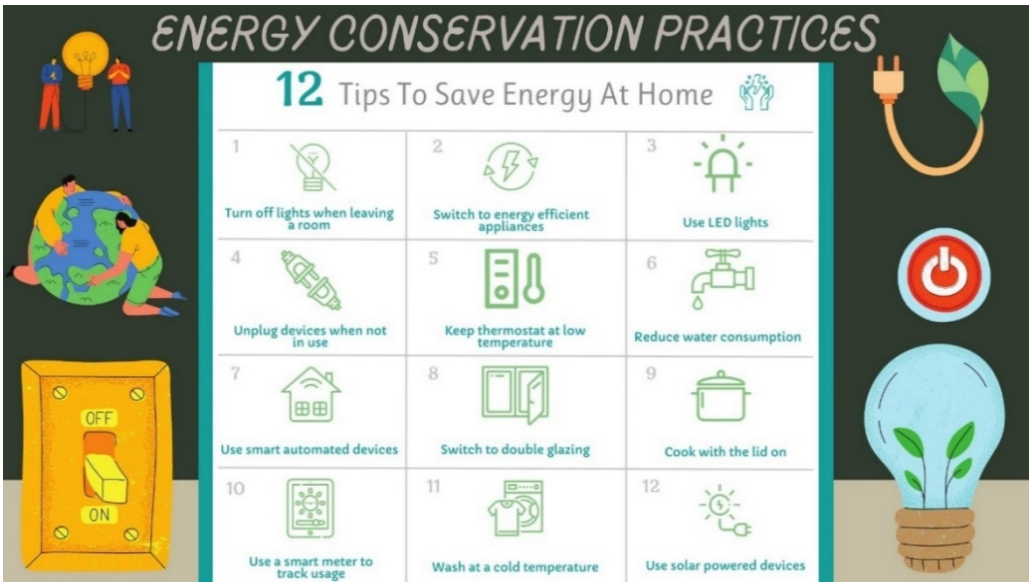

| Actual | Previous | Highest | Unit | Frequency |
|---|---|---|---|---|
| 253270.00 | 244410.00 | 253270.00 | KT | Yearly |

**Energy Conservation Practices**

Energy conservation awareness not as it were works to close the gap between request and consumption of energy, but that also makes a difference to set up in society a mind- set of energy saving and a mindful attitude (Zulkifli, 2014). Energy consumption of Malaysia has increased in the last two decades as because of the combined needs of industrial development and urban expansion (Azlina, 2015). Malaysia's energy consumption will be rise continuously as a developing economy that continues to develop. There has been increased worry about energy use and its adverse influence on the atmosphere as a consequence of rising energy usage (Malaysia Productivity Corporation, 2016). There have been need various aspects of energy conservation to improve energy consumption in campus university. Velazquez et al. (2006) revealed that the most commonly used efforts in achieving sustainable universities are sustainability strategies that decrease energy use. Both effectiveness and conservation can reduce a lot of money and energy (Faghihi et al., 2015). Furthermore, it is important for the government to take into consideration student energy consumption habits when establishing rules for energy policy. The government is expected to adopt a policy through the Ministry of Research, Technology, and Higher Education that is focused on the creation of curriculum for higher education that are charged with energy and shape behavior of students to be energy-efficient (Andi et al., 2016). The figure 4 below show the energy conservation practices. Based on the figure, we can see those 12 tips to save energy at domestic such as turn off lights when clearing out room, switch to vitality effective apparatuses, utilize shrewd mechanized gadgets and so on. There are many ways to conserve energy at home, from simple changes in daily routine to significant financial commitments that not only protect the environment but also decrease energy consumption.

**Figure 4**

*Energy Conservation Practices*




**Level of Awareness**

Every level of awareness has an impact on how people behave and think. The attitude and personality were originally come from the continual and distinct interplay of competing mental factors that are present at three separate states of awareness, such as the preconscious, awareness and unaware (Kendra Cherry, 2020). Every one of those aspects of the mind has a significant impact on behavior. Feelings and behaviors outside of our perception heavily affect our actions, but when we are unconscious of these fundamental impacts (Kendra Cherry, 2020).

**Energy Conservation Knowledge**

Energy-conservation knowledge, which is a reflection of individual energy-conservation skill and experience, states to the objective rules that people discover to reducing the power consumption in the course of daily electricity use. A lack of awareness about energy saving is to blame for the excessive static energy usage of campus buildings. Issues environmental knowledge and pro-environmental conduct are significantly correlated (Wang et al., 2021).

