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Energy Conservation Behavior among Students at a Private Higher Learning Institution

[1]Zalina Hashim, [2]Nur Farzana, [3] Siti Mariam and [4]Rosima Alias

[1] *College of Engineering, Universiti Tenaga National, 43000 Kajang, Malaysia.*
[2] *College of Graduate Business School, Universiti Tenaga National, 43000 Kajang, Malaysia.*
[3] *College of Graduate Business School, Universiti Tenaga National, 43000 Kajang, Malaysia.*
[4] *College of Graduate Business School, Universiti Tenaga National, 43000 Kajang, Malaysia.*

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ABSTRACT

Background: This study uses Theory of Planned Behavior (TPB) to examine energy conservation behavior among a private university student. This study involved 367 students from technical and non-technical faculty. Result depicted that there is no significant different between technical and non-technical students towards intention to perform energy conservation. Finding in this study also showed that perceived behavioral control (PBC) is the highest contributors towards intention to perform energy conservation among students. Towards the actual behavior, results demonstrate that intention is the mediator that will influence the students energy conservation behavior.

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INTRODUCTION

The world is afflicted by various energy sustainable issues such as depletion of energy resources, expensive energy price and climate change (Low, Abdul Hakim and Choong, 2011). Pressures are mounting among global community to act immediately to protect the energy exhausted planet. According to Southeast Asia Energy Outlook Report 2013, Malaysia is the third largest energy consumer among ASEAN countries after Indonesia and Thailand. At an average rate of 1.2% increase per annum, the country's population is expected to reach 39 million by 2035. This would result in an increased in energy demand by 71%. Thus, relevant effort needs to be taken to reduce energy threat before it causes opposing impact to the ecosystem. One way to tackle the issue is through energy conservation approach (Joechem, 2000; Geethanjali, Hansa and Daniel, 2007).

According to Low *et al* (2011), there are two approaches that can be used to promote energy conservation among users. First, structural energy conservation which refers to the application of technologies instrument, tools or alternatives energy resources and second, non-structural energy conservation which emphasizes on improving or changing of the user's behavior on energy use to achieve energy reduction. However, it was reported that structural energy conservation only migrates the effect of energy use by human rather than curing the energy problem we are experiencing (Low *et al*., 2011; Kempton and Schipper, 1994). Hence, the best way to cope with the issue is to concentrate on the behavioral aspect which is the focus of this study.

Previous research reported that although many studies explored pro-environmental behavior (Ahmad *et al*, 2010; Saripah *et al*., 2013), research conducted on the use of energy by student at higher learning institutions is still lacking (Hafizal, Hamid and Maimunah, 2012). According to Galis and Gyberg (2011) student are the main energy wasters in higher educational institutions. This view is line with other researchers such as Mulhieldeen *et al*. (2008) and Ting *et al*. (2010). So what makes the students feel difficult to perform the energy conservation act? And what factors influence them to perform energy conservation? To answer those questions, there is a need to identify the reason(s) behind low energy conservation behavior among students. This is important due to this generation is the future consumer and capable in making a difference in the next 50 years. With their involvement, it will motivate and serve as a role model for others such as family and friend. In future, we will be able to reduce energy threat and secure the energy.

Corresponding Author: Zalina Hashim, College of Engineering, Universiti Tenaga National, 43000 Kajang, Malaysia.

According to Lynch and Martin (2013), the Theory of Planned Behavior (TPB) is a plausible model to be us to measure energy conservation behavior. According to these authors, TPB is a successful framework in explaining pro-environmental behavior including energy conservation. Thus, by using TPB construct, this study aims to identify energy conservation behavior among student at a higher learning institution. The objectives of this study are presented below:

1. To identify the level of intention to perform energy conservation between technical and non-technical students.
2. To identify the contribution of attitude, subjective norm and perceived behavioral control towards intention to perform energy conservation.
3. To identify the contribution of intention towards behavior to perform energy conservation.
4. To identify intention as the mediator towards behavior to perform energy conservation.

1. Methodology:

Participants:

In the present study, a questionnaire was distributed among 400 sample respondents at a private higher learning institution, Malaysia. Out of 400, only 390 questionnaires were filled up and collected. From the 390 questionnaires, 23 of the uncompleted questionnaire were unusable, leaving a total of 367 usable replies.

In this study, the study group included 353 (96.2%) Malaysian and 14 (3.8%) non-Malaysian students. Of the total sample, 180 (49%) were students taking technical degree (e.g. engineering and IT) and 187 (51%) were students taking non-technical degree (e.g. business and accounting).

