

## Article

# Socio-Cultural Impact of Energy Saving: Studying the Behaviour of Elementary School Students in Greece

Sideri Lefkeli <sup>1</sup>, Evangelos Manolas <sup>1</sup>, Konstantinos Ioannou <sup>2</sup>  and Georgios Tsantopoulos <sup>1,\*</sup>

<sup>1</sup> Department of Forestry and Management of the Environment and Natural Resources, Democritus University of Thrace, 193 Pantazidou Street, 68200 Orestiada, Greece; roylaleu@hotmail.gr (S.L.); emanolas@fmenr.duth.gr (E.M.)

<sup>2</sup> Hellenic Agricultural Organization “DEMETER”, Forest Research Institute, Vasilika, 57006 Thessaloniki, Greece; ioanko@fri.gr

\* Correspondence: tsantopo@fmenr.duth.gr; Tel.: +30-25520-41118

Received: 24 January 2018; Accepted: 3 March 2018; Published: 7 March 2018

**Abstract:** Education makes it possible for students to become familiar with the rational management of energy as well as learn to implement energy saving practices in their everyday life. The study of certain student characteristics helps in the direction of applying strategies of behavioural change. The aim of this research is to record the knowledge and attitudes of elementary school students in the Prefecture of Evros with regard to energy saving. The collection of research data was done through the use of a structured and anonymous questionnaire with closed questions. The method used for the collection of the research data was cluster sampling. This involved 17 elementary schools of the continental part of the prefecture. 612 questionnaires were completed by students of the 5th and 6th grade of these schools. The evaluation of the research data showed that 69.6% of the students think that the most appropriate house temperature is 20°C with 79.1% of the students keeping the thermostat switched off while the house is aired. With regard to the use of TV, stereo, play station and PC the research showed that 93.8% of the students switch off the above devices when these are not in use. In parallel, 86.6% of the respondents usually or always switch off the lights when coming out of a room and 46.2% of the students use energy saving bulbs. Also, 93% of the students recycle because they believe that doing so contributes to the protection of the environment while 41% always chooses to walk to school. With regard to the significance of reasons concerning energy saving 85.9% thinks that energy saving is important to very important for reducing environmental pollution.

**Keywords:** irrational energy management; environmental education; energy education programs; active participation of students

## 1. Introduction

The competitive behaviour of modern man led to his isolation from the natural environment and the degradation of natural resources. The use of renewable energy sources is one of the most important elements of sustainable development, which also constitutes the most effective solution for combating environmental problems [1]. The biggest part of the energy used comes from fossil fuels such as petroleum, coal and natural gas. As the energy requirements of countries continue to increase, the consumption of fossil fuels also continues to increase. The uncontrolled consumption of fossil fuels leads to the release of pollutant gases which impact negatively land and marine ecosystems. However, the finite nature of fossil fuels and the pollution of the natural environment constitute key determinants for the development and exploitation of new alternative forms of energy. Renewable sources of energy are infinite and environmentally friendly because they contribute to agricultural development, to the promotion of variety in energy sources and to the minimization of the danger resulting from the availability of nuclear weapons [2]. Their use brings some advantages which

contribute to the reduction of land and marine pollution. Renewable energy sources constitute the most attractive choice for satisfying energy demands. They can also be used without the fear of depletion [3].

Interest on renewable energy sources started in the 1970s mainly as a result of the petroleum crises of the era but also as a result of the degradation of the environment and of the quality of life from the use of traditional energy sources. Renewable energy sources were particularly costly in the beginning because at that time renewable energy applications were at an experimental stage. However, today renewable energy sources are taken into account in the official energy plans of developed countries and although they still constitute a very small percentage of energy production, nevertheless, steps are taken for further use of such sources. It needs to be noted that the cost of applying renewable energy solutions is continuously reduced in the last twenty years. In particular, wind energy and biomass can now compete with traditional sources such as coal and nuclear energy [4].