**Attitude**

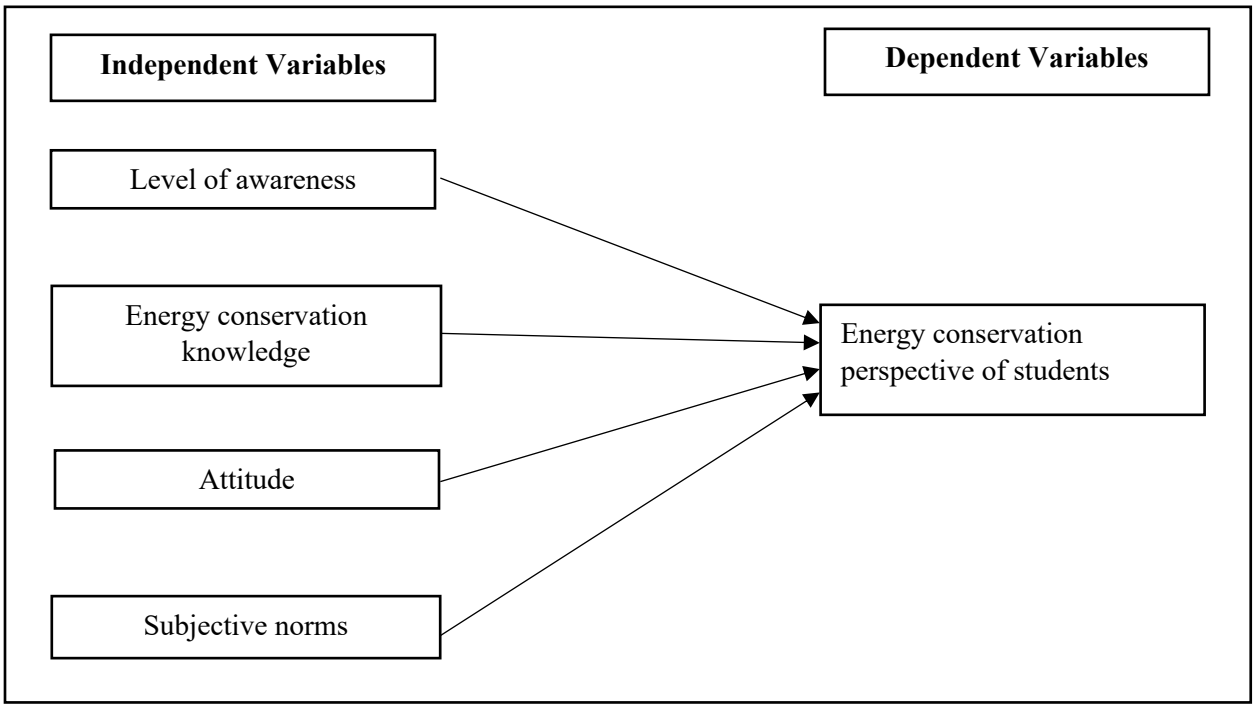
Attitude known to good or bad appraisals of an action. When considering pollution problem, attitude is the most significant element influencing decision to buy saving electricity products (Zhao et al., 2019). Attitudes are lasting in the sense that they are remembered and stay relatively consistent throughout time. Attitudes differentiate from transitory, immediate evaluative responses to an item in this sense. Finally, unlike broad assessment responses such as moods or generic dispositions, attitudes are unique to specific things. By summarizing the pro or con implications of an item and influencing our behavior toward the item, attitudes help us to smoothly and profitably to receive a reward or to escape penalty (Lavrakas, 2008).

**Subjective Norms**

Subjective norms communicated the social desires that a person sees when selecting whether to lock in in a specific activity. Social weight is the essential outside source of natural behavior, agreeing to the concept of dependable natural behavior. Students are under social burden to save energy mostly as a result of management of conserving energy, educational, and activities of club as well as the environment others have established (Wang et al., 2021).

**Figure 5**

*The Conceptual Framework*




The following hypotheses are developed:

H1: Level of awareness is positively related to energy conservation perspective of students

H2: Energy conservation knowledge is positively to energy conservation perspective of students

H3: Attitude is positively related to energy conservation perspective of students

H4: Subjective norms is positively effect on energy-conservation perspective of students

## METHODOLOGY

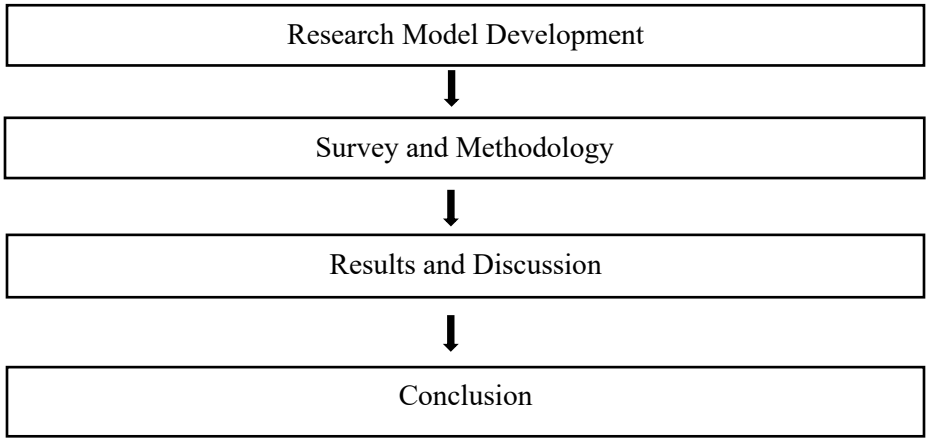
**Research Design**

In this study, researcher conduct quantitative method. Questionnaires used by the researcher to collect data for this study. For this survey, Google form were using to collected the data. Researcher used close-ended questions to get the result of respondents.

From the flow of research design, the first flow is research model development. Research model development includes the introduction and literature review and hypothesis. Introduction is defining the study background, research problem, objectives, scope of study and significance of study. Next, the theories in this study are explained in the literature review. The description includes the meanings, theories and concepts associated to level of responsiveness, energy conservation knowledge, attitude and subjective norms. Next, survey and methodology. This process involves choosing a sample method, developing an instrument, and conducting quantitative research. The methodology applied for this study, which included a questionnaire, questionnaire survey designation and data collection. The third process is results and discussion. This process includes data analysis. This section can support the evaluation of the measurement items and statistical method. The results of the study are described in the article. The last is conclusion. A study conclusion following on the analysis and conclusions reached in earlier chapter was drawn. In addition, suggestions also include for this article (NG, 2012).

**Figure 6**

*Research Design flow*




**Population and Sample**

The researcher used the 5- point Likert scale as measurement in section B to section F. The 5- point Likert skills which is ranked from 1= "Strongly Disagree" to 5 "Strongly Agree". Questionnaires used by the researcher to collect data for this study. In this study, primary and secondary data were utilized. Primary data came from surveys while secondary data came from statistics reports, books and websites. For this research, students of Universiti Utara Malaysia are the target of the population. The total undergraduate students in UUM are 33658 (Universiti Utara Malaysia News, 2022). 377 students in Universiti Utara Malaysia were chosen to serve as the study's primary sample size.

The questionnaire was using Google form uploaded on social media websites and will receiving answers. Students of UUM were given surveys to total in arrange to gather information for the study's expository component. The form is separated into sections A, B, C, D, E and F. The respondents' demographics are presented in Section A. The purpose of this part is to collect the respondents' fundamental data. There are various questions in this section such as gender, race, age, semester and school. Furthermore, section B is the level of awareness of students have 5 questions. Section C which energy conservation knowledge which consists of 4 questions. Besides, section D is the attitude which have 7 questions. Section E is the subjective norms have 5 questions. Last, section F which student perspective to take action to save energy consists of 3 questions.

