

## Applying Conservation Psychology in Decreasing Electrical Energy Consumption and Preserving Environment by Students

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Received 10 March 2008;

Revised 15 Jan. 2009;

Accepted 25 March 2009

**ABSTRACT:** In order to examine the hypothesis of this research, an accidental sample of 122 students have been appointed from among the community of female students who were studying at the last year of primary school in Isfahan . The sample was divided into four groups, cognitive group, behavioral group, cognitive- behavioral group and control group. The impacts of independent variables have been assessed by attitude questionnaire, periodical energy electrical bills and energy-environment software. The outcomes indicated that the attitude of cognitive – behavioral group (mixed) and cognitive group have a meaningful difference from control and behavioral groups, after performing the independent variable. In changing the attitude too, the activity of cognitive – behavioral group is better than cognitive group. Also, the behaviors of student in cognitive, behavioral and cognitive – behavioral groups are different from the behavior of students in control group. The energy bills of these three groups showed 4389kw/h saving and 2513303/787 gram reduction in green house gasses and 738230 Rails reduction in social costs.

**Key words:** Conservational Psychology, Attitudes, Energy Consumption, Green House Gasses, Social Costs

### INTRODUCTION

The conservation psychology developed in order to link the social science and nature, research and practice, psychology and other social sciences. This field is devoted to doing researches on sustainable development, preserving environment and natural resources. Despite of expansion of studies in this regard, this field is still unknown for many psychologists engaging in similar activities. (Saunders, 2003; Winter, 2004; Clayton, 2005). Conservation psychology studies are mainly focused on conservation behaviors such as recycling, taking care of animals, environment and natural resources including energy. The purpose of conservation psychology is studying the people's behavior in protection of environment or the ways for increasing People's attention to preserve

environment and natural resources. This model is looking for identifying behaviors for conserving environment and natural resources. Another psychological method dealing with reviewing people's behaviors and attitudes in environment is called Environmental psychology. Environmental psychology is surveying the effect of environment on human and the effect of physical environment made by human on human (Kaplan, 2000).

Social psychology and environmental psychology have been interested in notions of energy saving and preserving the environment too. But today these notions are considered based on various aspects. Shobeiri et al. (2007) investigated secondary school students' environmental awareness in India and Iran. Nine hundred and ninety-one students were selected through their

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study. Their studies encompass 476 boys and 515 girls. They were assessed using the Environment Awareness Ability Measure (EAAM). Results indicate that there are significant differences between Indian and Iranian students in their level of environmental awareness. Also there are significant differences between them in environmental awareness across and within two groups with regard to their gender.

Whether this notion will be considered as an umbrella for studies about preserving Energy and environment, the problems of using Energy resources and environment are related to people's behaviors and actions. Changing people's attitude is crucial in meeting these problems. Many Psychologists are interested in this field. Based on present approaches in psychology, psychologists apply different techniques to change the consumers' behavior and attitudes:

1. Information and education techniques, individual and group commitment, behavioral impact in cognitive axis.
2. Positive reinforcement methods, monetary stimulus, designing environment, feedback, classical conditioning in behavioral axis.
3. Modeling, showing, training and induction in behavioral cognitive axis have been applied by users.

Using psychological methods of changing behavior and attitude, most of these researches have shown 3 to 20 percent consumption saving. The results of these studies indicated that applying psychological methods are effective in changing the behavior and attitude of energy consumers (The followings are among these studies: Gelntis, 1999; Darby, 2002; Rolls, 2001; Wilhite, 1999; Larsson, 2000; Lawrence, 2003; Bender, 2001, Estas, 2002; Harigan, 2004; Sanders, 2003; Reports of United States' Department of Energy, 2004). As an effective method in changing the behavior of energy consumers, model making have been used in one research. Watching a movie for 20 minutes at nights before sleep, including thermostat control, wearing cloths, preparing children and receiving guests resulted in decrease of heating consumption up to 25%.