Energy saving is an efficient way of confronting our energy and ecological problem in order to achieve sustainability. Energy saving means reduction in the amount of energy consumed in a process or system, or by an organization or society, through economy, elimination of waste, and rational use. Sustainability is the ability of a process or human activity to meet present needs but maintain natural resources and leave the environment in good order for future generations. Change of attitude and behaviour with regard to the sustainable use of energy is necessary. It is important that citizens and particularly students understand the significance of rational energy management so that they can create positive attitudes towards the management of natural resources. Education on energy issues plays a key role in the formation of student behaviour. The application of initiatives regarding energy saving within school units can only bring benefits and lead towards reduction of energy cost [5]. Educational institutions are the most appropriate places in which students are taught energy conservation and involved in activities regarding rational energy management. Students are given opportunities to appreciate activities regarding energy saving and disseminate what they learnt in their wider social environment [6]. The environmental education strategies applied constitute a significant educational process which strengthens student awareness of environmental issues [7].

Factors which influence the attitudes of students towards the environment are the features of their family environment, their energy education at school and social interaction [8,9]. What needs to be emphasized is the importance of the social context of the adolescent, and the necessity to take this into account as a channel which amplifies the impact of specific environmental education strategies [10].

Through the activities of an appropriate educational curriculum the students can revise his personal values, understand the good called energy and learn to use it rationally [3,11]. The aim of this paper is to investigate the behaviour of elementary school students with regard to energy management. This paper is expected to show the influence of the social context of students on environmental protection. In particular, the aims of the research are to investigate the everyday habits of students with regard to energy management, to recycling processes, and to how they commute from house to school. Also, an important aim of the research is to study the reasons for which students think energy saving is important. At the same time, it is important to highlight the importance of the stimuli students have received through the material they have been taught from the physical sciences curriculum, their participation in environmental education programs as well as their wider social environment.

## 2. Energy Saving in the Educational System

The concept of energy is taught in the Greek educational system since the end of the 1970s [12]. This interest is due to the response of the educational system to the energy crisis which appeared and marked the beginning of the 1970s. In recent years, in the curriculum of elementary education, energy became independent as a concept. However, its importance for everyday issues and problems was also highlighted (energy saving, renewable and non-renewable energy sources). In particular, the Cross Curricular/Thematic Framework (C.C.T.F) aims that students acquire a holistic view of the concept of energy and become familiar with the scientific way of thinking and methodology (observation,

collection of information, formulation of hypotheses, analysis and interpretation of data, extraction of conclusions) [12].

From early grades students learn to construct simple energy systems which they continue to do until senior grades where they calculate the energy footprint of their homes. In the last grades of elementary school students are capable to use the term “energy”, the terms “energy storage” and “energy transfer” and, in addition, they are in a position, to suggest solutions regarding the consumption of less energy in meeting their needs and desires. Physical science school books provide knowledge with regard to restricted energy reserves and attempt to orient students towards the adoption of simple everyday habits so that they can contribute to the restriction of energy waste. Conscious behaviour is a product of the learning process and for this reason “energy education” is important. Energy education can help students form an objective view regarding the use of energy in their everyday life [13].

Today students receive several stimuli with regard to energy management and have formulated conceptual representations on the issue of energy through their experiences from the school program and everyday interaction. The Cross Curricular/Thematic Framework (C.C.T.F) and the program of studies emphasize the use of renewable sources of energy and promote the significance of environmentally friendly behaviour. It is important that students are prepared for the exploitation of renewable energy sources [14] and for this reason the content of educational programs should contribute to the creation of a positive attitude towards the management of the natural environment [15].