**Data Analysis Method**

Researchers using statistical software packages (SPSS) of software to characterize facts, identify trends, and verify data for interpretation of results.

## RESULTS

The respondents for this study were 377 UUM students living in Sintok, Kedah. The demographic composition of respondents by gender, race, age, and semester is shown in Table 1. The results showed that the proportion of women was higher than that of men. 55.2% of respondents were female and 44.8% were male. The percentage of Chinese respondents was 41.4% out of her 156 respondents, and the percentage of Malaysian respondents was 35.5% out of her 134 respondents. Additionally, 22.8% or 86 respondents were Indian. The percentage is 0.3% and 1 respondent indicated other. Also, the number of respondents was 99, corresponding to 26.3% of the 18-21 age category. The largest number of respondents, 256, were between the ages of 22 and 24, accounting for 67.9%. Furthermore, the remaining 5.8% or 22 respondents are in the 25-27 age group. Most of the survey respondents were students in their 7th semester or above, 44.3% (167 people). 30.5% (115) of the respondents belong to the semester 1 and 2 categories, and 65 (17.2%) students belong to categories 5 and 6. The Semester 3-4 category received the least responses at 8% (30 respondents).

**Table 1**

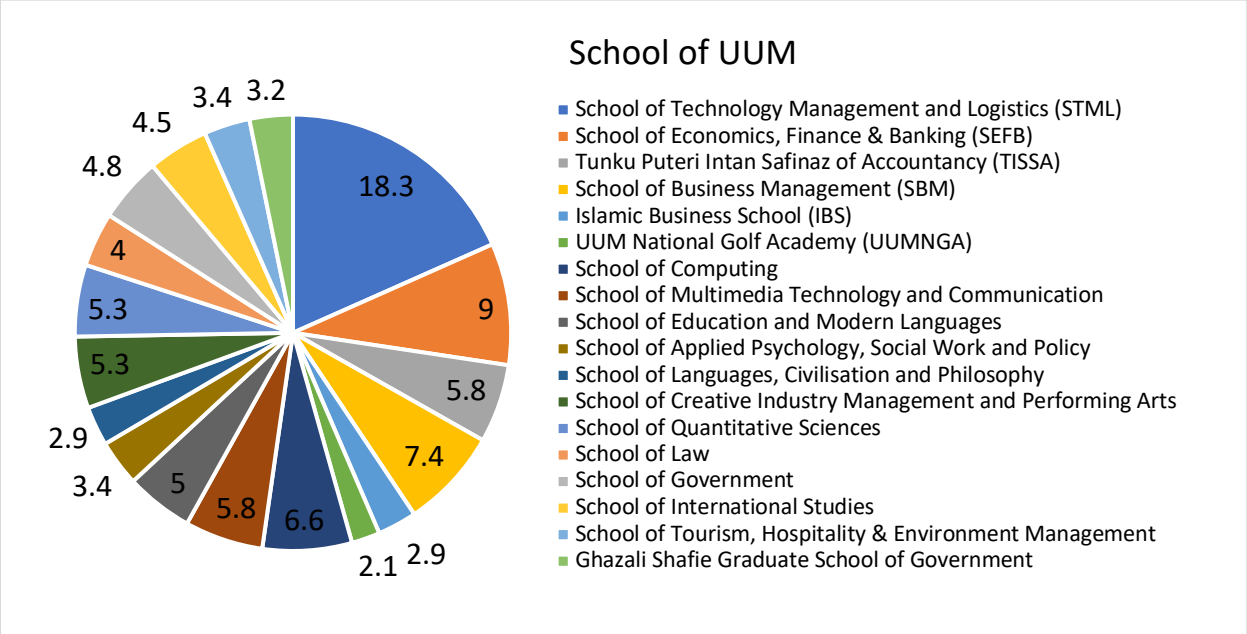
*The Demographic of respondents which includes gender, race, age, semester*

| Question | Responses | Percentage (%) |
|---|---|---|
| Gender | | |
| Female | 208 | 55.2 |
| Male | 169 | 44.8 |
| | | |
| Race | | |
| Chinese | 156 | 41.4 |
| Indian | 86 | 22.8 |
| Malay | 134 | 35.5 |
| Other | 1 | 0.3 |
| | | |
| Age | | |
| 18-21 years old | 99 | 26.3 |
| 22-24 years old | 256 | 67.9 |
| 25-27 years old | 22 | 5.8 |
| | | |
| Semester | | |
| Semester 1-2 | 115 | 30.5 |
| Semester 3-4 | 30 | 8.0 |

| | | |
|---|---|---|
| Semester 5-6 | 65 | 17.2 |
| Semester 7 and above | 167 | 44.3 |

**Figure 7**

*Respondents*




The mostly of respondents are from School of Technology Management (STML) which is 18.3% (69 respondents) while the second are from School of Economics, Finance & Banking (SEFB) which is 9% (34 respondents). Besides, the third mostly of respondents are from School of Business Management (SBM) 7.4% (28 respondents). 6.6% of respondents are from School of Computing (25 respondents). Each 22 of respondents which is 5.8% are come from School of Multimedia Technology and Communication and Tunku Puteri Intan Safinaz of Accountancy (TISSA). Furthermore, each of School of Creative Industry Management and Performing Arts and School of Quantitative Sciences are same respondents who participated to the questionnaire which is 5.3% (20 respondents). The least of respondents are come from UUM National Golf Academy (UUMNGA) which is 2.1% (8 respondents).

