

PRE-SERVICE PRIMARY TEACHERS' ATTITUDES TOWARDS ENERGY CONSERVATION*

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Abstract

This study aims to examine the pre-service primary teachers' attitudes towards energy conservation. In order to reach this main aim following research questions are formulated: (1) What are the attitude levels of pre-service primary teachers in terms of energy conservation? (2) Do pre-service primary teachers' attitudes towards energy conservation significantly differentiate due to their gender, grade levels, and main settlement place? The study was conducted on pre-service primary teachers training at the Faculty of Education in Rize University. Research data were collected from 323 voluntary pre-service primary teachers in 2007-2008 academic years. Energy Conservation Attitude Scale (ECAS) (Michigan Energy Extension Service, 1979) consisting of nine subscales was used as data gathering instrument. The means corresponding to the attitudes of the pre-service primary teachers towards energy conservations were measured for each subscale and means were compared in terms of the demographic variables of the participants like gender, grade and settlement place by using t-test and one way ANOVA. This study pointed out that pre-service primary teachers have positive attitudes towards energy conservation. Moreover, the result showed that female pre-service primary teachers' perceived more positive attitudes than male pre-service primary teachers on the subscales of "automotive conservation" and "sensitivity for energy conservation". On the other hand male pre-service primary teachers' attitudes were significantly higher than female pre-service primary teachers' attitudes on the subscales of "insensitivity and lack of responsibility", and "supporting nuclear energy". The study also revealed that while the grade levels have some significant effects on the attitudes of the pre-service teachers' attitudes towards energy conservation, the settlement place in which the pre-service primary teachers usually lived up to now has no significant effect on their attitudes. The study may be concluded with recommendation that energy conservation subjects must be taken part more in curriculums at primary schools.

Key words: Energy Conservation, Energy Saving, Attitudes, Pre-service Teachers

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INTRODUCTION

Energy consumption aroused from industrialization has caused energy sources running out rapidly in the earth. It is a fact that commonly used energy sources such as coal, petroleum, and natural gas are exhaustible in the earth. World energy reserve has almost become exhausted (WEC, 2004). Not only excessive energy consumption causes energy scarcity but also it damages to environment such as global warming by consuming fossil oil. It is known that energy problems are related to environmental problems directly. Although people have known that the best way to overcome the energy scarcity is to use less energy, day by day energy consumption has increased instead of energy conservation (Erten, 2002).

Energy conservation consciousness began to improve after energy crisis in 1973-1974 in the world. With this crisis, governments and scientists not only began to search and use renewable energy sources but also they revived energy conservation thereby suggesting using car less. As a result the idea has been improved that technical precautions only is not enough for energy conservation, at the same time institutional and individual precautions have to be implemented (Erten, 2002).

Later 1970s, in order to increase consciousness for energy conservation, education curriculums were changed in USA at each grade. These changes charged teachers to have some responsibilities: For example, it was officially stated that; “all Americans teachers face the eighties knowing that all Americans must have the skills and knowledge to use energy wisely to make informed decisions on energy policies” (Ulmer, 1983).

Various activities have also been carried on in Turkey to encourage Turkish public for energy conservation through the Project of Energy Productivity (En-Ver). This project has been implemented by Ministry of Energy and Natural Resources in Turkey nowadays. “The cheapest energy is saved one” has been accepted as the main slogan of this project.

It is necessary to gain consciousness for energy conservation to the public in order to prevent unconscious energy consumption. Primary education plays very important role in this consciousness gaining process. Environmental and energy education can provide that students gain some information, develop positive attitudes and behave confidently with these attitudes in terms of energy conservation at primary schools. It is known that positive attitudes and true information about environment and energy conservation are not enough to have conscious and confident behaviors in terms of energy conservation. Because, turning attitudes into behaviors need a long time (Erten, 2005). Development of a positive attitude among students about any subject depends on learning process and consequently on their teachers (Tekbıyık & İpek,

2007). Furthermore researches show that teachers' attitudes about a subject also greatly affect their students' attitudes about that subject (Bloom 1989; Palmer, 2001). Therefore it is important to determine in-service and pre-service primary school teachers' attitudes towards energy conservation.