Through environmental education programs students acquire knowledge and develop the skills they need to defend the environment in everyday life. They formulate a new code of behaviour which is based on energy saving practices. The result is that students become familiar with electrical energy management, participate in the recycling process and avoid the use of a car for going to school. In Jordan, students are aware of the use of renewable energy sources and show a positive attitude and willingness towards using them [2]. Similar behaviour is shown by school students in Turkey who are supporters of renewable energy sources because they believe that the energy which such sources can provide is adequate [16]. Students in Finland participate in sustainability activities and learn through them about natural resources management and energy saving [17]. The study of student behaviour in schools in Taiwan shows that energy saving is linked with their everyday life [18]. Also, research conducted on 2400 students in Taiwan showed that students are encouraged to develop innovative ideas on energy through programs of energy education implemented in their schools [19]. Also, the study of the views of students in N. California and E. Massachusetts, regarding management of energy, shows that students after participation in an energy education program, have improved their home energy saving behaviour [20].

The study of research data regarding female students (also members of the Scouts association), 8–14 years old, showed that after their involvement in a program of energy saving, have improved their energy saving behaviour. These students usually deactivate electric devices, adopt desirable behaviour with regard to heating practices in winter, and with regard to energy management, they exchange information with other people [21]. Similar behaviour is shown by students in an elementary school in North-eastern USA, who, after, their participation in an energy management program, reduced their energy consumption of energy for more than 15% [22]. Research carried out with high school students in Grevena in Greece showed that these students have adopted a positive attitude towards energy management. 66.67% of the sample turn off the lights when coming out of the room, 44.98% always switches off television and personal computer using the central button of operation and 57% never leaves the windows open when the heating or air-conditioning is activated. 65.46% of the students asked usually walk to school from home [23].

With regard to the management of electricity from students in the Santa Elena high school in the Phillipines, during the academic year 2013–2014, it is found that an over-all weighted mean of 2.15 was computed, which signifies that the respondents usually switch off the lights when leaving a room. The responses about water and energy conservation consist of four items, with emphasis on the

following: avoid the waste of water by using glass, when brushing teeth and using basin when washing dishes; switching-off the lights and the fan in the classroom if not in use; using solar flashlight and calculator; and providing support for local programs on conservation through conserving electricity at home and at school [24]. Svolis says that the students of the 4th high school of Lamia in Greece, after involvement with the issue of rational energy management, aim to use alternative forms of energy and suggest ways to reduce energy consumption both at home and at school [25]. Vasili's research on 50 students of preschool age in Patra and Kyparissia in Greece shows that 98% of these students deactivates the lights when leaving the room while 72% of the sample uses both sides of paper [26].

Students must be aware of the importance of recycling so that they can develop a positive attitude and successfully participate in recycling activities [27]. Research carried out in schools in Ireland reveals that students of "green schools" participate in high percentage in the process of recycling. These students recognize the need to separate garbage, contributing to the reduction of the quantity of garbage, have the opportunity to think of the consequences of their actions on the environment and, with regard to recycling as well as the adoption of rational environmental practices, they function as transmitters in their family environment [28].

Elementary school students in Chalkidiki in Greece collect batteries and take them to recycling points, a fact which confirms that students are aware and educated on the significance of recycling [29]. Research concerning students 6-10 years old, confirm the views of the students asked on the significance of recycling with regard to the reduction of garbage, the conservation of natural resources and the economy [30]. Research on the views of 41 students, 6–12 years old, on recycling, shows that students recognize its effectiveness while a percentage of the sample usually recycles at home [31]. Similar behaviour is adopted by 14 elementary school students who hold ecocentric views on recycling [32].

However, research carried out on preschool and school students of four public schools in Volos with differing social and economic background, provides information on the definition of recycling, its process as well as the views of students regarding benefits from recycling. The elaboration of research data shows that the two age groups are used to recycling only paper or batteries at home, without, however, realizing to a significant degree the benefits of recycling. In particular, preschool students find it difficult to separate garbage according to the material they are made of [33]. The investigation of the attitudes of students regarding energy saving in schools in Spain and Mexico shows that students in Spain are famous regarding recycling behaviour while students in Mexico use mass transportation for their movement from and to school [34].

