# Periodic Research

# A Study of Determining Energy Saving Behaviour and Energy Awareness amongst College Students

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## Abstract

The gradual increase in the amount of energy used in connection with technology makes energy an even more important issue. Taking raw material from the natural environment, humans produce nutrition and energy in a production environment. One of the main reasons for air and environmental pollution is fossil fuels like coal, petroleum and natural gas which are used in industry and for heating purpose. Furthermore, since the use of fossil fuels might cause environmental pollution, energy production and consumption processes lead to destructive environmental pollution. For these reasons, the consumption of energy sources causes environmental problems and retards sustainable development. Population growth, economic growth and the efforts for achieving high living standards are among the factors that affect this increase in global energy consumption. Due to the fact that energy sources are restricted, energy saving, renewable energy sources and energy awareness are crucial subjects today. Individuals particularly students should acquire personal behaviours and habits at an early age. The role of current energy saving and energy awareness studies in students developing positive attitudes towards energy saving and energy awareness is unknown. The focus of the present research was to determine energy saving and energy awareness of college students. The sample of the present study consisted of 135 undergraduate students of Faculty of Commerce, The M. S. U. of Baroda, selected by way of random sampling method. Interview schedule was used for data collection. Descriptive statistics was used for the study to determine the energy saving and energy awareness level of the students. It was found that the college students had a high level of awareness about renewable energy sources, energy saving and energy awareness, however they had a moderate level of interest in energy. It was further found that there was a significant difference among energy saving awareness of college students according to gender and this difference was in favour of females.The present research would prove beneficial in solving major environment problems like global warming and environmental pollution.

**Keywords :** Energy Saving Behaviour, Energy Awareness and Interest in Energy

## Introduction

The gradual increase in the amount of energy used in connection with technology makes energy an ever more important issue. Nature is a source of nutrition, oxygen, water, energy and production for human beings. Taking raw material from the natural environment, humans produce nutrition and energy in a production environment. As a result of this production process, a product is obtained but a waste then enters the natural environment. While nature recycles and transforms some part of these wastes into raw material, a greater part pollutes the natural sources (Invergard, 1976). Air and environmental pollution are the most widely known types of pollution. One of the main reasons for air and environmental pollution is fossil fuels like coal, petroleum and natural gas which are used in industry and for heating purposes. Among the emissions produced as a result of burning of these fossil fuels, particularly carbon dioxide and sulfur dioxide are the leading air and environmental pollutants. These gases compound with water in the air and fall back to the earth in the form of acid rains. Acid rains damage the flora and our buildings and cause water and environmental pollution (Alpdogan, 1996). Furthermore, since the use of fossil fuels might cause environmental pollution, energy production and consumption processes lead to destructive environmental pollution (Ayvaz, 1991). For these reasons, the consumption of energy

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sources causes environmental problems and retards sustainable development. Global energy consumption increases approximately by 2% annually. Population growth, economic growth and the efforts for achieving high living standards are among the factors that affect this increase in global energy consumption. By the end of the 21st century, it is inevitable that this increase will double. The decrease in energy source reserves increases energy costs as well. Therefore, yield losses should be minimized in energy production and consumption. The increase in yield losses draws attention to environmental problems. In addition the reduction in energy reserves threatens sustainable development. There is a strong relationship between environmental effects of energy use and sustainable development. To achieve sustainability, renewable energy sources should be efficiently used and environmental pollution must be prevented. Plans should be made to minimize environmental problems emerging during energy production and consumption. These plans must develop economic and reliable use of energy sources (Selici et al., 2005).

Energy cannot be destroyed. However it decreases as a result of entropy (entropy is the randomness and disorder in a system. As disorder increases in systems, entropy increases as well. In this case, entropy reduces the amount of useful energy and increase the amount of non-useful energy). For example, fossil fuels burnt for heating and lighting purposes in houses and work places increase the amount of carbon-dioxide emissions in the air (Darby, 2010). The increase in the use of this kind of energy results in global warming and environmental pollution. For example, while tropic ocean surface temperatures increased by half a degree between the years of 1949 to 1989, there was an 8% increase in melting snow in the northern hemisphere since 1983. For these reasons, energy saving and renewable energy sources are even more important today.

Regarding the problems arising due to the desire of the European Union and the United States of America to forward their interests through the wars of oil and to hold power in the management of oil sources, the power-hungry countries began to seek alternative energy sources and ways to develop energy saving policies (Caha, 2008).