There are not enough researches in scientific literature on in-service and pre-service teachers' attitudes towards energy conservation. One of the studies in this subject was performed by Karagöz (2007) in order to determine chemistry pre-service teachers' interests and attitudes about nuclear energy. Study results showed that pre-service teachers have not true information and attitude about nuclear energy. However, it was observed that pre-service teachers think nuclear energy power stations as necessary in order to overcome the energy scarcity in our country and they support establishing nuclear energy power stations in Turkey.

Erten (2002) studied male and female student' attitudes towards energy conservation and he observed that female students do not believe to be effective sufficiently on energy conservation at home. Moreover it was emphasized that students were educated sufficiently about energy conservation but they did not put this knowledge into practice. Also another study by İnce et al. (2006) showed that university students do not turn their attitudes sufficiently into behaviors although they have sufficient knowledge about energy conservation.

Briefly, as it has been pointed out in the literature, individuals' attitudes towards energy conservation affect their behaviors relating to energy consumption. On the other hand, teachers play very important role for their students to develop positive attitudes towards anything in their life. In this case it is important to determine pre-service primary teachers' attitudes towards energy conservation. It is doubtless that, teachers' attitudes towards energy saving will determine their educational behaviors on their teaching activities, thus their students will gain true information and attitudes about energy conservation through these activities.

Aim of the Study

This study aims to examine the pre-service primary teachers' attitudes towards energy conservation. In order to reach this main aim those research questions are formulated:

1. What are the attitude levels of pre-service primary teachers in terms of energy conservation?
2. Do pre-service primary teachers' attitudes towards energy conservation significantly differentiate due to their gender?

3. Do pre-service primary teachers' attitudes towards energy conservation significantly differentiate due to their grade levels?
4. Do pre-service primary teachers' attitudes towards energy conservation significantly differentiate due to their main settlement place?

METHODS

Participants

The study was conducted on pre-service primary teachers training at the Faculty of Education in Rize University. The faculty has almost 500 pre-service teachers. Those pre-service teachers were asked to respond data gathering instrument voluntarily. As a result research data were collected from 323 voluntary pre-service primary teachers in 2007-2008 academic year.

Data Gathering Instrument

Energy Conservation Attitude Scale (ECAS) (Michigan Energy Extension Service, 1979; cited in Ulmer, 1983) consisting of 38 items was used as data gathering instrument. The original English form of the scale was translated into Turkish and updated by the researchers. Language validity of the instrument was controlled by two language experts. Furthermore, validity and reliability of the scale were measured by the researchers.

Factor analysis was implemented for the validity test. At the result of the factor analysis two items producing factor loadings below 0,40 were dropped from the scale. Thus a data gathering instrument was concluded consisting of 36 items scaled on a five-point Likert-type (from strongly disagree [1] to strongly agree [5]). Furthermore, it was found that the scale consists of nine subscales as like its original form. The nine subscales was renamed and Cronbach-Alpha reliability coefficients were measured for each subscale. The subscales and Cronbach-Alpha reliability coefficients corresponding to these subscales may be seen at Table 1. Moreover, Cronbach-Alpha reliability coefficient was found as 0,77 for the whole scale.

Table 1. Subscales of energy conservation attitude scale (ECAS) and theirs Cronbach-Alpha Reliability coefficients

	Subscales	Number of Item	Cronbach-Alpha
Subscale1	Automotive conservation	5	0,68
Subscale 2	Insensitivity and lack of responsibility	6	0,60
Subscale 3	Solar Energy	3	0,65
Subscale 4	Working voluntarily for conservation	5	0,79
Subscale 5	Government involvement and tax support	6	0,65
Subscale 6	Supporting Nuclear Energy	2	0,82
Subscale 7	Conservation of Air Conditioning	2	0,71
Subscale 8	Impact on Employment	2	0,59
Subscale 9	Sensitivity for conservation	5	0,61

Whole scale's Cronbach-Alpha reliability coefficient is 0.77

Analyzing of Data

Data analyses were made through SPSS for windows. First of all, the means responding each subscale were computed. The means corresponding to the attitudes of the pre-service primary teachers towards energy conservations were tired to be described in terms of the intervals given at Table 2. Pre-service teachers' attitudes measured for each subscale were compared in terms of the demographic variables of the participants like gender, grade and settlement place by using t-test and one way ANOVA.