Feedback methods have been used in submitting instant and practical information to energy consumers. Results indicated that feedback has a great role in increasing knowledge about energy. Most of energy consumptions are hidden and this lead to unaware consumption. A study on feedback methods shows saving between 4 to 20%. The outcome of this study is based on 34 researches using direct and indirect methods from 1975 to 2000 (Darby, 2002). It should be noted that many energy saving measures are not economical in Iran since the energy prices are too low when compared with international ones (Karbassi *et al.*, 2008; Shafie-Pour *et al.*, 2007).

A study indicates 10.6% reduction in energy consumption in the industries which have passed a short course on energy consumption (Gazanfari *et al.*, 2003). Also in a study on 813 students in 3 different education regions in Tehran, the energy efficiency education increased the student's attitude and knowledge about energy saving and preserving environment. In this study girls functioned better than boys (Saffarinia, 2004). A training program on 500 schools in England from 1999 shows that 76% of parents changed their behavior toward energy saving and preserving environment, due to their children's training, and 54% respected energy saving criteria including using compact lamps and isolation F doors and windows.

A program called "Energy Smart School" was preformed in Michigan State in United States in 2004 & 2005. The students were active in energy consumption in this program. Instead of learning a text or a book, they were taught some concepts about reduction of energy costs in house and school (Shirman, 2005). This study and similar researches shows, in sample groups, reduction of energy up to 3.75% KW and natural gas up to 18.2%. Due to the fact that various findings have been acquired about applying conservation psychology methods in energy savings, this research attempts to answer the following questions: Is it possible to use psychology as a model for energy saving and perception of environment? Can changing behavior and attitude methods lead to reduction of student's

energy consumption and green house gasses? Is the efficiency of behavioral, cognitive and behavioral-cognitive methods different from each other in changing the consumer's attitude and behavior?

**MATERIALS & METHODS**

Target groups in this research were 122 students from Mahjoob primary school in Isfahan city in 2006-2007 educational years. Three different tools are used in assessing considered variables.

1. attitude Questionnaire:

The attitude questionnaire was used to measure the change in students' attitude toward energy consumption. Questionnaire was prepared containing 35 questions based on Likert scale, after interviewing with some experts in energy division and social psychology instructors and reviewing previous studies in this regard. The questions of this scale were rated from full agreement (five grades) to full disagreement (one grade). More than 80 questions were codified; 35 of which were chosen after substantial and formal reviews. The reliability of questionnaire was adopted on a group of 42 students. The integrity level of questions was 80%.

2. Monthly energy consumption bills :

The monthly energy consumption bills are become prepared by regional electricity company periodically and are sent to consumers. The amount of energy consumption is recorded by electricity counter and then is sent to the software of Isfahan Electricity Company for analysis. The

data about the amount of student's family consumption is estimated by this software after receiving membership number.

3. Analysis of environmental Pollutants and social costs decrease. This analysis has been done by using the factors related to release of various environmental pollutants in the country that has been estimated by energy – environment software (Karbassi & Samadi, 2000).

**RESULTS & DISCUSSION**

The results of this research have been analyzed using Co-variance analysis through SPSS-13 and energy-environment software in 3 statistical analysis divisions related to energy consumption attitude, changing energy consumption behavior and green house reduction.

1. Statistical analysis of data related to energy consumers attitude According to the results of Tables 1 & 2, It can be mentioned that there is a difference between average of attitude toward consumption before and after executing independent variables and this difference in level ( $\alpha=1\%$ ) is meaningful. So, there is a difference between and after test averages in cognitive and cognitive-behavioral (mixed) groups. This difference has been seen in behavioral and central groups.