Instruments:

The survey questionnaire consists of Part A and Part B. Part A of the survey consists of several demographic questions. Part B consists of four questions on attitude, adapted from Gardner and Ashworth (2007) which measures the perception of respondent tendency to respond positively or negatively towards energy conservation. There are seven questions on subjective norms adapted from Gardner and Ashworth (2007) and Titah and Barki (2009) which measures the respondent perception on the influence of people who are important to them in conducting energy conservation. Seven questions on perceived behavioral control (PBC) which measures the respondent perception on their ability to perform energy conservation behaviour adapted from Gardner and Ashworth (2007). For intention, the questions are adapted from Gardner and Ashworth (2007) which measures the respondent intention towards performing energy conservation act. All questions for attitude, subjective norm, PBC and intention are measured using a 5-point Likert-scale ranging from 1-srongly disagree to 5-strongly agree. Respondents are also asked on the actual energy conservation behavior performed by them using questions adapted from Rogerson, Bellingham and Shevtsova (2009) using a 5-point Likert-scale ranging from 1-never to 5-almost always. The questions were pilot tested in order to improve the validity and reliability of the questionnaire.

Reliability and Validity:

Result of reliability analysis for the actual data is presented in Table 1. The Cronbach's Alpha for attitude, subjective norm, perceived behavioral control (PBC) and intention is greater than 0.7 which indicates inter-item consistency. According to Zikmund (2003), the reliability of data set is acceptable if Cronbach's Alpha is above 0.7.

Table 1: Reliability Test Result.

Variables	Cronbach's Alpha
Attitude	0.852
Subjective Norm	0.884
Perceived Behavior Control (PBC)	0.868
Intention	0.854
Behavior	0.841

2. Results:

Confirmatory Factor Analysis (CFA):

Confirmatory Factor Analysis (CFA) is used to confirm the validity and reliability of the variables used in the study. The CFA result indicates that the standardized coefficient of the relations between factor and items ranged from 0.5 to 0.82 as shown in Figure 1 below. From the analysis conducted the *Comparative Fit Index (CFI)* and *Goodness of Fitness Index (CFI)* value is 0.8. According to Zainudin (2012), the value more than 0.8 is acceptable and considered a good fit. To evaluate the goodness of fit of the model, the *Root Mean Square Error of Approximation (RMSEA)* is used. The RMSEA value of this study is 0.08. According to Brown and Cudeck (1993) RMSEA value smaller than 0.08 indicate acceptable fit while the values greater than 0.1 leads to model rejection.

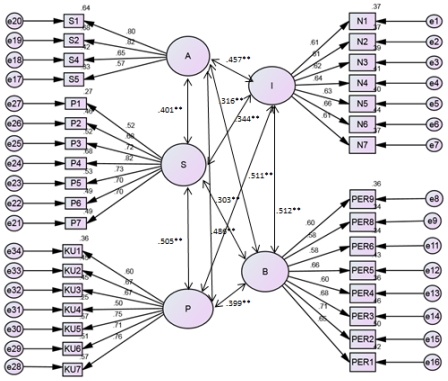

Fig. 1: Confirmatory Factor Analysis (CFA).
A - attitude
S - subjective norm
P - perceived behavioral control
I - intention
B - behavior.
T-test Analysis

Table 2: T-test result for technical and non-technical students.

College		N	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Intention	Technical	180	3.8698	.53330	1.446	365	.149
	Non-technical	187	3.7853	.58422			

Based on the result presented in Table 2 the mean value of technical students (M=3.8698) is slightly higher compared to non-technical students (M=3.7853). However, in overall, the result indicates that there is no significant different between both group. A t-test failed to reveal a statistically reliable difference between the mean number of intention that the technical student has (M=3.8698, s=0.53330) and the non-technical student (M=3.7853, s=0.58422), t=1.446, p=0.149 which is more than p< 0.05. This indicate that there is no significant different towards intention to perform energy conservation between technical and non-technical students

Correlation Analysis:

Table 3: Correlation result of the variables.

	1	2	3	4	5
Attitude	1	.401**	.486**	.457**	.316**
Subjective Norm		1	.505**	.344**	.303**
Perceived Behavioral Control			1	.511**	.399**
Intention				1	.512**
Behavior					1

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

Result of Correlation Analysis is presented in Table 3 above. The relationship reading of the variables in this study is based on Davies (1971) interpretation of correlation scale. The result illustrates that there is a positive and moderate relationship between attitude and intention at 0.457** significant at 0.01 level (2-tailed). For subjective norm, the correlation analysis depicted that there is a positive and moderate relationship between subjective norm and intention at 0.344** significant at 0.01 level (2-tailed). The result also shows that there is a positive and strong relationship between perceived behavioral control and intention 0.511** significant at the 0.01 level (2-tailed). Finding in the Table 3 also illustrates the positive and strong relationship between intention and behavior at 0.512** significant at the 0.01 level (2-tailed).