**Figure 8**

*Level of awareness of students*

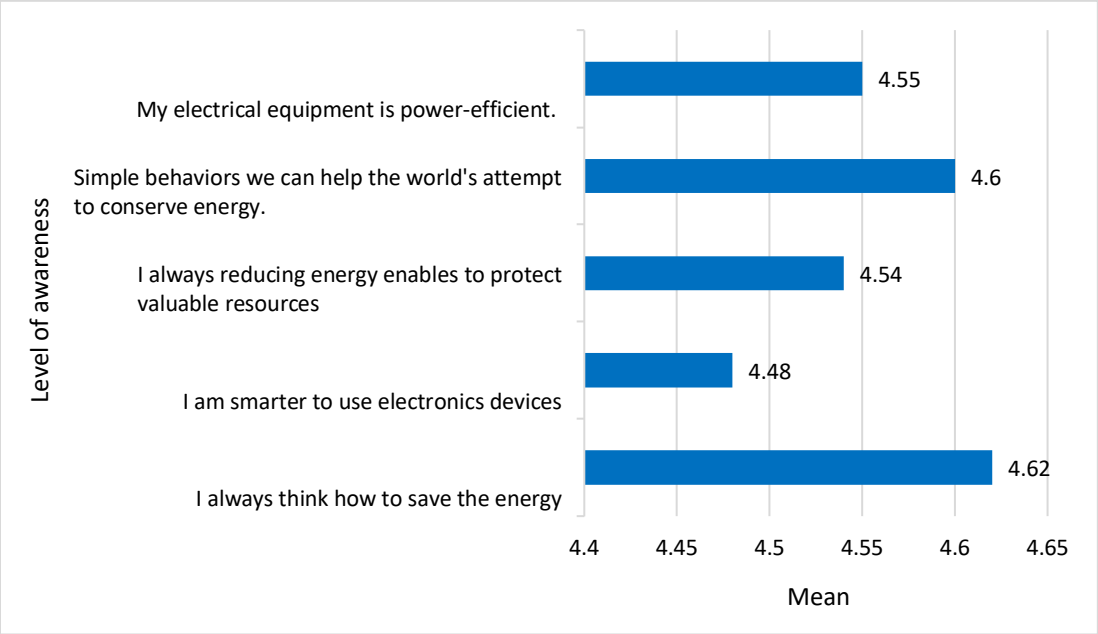



Figure 8 shows the level of awareness of students. The majority of the students have always think how to save the energy. The mean is μ= 4.62 which is the highest of mean. Besides, students also have simple behaviors help the world attempt to conserve energy (μ= 4.60). This show that students have awareness for use less energy. As a result of changing attitudes and behaviors brought about by awareness, students are more likely to look for methods to conserve energy. They are also more likely to utilize and maintain energy-saving technology long after it has been installed (NG, 2012).

Besides, students also agree to always reduce energy enables to protect valuable resources. This mean that students have perception to save energy. Students also agree to have electrical equipment with power-efficient. It shows that no obvious differences but it can be deduced that students' intention to save energy.

The lowest mean recorded is 4.48 for smarter to use electronics devices. Through advancements in energy production and energy gadgets, IR 4.0 is focusing energy efficiency more and more. Energy efficiency is creating the same item or service with little energy increases. Energy efficiency utilizes the greatest technology or systems to lower energy usage, such as hybrid systems, LED lights, and software solutions (Mohd Haddouche & Adrian, 2022). They don't develop appropriate energy-saving practices when using devices for lengthy periods of time.

This awareness contributes enormously to the high awareness level toward energy saving as an entirety, with recorded implies of 4.62, 4.60 and 4.55 individually. This can be resolved that students have high level of awareness for saving the energy.

**Figure 9**

*Energy Conservation Knowledge*

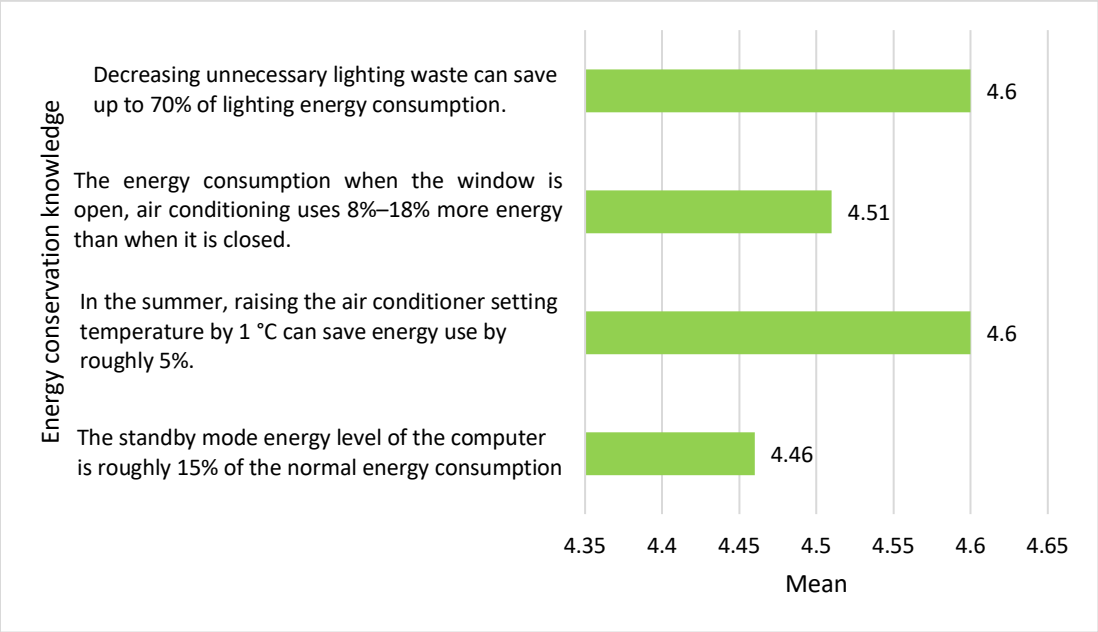



Figure 9 shows that the energy conservation knowledge of students. Based on the questions regarding the energy conservation knowledge of respondents, it can be seen that raising the air conditioner setting temperature by 1°C can save energy use by roughly 5% in the summer and decreasing unnecessary lighting waste can save up to 70% of lighting energy consumption are the highest mean range with a mean of 4.60. This show that students have some knowledge about air conditioner and lighting on how to save energy.

Student understood everything of efficiency in energy knowledge they have learned via reasoning, knowledge, or experience about the facts, ideas, and methods related to energy and how to use them more wisely (Syaiful et al., 2016). Knowledgeable students are more passionate in showing energy-saving behaviors.