2. Statistical analysis of data related to energy consumer behavior. Due to outcomes of the Tables 3 & 4, it can be mentioned that there is a meaningful difference in ( $\alpha=0.5$ ) level between averages of energy consumption behavior in

**Table 1. analysis of the Co-variance of attitude to energy consumption questionnaire**

The resource of changes	ss	df	MS	F	Level of Meaning ( $\alpha$ )
between Groups	20448.78	3	6816.26	60.60	0.01
Error	13384.89	119	112.47		

**Table 2. Follow-up Test Comparative survey of energy consumption attitude, emphasizing on Error groups**

	Behavioral	cognitive	Mix	Control
Behavioral		-31.23	-3.31	-22.11
Cognitive	0.01		27.91	9.11
Mixed	0.01	0.01		-18.79
Control		0.01	0.01	

**Table 3. Co-variance Analysis**

The resource of changes	SS	df	MS	F	Level of Meaning (a)
BETWEEN Groups	36642.18	3	12214.06		
Error	373433.56	92	4059.06	3.009	0.05

**Table 4. Follow-up Test Comparative review of energy consumption behavior emphasizing on four groups**

	NOX	SO <sub>2</sub>	CO <sub>2</sub>	SO <sub>3</sub>	CO	CH	SPM
gr/kw	0/894	1/000	572/603	0/015	0/001	0/034	0/106
Total Reduction	3923/76	4389	2513154/5	65/835	4/389	149/22	474
Social cost Rial/kw	53/6	8/2	106/4				
Total social cost	23520/4	35989/6	466989/6	738229/8			

\* Rials 9500= us \$ 1

**Table 5. factors related to the release of various pollution and social cost**

	Behavioral	cognitive	Mix	Control
Behavioral		-9.03	-9.90	50.41
Cognitive	-		-27	41.38
Mixed	-	-		41.11
Control	0.01	0.05	0.05	

experimental groups and control groups. It means that the experimental groups in post exam stage, show reduction in electricity consumption expenses and about 4389kw (over 15%) saving have been acquired in electricity expenses in experimental groups in comparison with sample group.

**3. Analysis reduction of environmental pollution and social cost.**

The reduction of NO<sub>x</sub>, SO<sub>2</sub>, CO<sub>2</sub>, SO<sub>3</sub>, CO, CH, SPM is clear (Table 5).The above table indicates the reduction of 2513303.787 gram in green house and 35989.22 Rials in social costs, applying this study on sample student group.

**CONCLUSION**

Most researches have shown the relation between applying psychological methods in changing behavior and attitude of energy consumers. Some researchers, using psychological methods, have acquired 20 percent saving in sample group function (Darby, 2002; Laurens 2003; Rolls

2001, Bender 2001; Harigan, 2004).Most researches have resulted in changing the consumption attitudes of students too (Gazanfari *et al.*, 2004, Center for Sustainable energy of England 2004, United States Department for Energy 2005). The findings of this research approve the previous research in this regard. The findings of this research imply that applying cognitive and behavioral-cognitive (mixed) methods on students have increased the post-exam average of the two experimental groups. Cognitive and behavioral- cognitive (mixed) groups, in the level of (a=1%).

So the result is that the difference between two cognitive and mixed groups is meaningful and the attitude of these two groups differed in comparison with behavioral and control groups.In relation to student’s changing consumption behavior, it should be mentioned that, electricity bills before and after executing independent variables in 3 groups; cognitive, behavioral an

Cognitive-behavioral groups have showed a meaningful difference in level ( $\alpha=5\%$ ). So it can be concluded that the average of electricity bills before and after executing independent variables are different and the function of 3 experimental groups have shown over 15 percent reduction in comparison with control groups. So, applying the aforementioned methods on students has changed the family energy saving behavior. In relation with green house gasses and social costs study shows the reduction of 2513303.787 gram in green house gasses and 738229.8 Rials in social cost. These results approve previous studies such as Rolls, 2001; Fronham *et al.*, 2001; Verner, 1996; Karkkainen, 2002 and Bender, 2001. Final outcomes of this research indicate that conservation psychology and changing behavior and attitude methods can be used in reduction of energy consumption and protection of environment in the country. As it has been emphasized by Sanders, 2003, Clayton, 2005, winter, 2004.

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