Research by Panter et al. showed that half of the students usually walk to school or alternatively use a bicycle [35]. Napier et al [36] found that students walk to school if this is near home since their parents believe that their children are not in danger, while 75% of the students in San Francisco, for reasons of convenience, and for saving time, go to school by car [37]. 50% of students in New Zealand, due to danger in their neighbourhoods, go to school by car [38]. According to Beck and Greenspan the most common means of transportation to school is the car (46.3%), next is the school bus (39.6%) and last in the hierarchy is walking (14.2%) [39].

With regard to energy management students are receivers of many stimuli and can realize the significance of environmentally friendly behaviour [40]. According to Kandpal and Broman, students are aware of the basic principles of using energy and prepare for strategies which exploit renewable forms of energy [14]. Research on energy management on students, shows that they can understand the good called energy and through "energy education" learn to use it rationally [11].

Saving energy must become an everyday practice for every student. It is important that we use strategies for making students aware for the seriousness of the issue and also involve students in appropriate activities [41]. According to Coker et al. the provision of knowledge on energy management and experiential learning can form active and conscientious students [42]. It is also important that the students/future citizens are equipped with environmental knowledge which will lead to the development of sustainable solutions.

In order to secure environmental quality it is important to adopt a way of life which will be based on: the reduction of household energy consumption, the reduction of CO<sub>2</sub> emissions, the development of more green areas, the reduction of pollution, the development of environmental programs at school and knowledge retrieved from newspapers, books and journals Recycling of goods, less use of electricity, less use of cars and the creation of devices with energy efficiency could seriously contribute to the protection of the environment [43].

### 3. Methodology

The research area included the geographical borders of Elementary Education of the Prefecture of Evros which belongs to the administrative region of Eastern Macedonia and Thrace. The Directorate of Primary Education of the Prefecture of Evros supervises and cooperates with 162 schools (kindergartens and elementary schools). It is comprised of five municipalities and, in particular, the Municipality of Alexandroupolis, the Municipality of Orestiada, the Municipality of Didymoteicho, the Municipality of Soufli and the Municipality of Samothraki. One of the responsibilities of Elementary Education is the organizing of school activities. Each year the teachers of these schools, in cooperation with students, design and realize various programs. The programs are categorized in three categories according to their theme: cultural, health and environmental. These programs are supervised by the teacher of each class and the district supervisor for school programs and activities. The questionnaire was divided into three sections. The first section was about questions with regard to the contribution of renewable energy sources in confronting environmental problems, the emotions of students concerning climate change and the significance of developing in the future technologies designed to produce electrical energy from energy sources which are not harmful to the natural environment. The second section was about student daily habits with regard to electrical energy management, the recycling process, the use of means of transportation as well as the study of reasons with regard to the significance of energy saving. The third section was about the social characteristics of students.

For the collection of research data regarding the views and attitudes of 5th and 6th grade students of the Prefecture of Evros a structured questionnaire was used because it was regarded as the most appropriate tool in order to achieve the aim of the research. Questionnaires are used to collect data by asking people to answer to the same group of questions. They are usually used in the framework of research strategies which aim to collect data on the views, behaviors, characteristics, attitudes etc. Although there is a variety of definitions, we use the questionnaire as a general term which refers to techniques of data collection where every respondent answers the same group of questions in a pre-determined sequence. The advantages of collecting information through the use of questionnaires are that these are less costly, can be sent to a large number of people, they are easy to create and use, the respondents are free to express their opinion (lack of direct communication), the ways of analyzing the material are standardized, the researcher cannot influence the answers, the questionnaires are the less time-consuming method [44].