Table 2. Evaluation interval for the Likert type scale

(5) Strongly Agree	4.20 - 5.00
(4) Agree	3.40 - 4.19
(3) Undecided	2.60 - 3.39
(2) Disagree	1.80 - 2.59
(1) Strongly Disagree	1.00 - 1.79

FINDINGS

Descriptive Findings on the Attitudes towards Energy Conservation

The attitudes of the pre-service primary teachers towards energy conservations were tabulated in terms of arithmetic means and standard deviations calculated for each subscale (Table 3).

Pre-service primary teachers' attitudes towards energy conservation were tired to be described in terms of nine dimensions (subscales) such as automotive conservation, insensitivity and lack of responsibility, solar energy, working voluntarily for energy conservation, government involvement and tax support, supporting nuclear energy, conservation of air conditioning, impact on employment, and sensitivity for conservation.

Table 3. Means of ECAS scores of pre-service primary teachers

Subscales	Mean (\bar{X})	Standard Dev.
Automotive conservation	3,78	0,69
Insensitivity and lack of responsibility	2,37	0,70
Solar Energy	4,29	0,65
Working voluntarily for conservation	3,81	0,71
Government involvement and tax support	3,87	0,63
Supporting Nuclear Energy	3,16	1,23
Conservation of Air Conditioning	3,92	0,93
Impact on Employment	3,81	0,77
Sensitivity for conservation	4,21	0,59

As it may be seen from Table 3 arithmetic means corresponding to the attitudes of the pre-service primary teachers on those subscales are orderly 4,29 for solar energy, 4,21 for sensitivity for conservation, 3,92 for conservation of air conditioning, 3,87 for government involvement and tax support, 3,81 for working voluntarily for energy conservation and impact

on employment, 3,78 for automotive conservation, 3,16 for supporting nuclear energy, and 2,37 for insensitivity and lack of responsibility. These results show that pre-service primary teachers have attitudes towards solar energy and sensitivity for energy conservation at *strongly agree level*. At the same time they have attitudes towards conservation of air conditioning, government involvement and tax support, working voluntarily for energy conservation, impact on employment, and automotive conservation at *agree level*. However, pre-service primary teachers have attitudes at *undecided level* in terms of supporting nuclear energy whereas they have attitudes at *disagree level* in terms of insensitivity and lack of responsibility for energy conservation.

Gender Effects on the Attitudes towards Energy Conservation

Pre-service primary teachers' attitudes toward energy conservation are compared through independent t-test in terms of their gender at Table 4.

The results indicate that pre-service primary teachers' attitudes differentiate significantly at the dimensions (subscales) of automotive conservation ($t= 3,257$; $p= 0,001$), insensitivity and lack of responsibility ($t= -4,978$; $p= 0,000$), supporting nuclear energy ($t= -6,148$; $p= 0,000$), and sensitivity for energy conservation ($t= 3,954$; $p= 0,000$). There are not any significant differences between the attitudes of the pre-service primary teachers on other dimensions (subscales) of energy conservation.