Regression Analysis:

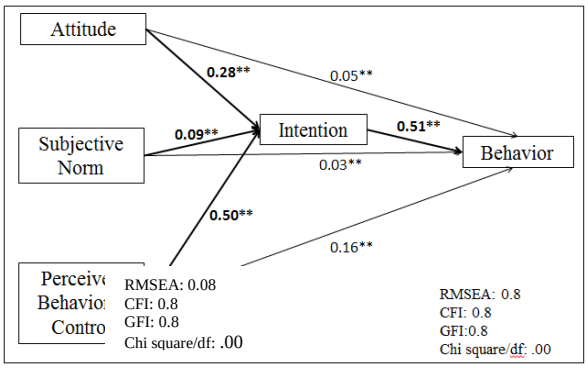

Fig. 2: Contribution of the variable.

Figure 2 illustrates the contribution of attitude, subjective norm and perceived behavioral control towards intention and behavior to perform energy conservation. The value of Chi Square/df=0.00, *Root Mean Square of Error Approximation (RMSEA)* = 0.08, *Goodness of Fitness Index (GFI)* = 0.8 and *Comparative Fit Index (CFI)* = 0.8. Overall, the result indicates that there is a good correspondence between the variable model and the data in this study. The path coefficient showed a significant relationship between the variables.

According to Figure 2, perceived behavioral control (PBC) contributes the most towards intention to conserve the energy with 0.5 (50%) ($p<0.05$) followed by attitude with contribution of 0.28 (28%) ($p<0.05$). Meanwhile subjective norm only contributes 0.09 (9%) ($p<0.05$) towards intention to perform energy conservation.

The strong fit between model and the study's data suggest that intentions, 0.51 (51%) ($p<0.05$) completely mediates the influence of attitude, subjective norm and perceived behavioral control on the actual behavior in energy conservation. This finding suggests that although these constructs do not influence behavior directly, they do so indirectly through their influence on intention which in turn has a direct effect on behavior.

4. Discussions:

This study aims to examine energy conservation behavior among student at a private higher learning institution using Theory of Planned Behavior (TPB) model. Result depicted that there is no significant different on the intention to perform energy conservation between technical and non-technical students. Towards the intention to perform energy conservation, results showed that perceived behavioral control (PBC) is the highest contributors followed by attitude and subjective norm. The finding on PBC and attitude is similar with those of Lynch and Martin (2013), Abraham and Steg (2011) and Midden and Ritsema (1986). Previous study found that there is no contribution of subjective norm towards intention to reduce energy use. However in this study, it is found that there is a contribution of subjective norm even though it is a small value. The higher contribution of PBC shows that the greater perceived behavior control, the stronger individual intention to perform energy conservation. When students perceived greater control and easiness to perform energy conservation, the higher the possibility for them to execute the behavior.

The study also found that TPB is a plausible model to explain energy conservation among students. Higher predictability of the TPB variables on intentions than actual behavior is consistent with previous study applying this model (Lynch and Martin, 2013). According to the model, attitudes, subjective norm and perceived behavioral control predict the intention which in turn predicts the behavior. Hence, to achieved energy conservation, the intention need to be strengthen.

5. Conclusion:

Result from this study will help to improve our understanding on the reason behind energy conservation effort taken by the student. Finding in this study has showed that perceived behavioral control is the main factors that contribute the most towards students' intention to perform energy conservation. To ensure the students received greater control to execute the behavior, the management of the universities should strengthen energy conservation program by providing them relevant activity to energy conservation. With good energy conservation program, it will not only help to increase the students' awareness, but also encourage them to seek out ways to save energy thus change their behavior. Moreover, energy awareness developed at this stage provide a long term benefits as the student will carry the energy awareness to others such as family, friends and even at workplace after graduation. They also will motivate and serve as a role model for others students and family members. Hence, with their influences we will able to reduce energy threat and secure energy future for next

generation. With respect to future research, further research on the influence of subjective norm on energy conservation is therefore encouraged. Besides, to understand more clearly on students' intention to perform energy conservation more variable should be identified.

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