The sample was comprised of 17 elementary schools out of 53 which operate in the area. 612 questionnaires were completed by students of 5th and 6th grade. The reliability of the particular research questions is mainly based on the experience of the senior researcher in the particular research area. The senior researcher who conducted this research had sufficient educational experience both with regard to teaching at this educational level and with regard to issues concerning the area under investigation. In addition, the senior researcher had devoted sufficient time with regard to the issue under investigation both with regard to previous research projects in the particular area as well as with regard to data collection. In addition, this questionnaire was based on the available literature and was given for checking/corrections to ten educators of schools in which the research was to be conducted. Finally, after the completion of the questionnaire a pilot research was conducted to 25 students. The final questionnaire was formulated after completion of this pilot research. The sample was comprised of 17 elementary schools out of 53 which operate in the area and 612 questionnaires were completed by students of 5th and 6th grade. For purposes of approval for carrying out the



research the procedure followed was the procedure set by the Pedagogical Institute of Greece which supervises all research in Greek schools. The collection of data was done the period May–June 2016 and for the evaluation of data descriptive statistics were used, Friedman’s non-parametric test and the test of independence  $\chi^2$ .

#### 4. Results

The results came from the content, the concepts and the logical sequence of questions in the questionnaire. In particular, from the evaluation of the research data the following themes were created: “management of household energy”, “recycling”, “movement of students and means of transport”, and “saving energy”. In particular, the focus was on the regulation of house heating, the management of house electrical energy, the operation of the heating or cooling system as well as on the condition of electrical devices when these are not used. The focus was also on habits of saving paper and recycling, on the most important reasons of energy saving and particular attention was paid to the way students commute from their house to school. With regard to the social and economic characteristics of the students asked, 38.9% of fathers of students are civil servants while 26.3% of fathers are self-employed. 14.7% are private employees and 13.4% farmers and stock farmers while 3.3% of fathers are unemployed and 3% pensioners. With regard to mothers of students 25.9% are civil servants and 21% private employees. 27.5% of mothers only do house work and 13.4% are free lance professionals. A very small percentage of mothers (2.7%) are farmers and stock breeders. 47.0% of men and 44.5% of women are graduates of upper secondary schools (lyceums). The percentage of fathers who are university graduates is 20.6% while the percentage of mothers who are university graduates is 26.6%. 10.9% of men and 9.3% of women are graduates of technical and vocational lyceums. The percentage of fathers who are graduates of lower secondary schools is 7.9% while the percentage of mothers with the same level of education is 5.5%. The percentage of fathers who are elementary school graduates is 4.4% and the percentage of mothers who are elementary school graduates is 3.5%. The percentage of parents who are graduates of Technological Education Institutes is 7% for fathers and 7.9% for mothers. The percentage of parents who are holders of a graduate degree is 2.2% for fathers and 2.7% for mothers. With regard to the sex and grade of students (Tables 1 and 2) 44.3% of students are girls and 55.7% are boys. In addition, 54.7% of students are at the 5th grade and 45.3% of students are at the 6th grade. With regard to regulating home temperature almost seven out of ten students (69.6%) think that the most appropriate temperature is 20 degrees.

**Table 1.** Sex (Percentage %).

Sex	Percentage %
Girl	44.3
Boy	55.7

**Table 2.** Grade (Percentage %).

Grade	Percentage %
5th	54.7
6th	45.3

Table 3 shows that 68.4% of the students think that it is preferable for a person to wear more clothes when he/she is cold rather than increase the heating. 17.4% of students have regulated home temperature at the level above 20 degrees and 13% at a level below 19 degrees (Table 4).

**Table 3.** The first thought of pupils when they are very cold while the heating is on (Percentage %).

Increase the Heating	Wear More Clothes
31.6	68.4

**Table 4.** Regulation of home temperature (Percentage %).

Below 19 Degrees	20 Degrees	More than 20 Degrees
13.0	69.6	17.4

Table 5 shows that almost eight out of ten students (79.1%) have the thermostat switched off when they open the windows in order to renew the air of the house. Next the test of independence  $\chi^2$ , in relation to the position of the thermostat, was carried out while the house is aired and this if the position of the thermostat is different in relation to grades and sex.