Student also have the knowledge about the energy consumption when the window is open, air conditioning uses 8%–18% more energy than when it is closed ($\mu$= 4.51). The lowest mean recorded is 4.46 the standby mode energy level of the computer is roughly 15% of the normal energy consumption. This means that students are agree fewer equipment should be left in standby mode if it is not needed. The school doesn't think about implementing programs to increase energy awareness.

Besides, poor planning and a lack of knowledge of sustainability are to blame for the failure of these programs. Therefore, before beginning any sustainability projects, university stakeholders must have a solid understanding of the idea of sustainability. In fact, a number of obstacles are impeding campus sustainability activities, including the lack of cooperation among supporters and important constituents and the low priority given to environmental concerns on campus (Ng et al., 2010).

**Figure 10**

*Attitude*

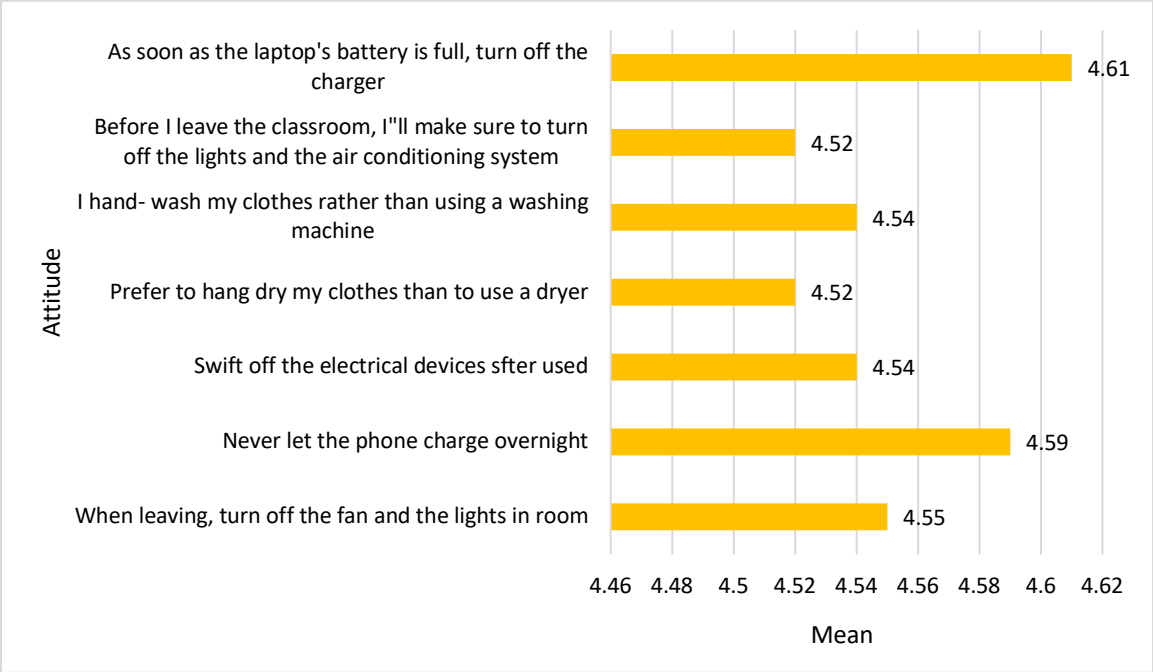



Figure 10 shows that the attitude of students. The respondents make a habit of as soon as the laptop's battery is full, turn off the charger (μ= 4.61) and they never let the phone charge overnight (μ= 4.59). Based on the questions, the highest mean is as soon as the laptop's battery is full, turn off the charger. They turn off the charge when fully charge the battery of devices for keep their battery healthy of devices. We can see that students only will care about their devices and never let the devices to overnight.

The confusing aspect is that there is minimal difference between the activities that receive high grades and those that receive really bad ones. Respondents are willing to do these actions for save energy but the attitude for prefer to hang dry my clothes than to use a dryer and make sure to turn off the lights and the air conditioning system before leave the classroom is relatively low (μ= 4.52). The attempts to preserve electricity are unimportant to students in this age range. The students felt responsible for paying for the electricity but were unaware of the rationale behind the reduction in electricity. They will not take the initiative to save energy facilities of schools. These students exhibit no dedication or care for school. This might account for the subjective norm's little impact on the study's participants' behavioral intention to save energy. Loss of the ability, reluctance, and social issues were thought to be the primary barriers preventing people from engaging in energy-saving actions (Vringer et al., 2007).

