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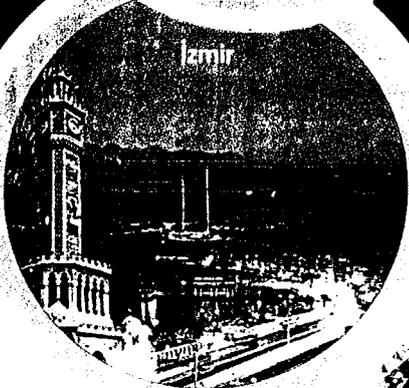
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RENEWABLE ENERGY (RE) AND ENERGY EFFICIENCY (EE) UNDERSTANDING AND AWARENESS AMONG SECONDARY SCHOOL STUDENTS AND TEACHERS IN MALAYSIA¹

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Abstract

This study was conducted to find out teachers and secondary students perceptions on their awareness and understanding of Renewable Energy (RE) and Energy Efficiency (EE). Earlier in 2003, a program on Renewable Energy (RE) and Energy Efficiency (EE) has been implemented by the Center for Education, Training and Research for Renewable Energy (RE) and Energy Efficiency (EE) (CETREE), Universiti Sains Malaysia, Penang, Malaysia where 1800 teachers had been trained to implement the program. This program consists of modules as complementary resources for teaching energy concepts in science subject at the secondary school. These teachers were trained through a series of workshop on how to use the modules. In this study, questionnaire was sent to teachers who had undergone the CETREE training and to students who had been taught using these modules. Majority of the teachers are more aware of using energy efficiently in school and home compared to the students. However, many of the teachers claimed that they are not practicing renewable energy at home and school but there are some students who practice renewable energy at home and conduct research on solar/biomass in school. In community, most of the teachers and students said that they did not organise talk or formed group of RE and EE awareness but some of them make an effort to disseminate this information in society. Thus, minority of the teachers still play an important role in the community to create RE and EE awareness. In addition, teachers and students perceived their knowledge of RE and EE are at the average level. The implication of this study indicate that there are still more effort needed to be undertaken to increase the teachers and students knowledge, attitudes and practice of RE and EE awareness.

Key words: *Renewable Energy, Energy Efficiency, Awareness*

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encourage the use of the alternative energy. One of the efforts is to bring the understanding and awareness of the renewable energy to school level until the tertiary level. Christopher (1998) mentioned that little knowledge about renewable energy among policy maker, finance institution and general community is the hindrance on the awareness of renewable energy.

Therefore, the concept and understanding of renewable energy need to be emphasised through education so that all community will be aware of the need and importance of renewable energy for the country to function. Understanding and knowledge of renewable energy through education is not enough to promote awareness among the community especially for student; it has to be integrated in the curriculum. However, Christopher (1998) stated that discussion on renewable energy is integrated across the curriculum such as physics, chemistry, biology and other skills but it is not given a serious consideration by teachers and students. Furthermore, Broman (1995) explained that a few factors that hindered teachers to understand the renewable energy concepts are; little knowledge on renewable energy, no appropriate approach to explain renewable energy, lack of teaching aids to explain renewable energy concept, lack of practical instrument related to renewable energy, and the present curriculum is very compact and thus there is no room and opportunity for teachers to give more information on renewable energy.

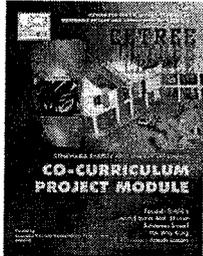
1.1 Malaysian Experience of Energy Issues

Sustainable use of energy is being given increasing attention in Malaysia. Malaysia is well endowed with both conventional (non-renewable) and non-conventional (renewable) sources of energy. The largest non-renewable energy resource found in Malaysia is petroleum (i.e. oil and gas). This resource is being actively exploited. Although, Malaysia has some coal deposits, only a small percentage is being mined. Realising the need for an alternative energy for future use, Malaysian Energy Commission (2005) announced that renewable energy as the fifth fuel in its five strategy of new fuel of energy supplies for the nation. It is targeted that Renewable Energy (RE) will contribute 5% of national energy demand until 2005. As in any developing nation, energy consumption per capita in Malaysia is still low but is expanding at a rapid rate in tandem with economic development. In addition, energy intensity with respect to gross domestic product had shown an increasing trend historically.