**Table 5.** Position of the thermostat when the house is aired (Percentage %).

Heating/Thermostat Switched on	Heating/Thermostat Switched off
20.9	79.1

According to Tables 6 and 7 the statistical test of independence  $\chi^2$  showed that there is dependence between grade and sex and the answers students gave for the variable “Position of the thermostat when the house is aired”. In particular, when the house is aired, girls are more careful compared to boys.

**Table 6.** Relationships between school grade and views of pupils with regard the position of the thermostat when the house is aired.

	Grade			
	5th		6th	
When they open the window in order to renew the air of the house	Frequency	Percentage %	Frequency	Percentage %
Heating/thermostat switched on	84	24.3	48	16.8
Heating/thermostat switched off	262	75.7	238	83.2
Total	346	100.00	286	100.00

$$\chi^2 = 10.322, p = 0.001 (p < 0.005).$$

**Table 7.** Relationships between sex of pupils and views of pupils with regard to position of thermostat when the house is aired.

	Sex			
	Boy		Girl	
When they open the window in order to renew the air of the house	Frequency	Percentage %	Frequency	Percentage %
Heating/thermostat switched on	90	25.6	42	15.0
Heating/thermostat switched off	262	74.4	238	85.0
Total	352	100.00	280	100.00

$$\chi^2 = 10.541, p = 0.001 (p < 0.005).$$

75.5% of students (Table 8) say that they have the windows closed when the heating system is in operation in winter or alternatively when the cooling system is in operation in summer. Almost four out of ten students usually use the air-conditioner (40.5%) or the fan (40.8%) (Table 9). 18.7 usually lower the tents or close the blinds of the windows.

**Table 8.** View of the students regarding the position of the windows when the heating system is in operation in winter or alternatively when the cooling system is in operation in summer (Percentage %).

Closed	Open
75.5	24.5

**Table 9.** Habits in dealing with heat (Percentage %).

Use the Air-Conditioner	Use the Fan	Lower the Tents and Close the Blinds of the Windows
40.5	40.8	18.7

With regard to the use of television, stereo, play station-computer game console, almost nine out of ten students (93.8%) switch off the above devices from the central button (Table 10). 87.7% of students switch off the television from the central button while 11.2% of students leave on standby position. 92.9% of students show the same behaviour with regard to the stereo, and the same happens for 93.8% of students with regard to the play station. Almost eight out of ten students (89.7%) usually switch off the personal computer from the central button while 6.8% of students leave the personal computer on standby position.

**Table 10.** State of devices when not in use (Percentage %).

	Switch off from Central Button	Leave on Standby	Leave Switched on
Television	87.7	11.2	1.1
Stereo	92.9	6.3	0.8
Play station—computer game console	93.8	4.6	1.6
Personal computer	89.7	6.8	3.5

Table 11 shows the habits of students with regard to the use of paper, the recycling of batteries and the management of electricity. Almost eight out of ten students (86.6%) usually or always switch off the lights when coming out of a room. Also, 47.3% of pupils always or usually recycle batteries either at home or at school while 46.2% of students use energy saving light bulbs. Almost five out of ten students always make rational use of paper. In particular, 57.8% of students usually or always use used paper for notes etc and 54.5% always use both sides of the paper when printing or photocopying documents.

**Table 11.** Saving habits with regard to energy, paper and recycling (Percentage %).

	Always	Usually	Sometimes	Rarely	Never	I Do Not Know
You use in your house energy saving light bulbs	26.6	19.6	14.4	9.7	8.7	21.0
You switch off lights when coming out of a room	66.5	20.1	7.8	3.5	1.6	0.6
Use used paper for notes etc.	32.0	25.8	19.8	13.1	8.1	1.3
You use both sides of paper when you print or photocopy documents	31.6	22.9	14.6	11.4	9.8	9.7
You recycle batteries at home or at school	28.2	19.1	13.9	17.2	16.9	4.6



Friedman's statistical test was used to examine the potential existence of a statistical difference between the views of students concerning saving habits with regard to paper, energy and recycling (Table 12). According to the results of the above mentioned test, the first energy saving habit, with mean rank 3.97, is that students switch off the lights when coming out of a room. Their second habit, with mean rank 3.03, is to use used paper for notes etc. Their third habit, with mean rank 2.83, is to use both sides of the paper when they print or photocopy documents. The students' fourth habit, with mean rank 2.64, is to recycle batteries at home or at school. In the last position, with mean rank 2.53, is the habit of the students to use energy saving light bulbs at home.