Table 4. Gender Differences on pre-service primary teachers' attitudes

Subscales	Gender	N	\bar{X}	Sd	df	t	p
Automotive conservation	Female	161	3,906	0,604	321	3,257	0,001
	Male	162	3,659	0,747			
Insensitivity and lack of responsibility	Female	161	2,187	0,585	321	-4,978	0,000
	Male	162	2,561	0,752			
Solar Energy	Female	161	4,339	0,528	321	1,293	0,197
	Male	162	4,247	0,742			
Working voluntarily for conservation	Female	161	3,845	0,663	321	0,831	0,407
	Male	162	3,779	0,756			
Government involvement and tax support	Female	161	3,929	0,592	321	1,764	0,079
	Male	162	3,807	0,659			
Supporting Nuclear Energy	Female	161	2,761	1,093	321	-6,148	0,000
	Male	162	3,556	1,226			
Conservation of Air Conditioning	Female	161	3,929	0,896	321	0,115	0,908
	Male	162	3,917	0,959			
Impact on Employment	Female	161	3,773	0,770	321	-0,947	0,345
	Male	162	3,855	0,779			
Sensitivity for conservation	Female	161	4,315	0,505	321	3,954	0,000
	Male	162	4,062	0,639			

statistically significance $p < 0,05$

As it may be seen at Table 4, female pre-service primary teachers' attitudes are significantly higher than male pre-service primary teachers' attitudes on the subscales of automotive conservation and sensitivity for energy conservation whereas male pre-service primary teachers' attitudes on the subscales of insensitivity and lack of responsibility, and supporting nuclear energy are higher than their female counterpart. These results reveal that female pre-service primary teachers, when compared to male pre-service primary teachers, are more sensitive for energy conservation and more suspicious for nuclear energy. On the other hand, these results also reveal that male pre-service primary teachers are more positive for nuclear energy and irresponsible for energy conservation than their female counterpart.

Grade Level Effects on the Attitudes towards Energy Conservation

Pre-service primary teachers' attitudes towards energy conservation are compared through one-way ANOVA based on their grade level, and the results are presented at Table 5. As it may be seen at the table the attitudes of pre-service primary teachers' attitudes towards energy conservation differentiate at the dimensions of insensitivity and lack of responsibility, working voluntarily for energy conservation, supporting nuclear energy, conservation of air conditioning, and impact on employment. In terms of the dimension of "insensitivity and lack of responsibility", attitudes of the pre-service primary teachers at third grade are significantly higher than the attitudes of the pre-service primary teachers at first and second grades. This result indicates that the pre-service primary teachers at third grade are more insensitive and irresponsible for energy conservation than their counterparts at first and second grades.

As it may be seen at Table 5, the pre-service primary teachers at second and third grades are more voluntary to work for energy conservation than the pre-service primary teachers at first grade. On the other hand, the pre-service primary teachers at second and third grades seem to support nuclear energy more than the pre-service primary teachers at first and fourth grades. At the same time, the pre-service primary teachers at second and third grades also seem to have significantly higher attitudes on "conservation of air conditioning" than the pre-service primary teachers at first and fourth grades. Lastly, the pre-service primary teachers at third grade have significantly higher attitudes on the dimension of "impact on employment" than the pre-service primary teachers at first grade.

Table 5. Grade level differences on pre-service primary teachers' attitudes (ANOVA results)