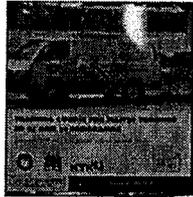
Electricity network coverage in Malaysia has increased from 80% in 1990 to 93% in 2005. For the rural area, the coverage has increased from 67% to 92 % in 2005 (Ninth Malaysian Plan). This signifies that electricity is the main resource for the people. With the increase of the energy coverage shows the increase of energy consumption among the people. Thus the costs that need to be put up with by the government also increased. In 2007, RM340 million is used to provide electrical energy to all Malaysian (source 2007 Annual Report, Tenaga Nasional Berhad). This amount has been identified as being increased due to the inefficient use of energy by the consumers. Various awareness campaigns have been carried out to help consumers to use electricity efficiently. Renewable energy knowledge was also introduced to consumers.

However, problems in energy consumption are getting acute lately due to lack of awareness among Malaysian. Consumers have been using energy without knowing that the amount of our energy resources is reduced. Thus, an effective step or initiative

4. Co-Curriculum Project
Module



5. Virtual lab CD



After these awareness efforts, this study is carried out to find out students and teachers perceptions on the RE and EE and their practices towards RE and EE. Teachers involved in this study are those that had received training in 2003. The students in the schools where their teachers were located become the main sample in this study.

2.0 RESEARCH METHODOLOGY

The study involves quantitative methods. Questionnaire was selected as the main method in this study to survey students' and teachers' perceptions of their knowledge and awareness regarding RE and EE. Two questionnaires were designed, that is for teachers and students. The aspects asked in the questionnaires are regarding perceptions of awareness on practices of RE and EE in schools, at home and community. Altogether, 22 items were developed. Another aspect asked is about perceptions on knowledge of RE and EE. This aspect consists of four main items which include: 1) identification of RE and non RE, 2) selection of practices of using energy efficiently, 3) choose the characteristic of EE on electrical appliances, and 4) reasons for using RE.

The population of this study involves 1800 secondary school teachers. Out of this number, only four hundreds questionnaires were distributed and the returned rate is 51%, that is 205 teachers. Besides, the number of students participated in the questionnaire was 278 from eight schools that was involved in the program. The teachers from these eight schools were not involved in the questionnaire. The data from the teachers was collected through mail while the data from the students were administered by the researchers.

The results also shows that more than 70 % of the teachers said that they keep the monthly electric bill, monitor monthly usage of electricity, iron clothes in large quantity at one time, and buy energy efficiency electric appliances. About 30 % of the students said that they keep the monthly electric bill and monitor monthly usage of electricity. On the other hand, about 40 % of the students iron their clothes in large quantity at one time, and buy energy efficiency electric appliances. Although most of the teachers said that they are more aware of using energy efficiently at home, however in terms of their practise in keeping all the monthly electric bills, monitoring monthly usage of electricity and buy energy efficiency electric appliances, some of the teachers do not practice it. Most of the students do not possess these good practices.