One of the measures taken by the European Union countries to reduce gradually increasing energy need was to require certification of each building according to the amount of energy use. Furthermore, to ensure that less energy is used for heating, ventilation, lighting and hot water in the buildings, these countries require employment of an energy manager.

The increase in number of vehicles and the growing interest and desire in using electrical devices constitute the areas of greatest energy use. Energy consumption according to sectors was a follows: 29% in industry, 30% in transport and 41% in individual consumption (European Commission, 2006).

Educational programs for energy saving, the European Union emphasizes that consumers should be informed about the environmental impacts of energy and energy saving as well. It is expected that simply changing the behaviour of keeping electrical devices in stand-by mode would conserve 44 billion kWh in general. It is expected that enhancing the scope of this implementation will lead to an improvement particularly in energy efficiency of buildings with high energy consumption. With emission trading, the enterprises which exceed their quotas will have the right to purchase emission released into the atmosphere, However as a result of less carbon release into the air, the enterprises are expected to tend to be energy efficient and save energy in order to gain income through emission trading (Caha, 2008).

If energy saving can be achieved, a saving of up to 20% can be achieved in 20 years. This, in turn, might provide an average family to make a saving of 200 to 1000 Euros in a year. Furthermore, reduction of energy consumption might decrease greenhouse gas effects and climate changes. Therefore, advanced technologies are in development for industrial energy saving in Europe.

The motive in energy is to achieve the most efficient use of limited energy sources and to reduce unnecessary energy consumption and losses. The goal is to perform the same work using less energy. To reduce unnecessary energy consumption and losses, humans should consume energy consciously. One of the ways of achieving this is through education. Students, families and teachers, in short, the society, should be trained for a conscientious consumption of energy. It is important to provide training to raise an awareness of energy and economic use of energy starting form primary education, which is the starting point of formal education. It is impossible or very difficult to change the habits acquired at a young age. For this reason, education can be considered as the most effective way of creating a lasting behavior change from a young age. Considering the importance of energy and saving, it is necessary to emphasize energy and saving at every school grade and college level.

A review of the literature revealed that there were numerous projects and studies on energy saving and efficient energy use (Mumma et al., 1966; Rowland, 1980; Sarvis, 1980; Wenig, 1981; Theiss, 1982; Crelinsen, 1983; Nicholson, 1996; Newson, 1997; Kirchhoff, 2001: Hjeresen et al., 2002; Papadouris, Constantinou and Kyratsi, 2008). In addition, to meet the increasing energy need in Europe in parallel to developing technology, renewable energy sources are of utmost importance.

Energy and energy sources are necessary for the survival of humans on earth. For this reason, energy and energy sources have always drawn the attention of humankind for many years and have led to many wars. Attempts to find new energy sources are ongoing. Water, sun, petroleum, wind, different gases, some mines, some plants have been used as energy sources; however, in recent years reaching these sources or obtaining energy became difficult. These restrictions in the field of energy or negative

human impact on the environment have led humankind to seek renewable energy sources. Today the importance given the particularly renewable energy sources has increased and studies are undertaken to perfect renewable energy sources. For example, smart house-buildings (buildings that produce their own electricity and heat themselves) projects have increased in recent years, indicating more importance given to renewable energy sources. Wind, Sun, and geothermal energy sources can be considered renewable energy sources. Renewable energy sources are directly or indirectly sun-based. Sunlight and sun energy are used for heating, lighting and electrical production. In addition, renewable energy sources have many advantages:

i) Renewable energy sources are clean energy sources. They have much less impact on nature than fossil fuels.

ii) While other energy sources are limited, renewable energy sources are limitless.

iii) Renewable energy sources require necessary materials and work power; as they are produced and installed in the immediate environment, they do not create energy dependency on external sources.

iv) While the use of fossil fuels is unreliable, there is no security risk for renewable energy sources (Morgil et al., 2006)

Due to the fact that energy sources are restricted, energy saving, renewable energy sources and energy awareness issues are crucial subjects today. Individuals should acquire personal behaviours and habits at an early age. Particularly children at the primary education level have an important potential for this preparation. The role of current energy saving and energy awareness studies in children's developing positive attitudes towards energy saving and energy awareness is unknown. One of the ways of determining this role is to ask their views on these issues. Considering that a review of the literature revealed no studies on determining energy saving and energy awareness or on the investigation of the factors affecting students awareness, and that it is in civilization's interest to acquire energy awareness of particularly college students because they will be decision-making adults in the future. Furthermore it is believed that collected feedback will have an important role in past and future studies and projects on energy saving and energy awareness. Feedbacks are necessary elements for effective learning (Darby, 2010). McCalley and Midden (2002) reported that as a result of feedback given to the participants, there was a positive increase in participants' energy saving behaviors. In line with the above review the study was planned with the following objectives:

**Objectives of the study**

1) To determine the baseline characteristics of the college students.