Subscales	Grade Level	N	\bar{X}	Stan. Dev.	df	F	p	Source of Sig. Dif. from Post Hoc Tests	
								As to Tukey test	As to LSD test
Automotive conservation	First Grade	85	3,642	0,712	319	1,674	0,173	-	-
	Second Grade	81	3,856	0,705					
	Third Grade	81	3,803	0,755					
	Fourth Grade	76	3,837	0,550					
Insensitivity and lack of responsibility	First Grade	85	2,257	0,623	319	3,321	0,020	-	1 st -3 rd 2 nd -3 rd
	Second Grade	81	2,261	0,659					
	Third Grade	81	2,531	0,734					
	Fourth Grade	76	2,461	0,747					
Solar Energy	First Grade	85	4,145	0,659	319	2,552	0,056	-	-
	Second Grade	81	4,399	0,544					
	Third Grade	81	4,358	0,627					
	Fourth Grade	76	4,276	0,721					
Working voluntarily for conservation	First Grade	85	3,623	0,724	319	2,881	0,036	1 st -2 nd	1 st -2 nd 1 st -3 rd
	Second Grade	81	3,911	0,698					
	Third Grade	81	3,884	0,790					
	Fourth Grade	76	3,839	0,581					
Government involvement and tax support	First Grade	85	3,810	0,666	319	0,614	0,606	-	-
	Second Grade	81	3,914	0,631					
	Third Grade	81	3,916	0,608					
	Fourth Grade	76	3,833	0,610					
Supporting Nuclear Energy	First Grade	85	2,671	1,216	319	16,118	0,000	1 st -2 nd 1 st -3 rd 2 nd -4 th 3 rd -4 th	1 st -2 nd 1 st -3 rd 2 nd -4 th 3 rd -4 th
	Second Grade	81	3,709	1,159					
	Third Grade	81	3,475	1,045					
	Fourth Grade	76	2,783	1,161					
Conservation of Air Conditioning	First Grade	85	3,618	0,969	319	9,363	0,000	1 st -2 nd 1 st -3 rd 2 nd -4 th 3 rd -4 th	1 st -2 nd 1 st -3 rd 2 nd -4 th 3 rd -4 th
	Second Grade	81	4,241	0,818					
	Third Grade	81	4,1173	0,852					
	Fourth Grade	76	3,7171	0,921					
Impact on Employment	First Grade	85	3,6353	0,749	319	2,681	0,047	1 st -3 rd	1 st -3 rd
	Second Grade	81	3,8148	0,804					
	Third Grade	81	3,9691	0,756					
	Fourth Grade	76	3,8487	0,766					
Sensitivity for conservation	First Grade	85	4,1129	0,578	319	1,307	0,272	-	-
	Second Grade	81	4,2123	0,621					
	Third Grade	81	4,2815	0,518					
	Fourth Grade	76	4,1474	0,633					

Settlement Place Effects on the Attitudes towards Energy Conservation

Pre-service primary teachers' attitudes towards energy conservation are compared through one-way ANOVA based on their settlement places they usually lived up to now, and the results are presented at Table 6.

Table 6. Settlement place effects on pre-service primary teachers' attitudes (ANOVA results)

Subscales		N	\bar{X}	Stan. Dev.	df	F	p
Automotive conservation	Province	139	3,734	0,720	320	0,768	0,465
	District	104	3,792	0,692			
	Town-village	80	3,852	0,631			
Insensitivity and lack of responsibility	Province	139	2,399	0,733	320	0,244	0,784
	District	104	2,336	0,671			
	Town-village	80	2,381	0,677			
Solar Energy	Province	139	4,269	0,541	320	0,180	0,836
	District	104	4,308	0,676			
	Town-village	80	4,317	0,765			
Working voluntarily for conservation	Province	139	3,778	0,707	320	0,661	0,517
	District	104	3,796	0,744			
	Town-village	80	3,890	0,676			
Government involvement and tax support	Province	139	3,845	0,667	320	0,230	0,794
	District	104	3,901	0,613			
	Town-village	80	3,865	0,586			
Supporting Nuclear Energy	Province	139	3,223	1,215	320	1,693	0,186
	District	104	2,989	1,184			
	Town-village	80	3,281	1,287			
Conservation of Air Conditioning	Province	139	3,820	0,982	320	1,613	0,201
	District	104	4,029	0,875			
	Town-village	80	3,962	0,885			
Impact on Employment	Province	139	3,831	0,760	320	,298	0,742
	District	104	3,836	0,768			
	Town-village	80	3,756	0,815			
Sensitivity for conservation	Province	139	4,1180	0,621	320	1,975	,140
	District	104	4,2673	0,549			
	Town-village	80	4,2075	0,578			

As it may be seen at Table 6, the attitudes of pre-service primary teachers towards energy conservation don't differentiate at any subscales (dimensions) based on their settlement place. This result shows that the settlement place (province, district or town-village) where the pre-service primary teachers usually lived up to now has no significant effect on their attitudes toward energy conservation. In other word, the pre-service primary teachers have similar attitudes towards energy conservation independent of the settlement place they usually lived up to now.