Table 2 Teachers' and Students' Responses on EE Practices at Home

Items on EE Practices At Home	Most Frequent/ Frequent	
	Teachers' Perception (n=205)	Students' Perception (n=278)
1. I switch off computers, television and radio when not in use	96.6	86.7
2. I remind my family member to switch off the light and fan when it is not necessary.	91.2	72.3
3. I remind my family member not to let the refrigerator door open for too long.	89.3	63.7
4. I keep all monthly electric bills.	78.5	32.7
5. I monitor my family monthly usage of electricity.	77.6	32.5
6. I will iron clothes in large quantity at one time	73.6	41.4
7. I only buy energy efficiency electric appliances	70.2	42.1
8. I use a traditional thermo flask to keep hot water.	50.2	31.6
9. I set the temperature for the air condition at 21-25 C	47.4	19.5
10. I set the temperature for the air condition at 16-20 C	34.2	21.9
11. I wash clothes using washing machine even though there are only a few clothes at one time	9.3	16.2

Table 2 also shows that 50.2 % teachers and 31.6 % students mentioned that they use a traditional thermo flask to keep hot water. This shows that many of the teachers and the students are not practising energy efficiently. Actually by using traditional thermo flask to keep hot water helps to reduce the use of energy for boiling water. The possibilities for not using this traditional thermo flask might be due to boiling water whenever they need or using microwave which will consume more energy.

The possible that some students are involved in the campaign might be due to the teachers in their school organised the campaign.

Table 4 also shows that 96.6% teachers said that they do not formed a group of students to disseminate information on RE and EE to nearby residents. In addition, 84.5% of students mentioned that they do not joined any group of students to disseminate information on RE and EE to nearby residents. However, 15.5% students stated that they join a group of students to disseminate information on RE and EE to nearby residents. This findings is similar to the above results due to some students are involved in joining group of students to disseminate the information.

The results show that 41.5% teachers said that in every opportunity, they make an effort for the society to be aware of the importance of RE and EE but only 31.3% of students do the same thing. Furthermore, 55.1% teachers claimed that they make an effort to disseminate information on RE and EE in the society/club which they are involved outside the school but only 20.9% of students did the same in disseminating information. Hence, this shows that the teachers and students admit that they participated in the community to disseminate the awareness of RE and EE. Surprisingly, these results in item 3 and 4 are in contradict with item 1 and 2 in Table 4, where teachers and students said they did not organise talk or form group for RE and EE awareness but they make an effort to disseminate this information to the society. Even they did not contribute in schools but they play an important role in the community to create RE and EE awareness.

Table 4 Teachers' and Students' Perceptions on RE Practices in Community

Items Renewable Energy & Energy Efficiency Practices In Community	Teachers' perception		Students' perception	
	Yes	No	Yes	No
1. The school and I organise talk on awareness of RE and EE to parents	2.0	96.1		
I took part in the awareness campaign of RE and EE organised by the school that involve parents			15.5	84.5
2. I formed a group of students to disseminate information on RE and EE to nearby residents	2.0	96.6		
I joined a group of students to disseminate the information on RE and EE to nearby residents.			15.5	84.5
3. At every opportunity, I make an effort for the society to be aware of the importance of RE and EE.	41.5	55.6	31.3	68.7
4. In the society/club which I am involved outside the school, I make an effort to disseminate information on RE and EE.	55.1	41.5	20.9	79.1

4.0 Conclusion

The program on RE and EE which has been implemented in 2003 by the Center for Education, Training and Research for Renewable Energy (RE) and Energy Efficiency (EE) (CETREE), Universiti Sains Malaysia, Penang, Malaysia has a small impact on teachers and students perception on understanding and awareness of RE and EE. As indicated by the results, majority teachers that were involved in this study are more aware of using energy efficiently in school and home compared to the students. This is expected because teachers should be the role model for the students.

Although, many of the teachers claimed that they are not practising renewable energy at home and school but there are some students who practice renewable energy by using solar water heater at home and conduct research on solar/biomass in school. This result is expected because it is not common practice at present in Malaysia to use solar energy in schools or at home. This is because the costs are high to install a solar power energy system for school or home.

Minority of the teachers play an important role in the community to create RE and EE awareness, but this is just a beginning effort on RE and EE understanding and awareness. Similarly, even if teachers and students perceived their knowledge of RE and EE are at the average level but the implication is that there are still more effort needed to be undertaken to increase their knowledge, attitudes and practice of RE and EE awareness.

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