2) To determine energy saving behaviours and energy awareness amongst college students.

3) To determine whether there existed any differences amongst energy saving awareness of college students according to various socio demographic characteristics.

**Methodology**

The research is a survey method. The population of the study consisted of 135 college students enrolled in the Faculty of Commerce, The M. S. U. of Baroda, Vadodara. A sampling of the study was determined using random method among random sampling method. A scale namely (ESEAS) Energy Saving and Energy Awareness was developed by reviewing the related literature and used for data collection. Additionally, Renewable Energy Awareness Scale was also developed to determine renewable energy awareness. A five point Likert scale consisting of 54 items namely "I strongly agree, I agree", I partially agree, I disagree and I strongly disagree was used. Content validity and reliability of the scale was established. An exploratory factor analysis was made initially on the 54 items and the items having a load value below 0.30 or the ones which were found to have high load value in more than one factor were excluded from the scale. A total of 21 items were retained to the scale, wherein the highest score was 105, while the lowest was 21. The sub factors were named as renewable energy sources, energy saving, interest in energy and energy awareness. The reliability coefficient of the scale was found to be 0.80 using the Cronbach's alpha reliability analysis.

**Table 1 : Names given to the factors related to ESEAS, number of items, results and reliability study, and sample items**

| Sub Dimensions | Number of Items | Cronbach Alpha | Sample Items |
|---|---|---|---|
| Renewable energy sources | 8 | 0.71 | Renewable energy sources are also clean energy sources. |
| Energy saving | 5 | 0.66 | Without hesitation I warn someone who does not pay attention to energy saving. |
| Interest in energy | 3 | 0.71 | I read scientific articles about energy. |
| Energy awareness | 5 | 0.55 | We should tend to use alternative energy sources in energy consumption. |

The data was analyzed using one way MANOVA analysis. The statements "I strongly agree" was considered as 5 points; the next was 4 point and so on.

**Findings and Discussion:**

The results of energy saving behaviour and awareness levels of college students have been assessed by an equal interval scale. Moreover energy saving and energy awareness have been categorized equally as low level, moderate level and high level respectively.

The results indicated that the students had a

high level of awareness of renewable energy sources, energy saving and energy awareness and a moderate level of interest in energy.

It was found that there was a statistically significant difference among the mean scores of students in terms of sub-factors of ESEAS E = 0.962, F (4.395) = 3.50, p<0.01].

Factor based one way ANOVA analysis according to gender indicated that the childrens energy saving awareness significantly varied according to gender [F ( 1,398.4.05, p<.05: wherein it was observed that average scores of females was higher than those of males.

**Table 2 : Equal Interval Scale Evaluation performed to determine Energy Saving Behaviour and Energy Awareness level of college students**

| Subscales | Score Intervals | | |
|---|---|---|---|
| | Lower level | Middle level | Higher level |
| Renewable energy sources | 8.00 - 18.66 | 18.67 - 29.33 | 29.34 - 40.00 |
| Energy saving | 5.00 - 11.66 | 11.67 - 18.33 | 18.34 - 25.00 |
| Interest in energy | 3.00 - 7.00 | 7.01 - 11.00 | 11.01 - 15.00 |
| Energy awareness | 5.00 - 11.6 | 11.67 - 18.33 | 18.34 - 25.00 |

**Conclusion**

The world realizes today that real development cannot take roots if it by passes students, who are the future of our nation and also represent the very kernel around which social change takes shape. Though the government of India is working towards an environmentally sound and sustainable quality of life. The problems, challenges and issues are multi-faceted. However, students are playing a crucial role in protection and conservation of environment. To achieve this, resources and inherent capabilities of students need to be channelized to develop their full potential so as to take their rightful place as equal partners is all spheres. Thus environmental degradation is related not only to biosphere alone, but to the social sphere as well.

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