DISCUSSION AND CONCLUSION

The main findings of this research indicate that the prservice primary teachers's attitudes towards energy conservation differentiate based on their gender and grade levels. In terms of gender variable, the results of this research reveal that female pre-service primary teachers are more sensitive for energy conservation and more suspicious for nuclear energy

than their male counterpart. On the other hand, these results of the recent study also reveal that male pre-service primary teachers are more positive for nuclear energy and irresponsible for energy conservation than their female counterpart. Since energy conservation is an environmental problem we may contend that these results confirms the study result (Özmen at al., 2005) indicating that female university students are more sensitive for environment problems than male students.

In terms of grade levels variable, the recent study results reveal that pre-service primary teachers' attitudes towards energy conservation rise as their grade levels rise. This result may be explained with the effects of the training program on the attitudes of the pre-service primary teachers towards energy conservation. This result also confirms the study result (Özmen at al., 2005) revealing that age affects the attitudes of the univesity student towards environment. It is obvious that the grade levels and the ages of the students are directly proportional. Moreover, results of the recent study indicate that the attitudes of fourth grade pre-service primary teachers towards energy conservation tend to decrease. This inclination may be expalined with the exam (KPSS)* anxiety of fourth grade pre-service teachers.

This research also indicates that first grade pre-service teachers have more negative attitudes towards nuclear energy than their counterparts at other grades. This may be arised from the social bias resulted from the Nuclear Accident of Chernobill in 1986. This result implies that first grade pre-service primary teachers are more sensitive for nuclear energy while upper grade pre-service primary teachers have more rational attitudes towards nuclear energy. However, the total means score corosponding to “supporting nuclear energy” subscale is relativley low. In others words, preservice primary teachers' attitudes in terms of “supporting nuclear energy” fall within “undecided” interval. This result is parallel to the result attained by Karagöz (2007) who stated that pre-service Chemistry teachers have nao sufficient knowledge and attitudes towards nuckear energy.

The main conclusions of the research may be stated as below:

In terms of descriptive findings;

1. The pre-service primary teachers have attitudes towards the subscales of “solar energy” and “sensitivity for energy conservation” at *strongly agree level*.
2. The pre-service primary teachers have attitudes towards the subscales of “conservation of air conditioning”, “government involvement and tax support”,

* KPSS: Public Officer Elimination Exam (Kamu Personeli Seçme Sınavı).

“working voluntarily for energy conservation”, “impact on employment”, and “automotive conservation” at *agree level*.

3. The pre-service primary teachers have attitudes towards the subscales of “supporting nuclear energy” at *undecided level*.
4. The pre-service primary teachers have attitudes towards the subscales of “insensitivity and lack of responsibility for energy conservation” at *disagree level*.

In terms of gender effects;

5. Female pre-service primary teachers’ attitudes are significantly higher than male pre-service primary teachers’ attitudes on the subscales of “automotive conservation” and “sensitivity for energy conservation”.
6. Male pre-service primary teachers’ attitudes are significantly higher than female pre-service primary teachers’ attitudes on the subscales of “insensitivity and lack of responsibility”, and “supporting nuclear energy”.

In terms of grade level effects;

7. Third grade pre-service primary teachers have significantly higher attitudes on “insensitivity and lack of responsibility” subscale than the pre-service primary teachers at first and second grades.
8. The pre-service primary teachers at second and third grades are more voluntary to work for energy conservation than the pre-service primary teachers at first grade.
9. The pre-service primary teachers at second and third grades seem to support nuclear energy more than the pre-service primary teachers at first and fourth grades.
10. The pre-service primary teachers at second and third grades have significantly higher attitudes on “conservation of air conditioning” than the pre-service primary teachers at first and fourth grades.
11. The pre-service primary teachers at third grade have significantly higher attitudes on the dimension of “impact on employment” than the pre-service primary teachers at first grade.

In terms of settlement place effects;

12. The settlement place in which the pre-service primary teachers usually lived up to now has no significant effect on their attitudes toward energy conservation.

This study pointed out that pre-service primary teachers have positive attitudes towards energy conservation. Energy conservation subjects must be taken part more in curriculums at primary schools in order to transfer these attitudes to students. In addition, in the future studies, teachers' attitudes and reasons of negative attitudes towards energy conservation should be examined in detail.

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