**Table 12.** Application of Friedman's test regarding saving habits with regard to energy, paper and recycling.

	Mean Rank
You use in your house energy saving light bulbs	2.53
You switch off the lights when coming out of a room	3.97
You usually use used paper for notes etc.	3.03
You use both sides of the paper when printing or photocopying documents	2.83
You recycle batteries at home or at school	2.64

$N = 632$ , Chi-Square = 411.416,  $df = 4$ , Asymp. Sig. 0.000.

With regard to the views of students on recycling (Table 13) nine out of ten students recycle. In particular, 93% of students recycle because they believe that they contribute to the protection of the environment. The percentage of students who do not recycle is 7% and this because they believe that they do not contribute much to the protection of the environment.

**Table 13.** Recycling and protection of the environment (Percentage %).

I Recycle Because I Contribute to the Protection of the Environment	I Do Not Recycle Because I Think That Recycling Does Not Contribute Much to the Protection of the Environment
93.0	7.0

Table 14 presents the way students move from home to school. In particular, five out of ten students (51%), regarding the route from home to school, never use a car or rarely move by car. In parallel, eight out of ten students rarely or never use public transport in order to go to school. 41% of the students asked always go to school on foot and 23.6% of students report that they usually or always use their bicycle as a means of transport from home to school.

**Table 14.** Mode of transport to school (Percentage %).

	Always	Usually	Sometimes	Rarely	Never
By car	23.3	12.2	13.6	29.6	21.4
By public transport—school bus	12.3	4.4	2.8	8.4	72.0
On foot	27.4	13.6	11.6	17.2	30.2
By bicycle	10.8	12.8	10.9	18.0	47.5

In order to investigate the possibility of existence of statistical difference between the views of students and how they move to school, Friedman's statistical test was applied. According to the results of the above mentioned test, students never move by car (mean rank 2.85). In particular, students, with mean rank 2.83, choose to go to school on foot, and, also, with mean rank 2.40, prefer to use their

bicycle. Regarding means of transport the last position in the hierarchy, with mean rank 1.92, is the school bus, which rarely or never is used by students (Table 15).

**Table 15.** Application of Friedman’s statistical test regarding the mode of movement of pupils to school.

	Mean Rank
By car	2.85
By public transport—school bus	1.92
On foot	2.83
By bicycle	2.40

$N = 632$ , Chi-Square = 270.717,  $df = 3$ , Asymp. Sig. 0.000.

With regard to the importance of reasons concerning energy saving (Table 16) almost nine out of ten students think that it is important to very important to engage in energy saving in order to reduce environmental pollution. 74.2% of students think saving money for financial reasons is important while 68.7% thinks that saving energy is important in order not to exhaust natural resources.

**Table 16.** Importance of reasons for energy saving (Percentage %).

	Unimportant	Of Little Importance	Moderate	Important	Very Important
In order to save money	4.9	6.6	14.2	34.3	39.9
In order not exhaust natural resources	3.8	8.9	18.7	35.3	33.4
In order to reduce environmental pollution	3.2	4.4	6.5	24.2	61.7

Friedman’s statistical test was used to examine the potential existence of a statistical difference between the views of the students regarding importance of reasons for saving energy, Friedman’s test was applied (Table 17).

**Table 17.** Application of Friedman’s statistical test regarding reasons for energy saving.

	Mean Rank
In order to save money	1.91
In order not to exhaust natural resources	1.78
In order to reduce environmental pollution	2.31

$N = 632$ , Chi-Square = 137.495,  $df = 2$ , Asymp. Sig. 0.000.