**Figure 11**

*Subjective Norms*

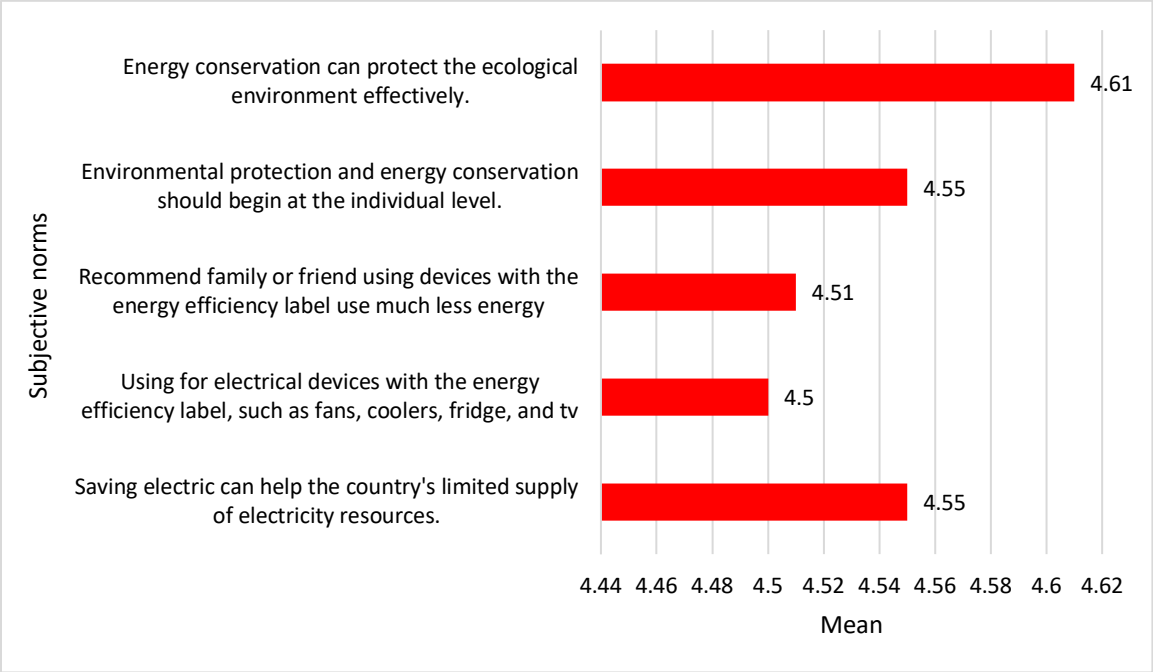



Figure 11 shows that the subjective norms of students. Energy conservation can protect the ecological environment effectively of respondents with a high mean indicated by μ= 4.61. This shows that mostly students have the belief that reduce electricity consumption can protect and help the environment. Subjective norms are influenced by beliefs and the ideas associated with acting out (Schultz et al., 2008). This caused each person to behave how their family, friends, and society would have wanted. According to the study done among university students who live in dormitories of campus found subjective norms and peer pressure can be utilized as an effective way to motivate students to reduce their energy use (Hassan et al., 2009). Social psychology theories demonstrate that groups such as friends, family and other media platforms play important roles in encouraging and upholding energy conservation as a way to save the environment (Costanzo et al., 2016).

The second highest mean with μ= 4.55 which are saving electric can help the country's limited supply of electricity resources and environmental protection and energy conservation should begin at the individual level. Using for electrical devices with the energy efficiency label, such as fans, coolers, fridge, and tv is the lowest mean among these questions with μ= 4.50. This shows that students think that not necessary using electrical devices with energy efficiency label can be save energy. Energy efficiency (EE) labeling is important since it offers a variety of details that may be used as a guide when consumers are choosing products place value on monetary and non-monetary attributes based on their preferences.

With different types of information, EE labeling can influence students' choices regarding energy-efficient household appliances. Students first decide how much they are willing to spend on an appliance based on the features listed on the EE label. For example, the decision to purchase a table fan is influenced by many variables, including the most popular brands on campus, their wide distribution, and the importance of the EE label to students when purchasing the product. Masu. The operating costs of some appliances can be significantly higher than the purchase price (Mahirah et al., 2021). Some students cannot afford to purchase products with the EE label. From these results show that students have high subjective norms for protect the energy.

**Figure 12**

*Overall Mean Score*

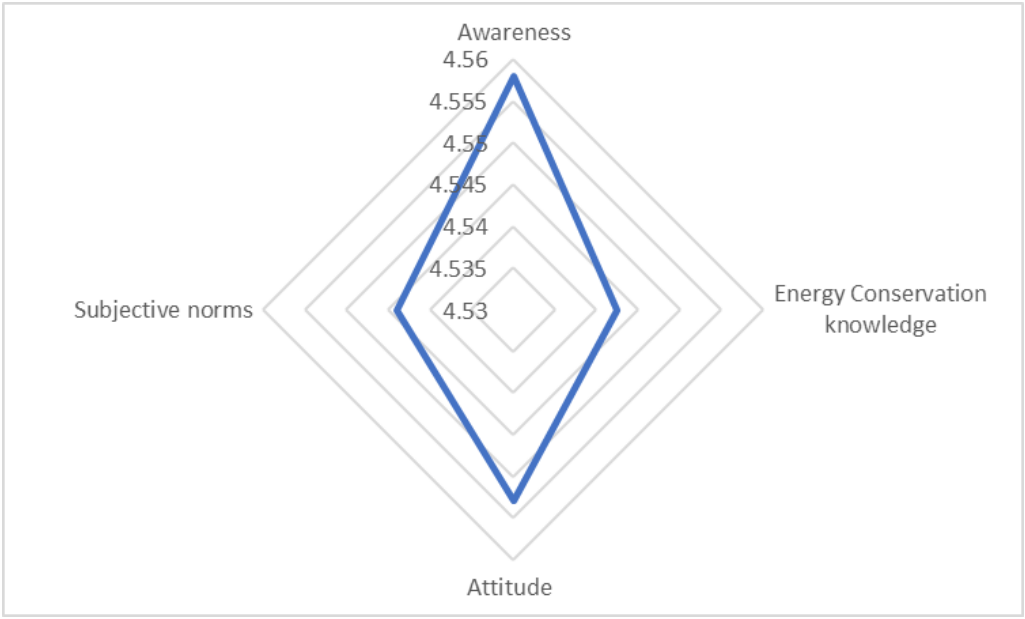



Figure 12 shows the total mean of awareness, knowledge, attitude and subjective norms. Based on the figure, attitude is the highest mean with total 31.87. The second highest mean of these current practices is awareness with 22.79. The mean of subjective norms is 22.72. While the energy conservation knowledge is the lowest among others, which is 18.17. There are many students agree that attitude can influence perspective of respondents toward energy conservation. Attitude can influence intention to save energy. Students with positive attitude will take steps to reduce energy consumption. Results of a survey conducted in China revealed that attitude had a favorable influence on the intention to save energy (Wang et al., 2018).

The second highest mean is awareness. Students who are aware will reconsider their actions and make little adjustments to save on energy use. They have energy- saving mentality and will take action to save energy. In addition, subjective norms are the third highest mean among others. Subjective norms can influence intention of individual to behave in an environmentally friendly way. The change in group behavior of students might have an impact on how people feel and behave (Razlin &Low, 2019). For example, in an experiment conducted in educational facilities, social norm feedback served as a successful energy-saving measure (Wong-Parodi et al., 2019). When the employees were notified of their coworkers' energy usage, they used much less energy.

Energy conservation knowledge is the lowest mean and to be considered as agree. Students with more energy conservation knowledge will take action to reduce energy. From the figure, we can see that students consider awareness, energy conservation knowledge, attitude and subjective norms influences the perspective toward energy conservation.

With a high level of awareness, energy conservation knowledge, attitude and subjective norms of energy conservation, we can see these are correlated. It might be said that perspective of respondents to take action to save energy behind their awareness, knowledge, attitude and subjective norms.

**Table 2**

*Reliability Analysis*

| Items of Variable | Cronbach's Alpha | N of items |
|---|---|---|
| **Energy conservation perspective of students** | 0.702 | 3 |
| **Level of awareness** | 0.719 | 5 |
| **Energy conservation knowledge** | 0.625 | 4 |
| **Attitude** | 0.814 | 7 |
| **Subjective norms** | 0.767 | 5 |

Based on Table 2, the data has been calculated the internal consistency of reliability by Cronbach alpha coefficient. Correlation analysis is a simple and direct method for measuring relationships between quantitative data. It can analyze relationships between variables and the strength of relationships. Generally, a correlation greater than 0.7 indicates a very close relationship. Items in the survey questionnaire went through the reliability analysis in accordance with the extracted four current practices. Students voted the attitude as the most factor that can influence energy conservation perspective of students with 0.814. Subjective norms are the second place highest with 0.767 and level of awareness are the third place with 0.719. Energy conservation knowledge is the lowest value that influence energy conservation perspective of students with 0.625.

**Table 3**

*Correlation Analysis*

| | | **Perspective** | **Awareness** | **Knowledge** | **Attitude** | **Subjective Norms** |
|---|---|---|---|---|---|---|
| **Perspective** | Pearson Correlation | 1 | .562** | .498** | .729** | .715** |
| | Sig. (2- tailed) | | < .001 | < .001 | < .001 | < .001 |
| **Awareness** | Pearson Correlation | .562** | 1 | .662** | .667** | .652** |
| | Sig. (2- tailed) | < .001 | | < .001 | < .001 | < .001 |
| **Knowledge** | Pearson Correlation | .498** | .662** | 1 | .604** | .575** |
| | Sig. (2- tailed) | < .001 | < .001 | | < .001 | < .001 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Attitude** | Pearson Correlation | .729** | .667** | .604** | 1 | .811** |
| | Sig. (2- tailed) | < .001 | < .001 | < .001 | | < .001 |
| **Subjective Norms** | Pearson Correlation | .715** | .652** | .575** | .811** | |
| | Sig. (2- tailed) | < .001 | < .001 | < .001 | < .001 | |

** Correlation is significant at the 0.01 level (2- tailed)

Based on the Table 3 the results of Pearson Correlation Analysis of the four factors which are awareness, knowledge, attitude and subjective norms toward perspective of students are moderately positive correlation relationship as the value between 0.4 to 0.7. Correlation analysis shows that attitude dimensions have the highest correlation of (r= 0.792). The second highest correlation is the subjective norms dimensions of (r= 0.715). Dimension of awareness of (r= 0.562). The knowledge dimension of (r= 0.498) is the lowest correlation.

## CONCLUSION

In conclusion, the level of awareness, energy conservation knowledge, attitude and subjective norms are evaluated in this article. Overall, the result shows that this study have achieve its objectives. Based on the objective 1, the level of awareness, energy conservation knowledge, attitude and subjective norms is high, which mean that perspective of students to energy conservation is high. Besides, the mean of attitude is higher than the level of awareness, energy conservation knowledge and subjective norms, which mean that attitude is most influences perspective of students to energy conservation.

Based on the analysis performed, the responses obtained student perspective toward energy conservation in Universiti Utara Malaysia (UUM) is extremely positive. Based on the objective 2, the relationship between level of awareness, energy conservation knowledge, attitude and subjective norms are positive correlated. This shows that these independent variables considerable effect on energy conservation perspective of students. If level of awareness, energy conservation knowledge, attitude and subjective norms the higher, the energy conservation perspective of students at the higher.

Governments should implement attractive and targeted education programs. Furthermore, awareness campaigns should be an important part of national energy policy. A comprehensive strategy allows to launch a variety of media campaigns. These media initiatives help increase student awareness. The main goal is to encourage behavior change in favor of sustainable energy. For future studies, recommend conducting research in all public universities in Malaysia such as USM, UKM, etc.

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## REFERENCES


Abualreja, H. M., & Udin, Z. M. (2017). Green Building Toward Construction Sustainability: Energy Efficiency with Material & Design Aspects. Journal of Technology and Operations Management, 100-109.

Aldhshan, S. R., Abdul Maulud, K. N., Wan Mohd Jaafar, W. S., Karim, O. A., & Pradhan, B. (2021). Energy consumption and spatial assessment of renewable energy penetration and building energy efficiency in Malaysia: A review. *Sustainability, 13(16),* 9244.

Allcott, H. & Mullainathan, S. (2010). Behavior and energy policy. *Science, 327*(5870), 1204-1205

Azlina, A., Abdullah, E. S. Z. E., Kamaludin, M. & Radam, A. (2015). Energy conservation of residential sector in Malaysia. *Journal of business and social development,* 3(2), 51-62.

Cherry, K. (2019). The Preconscious, Conscious, and Unconscious Minds. https://www.verywellmind.com/the-conscious-and-unconscious-mind-2795946

Chiara Delmastro and Rafael Martinez-Gordon. (2022, September). Space cooling. IEA. https://www.iea.org/reports/space-cooling

Costanzo M, Archer D, Aronson E and Pettigrew T 1986 Energy conservation behavior: The difficult path from information to action *Am, Psychol*. 41 521-8

Environmental and Energy Study Institute (EESI). (2021, July 22). Fossil fuels. Environmental and Energy Study Institute | Ideas. Insights. *Sustainable Solutions*. https://www.eesi.org/topics/fossil-fuels/description

Faghihi, V., Hessami, A. R. & Ford, D. N. (2015). Sustainable campus improvement program design using energy efficiency and conservation. *Journal of Cleaner Production, 107*, 400-409

Farabi, A. (2019). Energy consumption, carbon emissions and economic growth in Indonesia and Malaysia. *670216917*.