According to the results of the above mentioned test, the reduction of environmental pollution, with mean rank 2.31, is a reason of primary importance for energy saving. Next in importance, with mean rank 1.91, is saving money and in the last position, with mean rank 1.78, is not to exhaust natural resources.

## 5. Discussion

Understanding the behaviour of students regarding energy saving is important for purposes of promoting energy saving. Together with an appreciation of the benefits for energy saving, understanding the attitude of the students is something which will help in making the appropriate political and educational decisions.

With regard to the first theme “management of household energy” the students asked think that the most appropriate house temperature is 20 degrees and declare that they prefer to wear extra clothes when they are cold. The students usually air their house when the thermostat is switched off.

In addition, they close the windows when the heating system is in operation in winter and when the cooling system is in operation in summer. In parallel, students in N. California save more household energy [20]. In addition, students in North-eastern USA have also managed to reduce household energy [22].

During summer time, the majority of students use the air-conditioner or the fan and very few of them use tents. The majority of the sample always switches off electrical devices from the central button. They do the same with regard to lights when coming out of a room. Students in Grevena in Greece behave the same way and always deactivate electrical devices and lights when coming out of a room [23]. The same behaviour, with regard to the management of electricity applies to students in the Philippines [24]. At this point, it is important to note that girls are more careful than boys with regard to household energy management, something which is verified in the research by Puttick et al. [21].

With regard to the second theme “recycling”, the majority of students in the sample mainly recycle batteries just as students in Chalkidiki do [28,29,31] while, they simultaneously, support the view that recycling contributes to the protection of the environment. The same view is held by students in other research projects who acknowledge the significance of recycling for the reduction of garbage and the saving of natural resources [30,32]. Except recycling batteries, the same pupils have learnt to use used paper for notes etc or use both sides of paper, when they need to print or photocopy documents, something which proves their environmentally-friendly behaviour.

The study of the theme “movement of students and means of transport” shows that students rarely use a car or public transport in order to go to school. On the other hand, the majority of these students goes to school either on foot or by bicycle, just as it is proved from other research data which show that students go to school either on foot or by bicycle [35–37]. On the contrary, students in New Zealand, due to danger in their neighbourhoods, usually go to school by car [38].

The study of the fourth theme “saving energy” shows that the students of this sample think of energy saving as very important because they believe that it can first contribute to the reduction of pollution of the natural environment and second to saving money. This view has been adopted by students of schools in Finland, who have learnt through activities how to manage natural resources or as well as save energy [17]. In addition, taking initiatives in schools can only bring educational benefits [5], just as the content of educational programs may change behaviour towards the management of the natural environment [40].

## 6. Conclusions

This paper investigated the behaviour of elementary school students in the distant area of the Prefecture of Evros on a series of issues related to the management of household energy, recycling, movement of students to school and the importance of saving energy so that those who formulate and implement policy can use the findings of this research effectively. The habits of students regarding energy management show that students are careful and sensitive to such issues, which means that they have acquired these skills through their “energy education”. Students can develop environmentally-friendly behaviours through environmental education programs [45] something which is shown by the habit of students to recycle and properly manage used paper. Environmental education plays a key role in the everyday life of students [46] just as it does in the program of studies. It is worth noting that schools gradually change and aim to promote investigative and experiential learning processes with the ultimate aim to create environmentally responsible citizens.

Finally, this research could be repeated and address lower grade students and thus make obvious their habits with regard to energy management. In addition, this research could be expanded, modified and focus on linking knowledge about the environment with different courses in the program of studies.

**Author Contributions:** Sideri Lefkeli and Georgios Tsantopoulos designed the research; Konstantinos Ioannou and Evangelos Manolas analyzed the data; Georgios Tsantopoulos and Evangelos Manolas wrote the paper.

**Conflicts of Interest:** The authors declare no conflict of interest.

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