Hassan, M. G., Hirst R, Siemieniuch C & Zobaa, A. F. (2009). The impact of energy awareness on energy efficiency. *International Journal of Sustainable Engineering,* 2(4), 284-97

IEA. World Energy Outlook 2019, Paris. Available online: https://www.iea.org/reports/world-energy-outlook-2019.

Kamaludin, M. (2021). Energy efficiency labelling: investigating students' preferences and awareness on the energy-efficient electrical appliances in hostel. *670216917.*

Lavrakas, P. J. (2008). *Encyclopedia of survey research methods.* Sage publications.

Malaysia CO2 emissions - 2022 data - 2023 forecast - 1960-2021 historical - Chart. (n.d.). Trading Economics | 20 million Indicators From 196 Countries.

Malaysia Productivity Corporation. (2016). Malaysia.

Mansor, R., & Sheau-Tingi, L. (2019, September). The psychological determinants of energy saving behavior. *In IOP Conference Series: Materials Science and Engineering* (Vol. 620, No. 1, p. 012006). IOP Publishing.

Mohamad Nadzor, D. H., & Mohd Nawi, M. N. (2020). Strategy for improve energy management efficiency at male student residence hall, Yayasan Albukhari, UUM. *In Symposium on Technology*

*Management and Logistics (STML Go Green) 2019: Management of Technology, Volume 1* (Vol. 1, No. 35, pp. 85-87). Universiti Utara Malaysia.

Mohamed Haddouche & Adrian Llinca. (2022, June 15). Relation between energy efficiency and industry 4.0. *Encyclopedia MDPI | Scholarly Community*. https://encyclopedia.pub/entry/21585

Rafal Hejne. (2011). American Dream. https://globalurban.org/American_Dream.pd

Schultz P W, Khazian A and Zaleski A (2008). Using normative social influence to promote conservation among hotel guests. *Social Influence,* 3(1), 4-23

Shafie, S. M. Mahlia, T. M. I. Masjuki, H. H., & Andriyana, A. (2011). Current Energy Usage and Sustainable Energy in Malaysia: *A Review. Renewable and Sustainable Energy Reviews. 15(9)*: 4370–4377.

Shafie, S. M., Othman, Z., & Hami, N. (2018). PADDY RESIDUE AS FEEDSTOCK IN ELECTRICITY GENERATION: REDEMPTION OF LIFE CYCLE EMISSIONS AND COST ANALYSIS. Journal of Technology and Operations Management, 55-66.

Shaikh, P.H.; Nor, N.B.M.; Sahito, A.A.; Nallagownden, P.; Elamvazuthi, I.; Shaikh, M.S (2017). Building energy for sustainable development in Malaysia: *A review. Renewable and Sustainable Energy Reviews, 75*, 1392–1403.

Statistics. (2020). Malaysia Energy Information Hub. https://meih.st.gov.my/statistics;jsessionid=350AE11D4188DF55A0741ED356E490B4

Syaiful, A. Z. (2016). *The effect of knowledge and attitude of student towards save energy behavior in Makassar city* (Doctoral dissertation, Universitas Negeri Makassar).

Tan, C. H., Ong, M. Y., Nomanbhay, S. M., Shamsuddin, A. H., & Show, P. L. (2021). The influence of COVID-19 on global CO2 emissions and climate change: A perspective from Malaysia. *Sustainability, 13*(15), 8461.

Universiti Utara Malaysia News (2022). 4,067 new students begin their journey at uum. Universiti Utara Malaysia. https://www.uum.edu.my/news-highlights/4-067-new-students-begin-their-journey-at-uum

Velazquez, L., Munguia, N., Platt, A. & Taddei, J. (2006). Sustainable university: what can be the matter? *Journal of Cleaner Production, 14*(9-11), 810-819.

Vringer, K., Aalbers, T., & Blok, K. (2007). Household energy requirement and value patterns. *Energy Policy*, *35*(1), 553–566.

Wang, J., Yi, F., Zhong, Z., Qiu, Z., & Yu, B. (2021). Diversity and causality of university students' energy-conservation behavior: Evidence in hot summer and warm winter area of China. *Journal of Cleaner Production, 326*, 129352.

Wang, S., Lin, S. & Li, J. (2018). Exploring the effects of non-cognitive and emotional factors on household electricity saving behavior. *Energy Policy, 115,* 171-180

Wong-Parodi, G., Krishnamurti, T., Gluck, J. & Agarwal, Y. (2019). Encouraging energy conservation at work: A field study testing social norm feedback and awareness of monitoring. *Energy Policy, 130,* 197-205.

World Data Atlas. (2021, October 14). Malaysia CO2 emissions, 1970-2021 - knoema.com. Knoema. https://knoema.com/atlas/Malaysia/CO2-emissions

World Energy Council (2016). World Energy Resources. [online] Available at: https://www.worldenergy.org/wp- content/uploads/2016/10/World-Energy Resources-Full-report 2016.10.03.pdf

Yen, N. S. (2012). Energy awareness and energy-use behaviour of students in Malaysian university.

Yen, N. S., Shakur, E. A., & Wai, C. W. (2010). Energy conservation opportunities in Malaysian universities. *Malaysian Journal of Real Estate*, *5*(1), 26-35.

Zakaria, R., Amirazar, A., Mustaffar, M., Mohammad Zin, R., & Abd Majid, M. Z. (2013). Daylight Factor for Energy Saving in Retrofitting Institutional Building. In *Advanced Materials Research* (Vol. 724, pp. 1630-1635). Trans Tech Publications Ltd.

Zhao, S., Song, Q., & Wang, C. (2019). Characterizing the energy-saving behaviors, attitudes and awareness of university students in Macau. *Sustainability, 11*(22), 6341.

Zulkifli, N. E. I., Jamaludin, A. A., Ilham, Z., Jani, R., & Mokhtar, M. I. (2018). The Daily Practice of UM Students on Electricity Usage towards Energy Conservation. *Climate Change and Campus Sustainability, 2,* 133-146.