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Examining impacts of natural sciences education in comparison with health and social sciences for pro-environmental behaviours in Turkey

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Analysis of academic programmes has become very important for pro-environmental behaviours; however, impacts of natural, social and health sciences education for environmental knowledge and behaviours have not been investigated yet. Therefore, the aim of this study was to examine these impacts on environmental knowledge and relation with environmental behaviours of 706 university students. According to findings of study, health sciences students differed from other groups in environmental knowledge, however, no differences in terms of behaviours. Another major finding is: there is a statistically significant negative correlation between environmental behaviour and environmental knowledge for all students and especially for 'health sciences' ($r = -0.208$; $p < 0.01$) and 'natural sciences' students ($r = -0.131$; $p < 0.05$), contrary to our expectations. For items supporting 'consumer behaviours', majority of students indicated they had engaged in environmentally protective behaviours. For example, '90.4% stated to turn off unneccessary lights' (item 4); 79.1% tried to use both sides of papers (item 12) and 77.9% preferred public transportation (item 5). However, these high scores could be interpreted in terms of economical benefits rather than behaving environmentally. In conclusion, students did not have 'internalized ethical values' enabling them to behave actually environmental way by feeling themselves as part of nature.

Keywords: environmental knowledge; environmental behaviours; university students; educational background; environmental ethics

Introduction

It is evident that natural resources of planet Earth are under severe threat by global warming. Earth's life support systems and society have entered an era of enormous change. In the last 50 years, ecosystems and their services have changed more than any previous period in human history. Further enormous changes are inevitable, as human population increases 2–5 more billions by midcentury, human per-capita consumption continues to expand, drivers of ecosystem change intensify and feedbacks among ecosystem services and human well-being become stronger and more complex (Millenium Ecosystem Assessment 2014). Fortunately, awareness that the natural environment is being harmed by human actions has increased since the 1960s; that initiation of environmental problems is recognised; and that in the coming years severity will increase (Schultz et al. 2005). Earlier, environmental

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problems have been considered as technical and economic problems; while in recent decades social dimensions of environmental problems such as public attention and people's attitudes towards environment have became areas of environmental sociology and environmental psychology (Kalantari and Asadi 2010). Psychologists have long recognised that environmental problems are produced by maladaptive human behaviour (Milfont and Duckitt 2006). First representatives of this view, Maloney and Ward (1973), argued that, 'we must determine what the population "knows" regarding ecology, the environment and pollution; how they feel about it; what commitments they are willing to make and what commitments they do make'.

It is apparent that man–nature relationship is extremely complex and not only determined by inner-personal characteristics, such as values, motivations, but also mediated by outer personal factors such as cost of environmental behaviours, presence or absence of supporting policies and social norms, culture and so on. In the light of this, it can be explicit that what determines one's appropriate environmental approach and if he/she reflects this approach into behaviour is a direct correlate of individuals' attitudinal responses and the personal characteristics such as age, education, income and knowledge.

Theoretical models assume that environmental knowledge is an important precondition for pro-environmental behaviours (Arcury et al. 1986). Meinhold and Malkus (2005) indicate that environmental knowledge is a significant moderator for the relationship between environmental attitudes and environmental behaviours. This relationship is examined for several target groups (primary school students, teachers, parents, etc.). In several studies, no relationship between factual environmental knowledge and ecological behaviour (Maloney and Ward 1973; Amelang et al. 1977; Schahn and Holzer 1990; Krause 1993) or moderate relationship at best (Arbuthnot 1977; Dispoto 1977; Smythe and Brook 1980; Stutman and Green 1982; Hines et al. 1986/1987; Oskamp et al. 1991; Geok and Ivy 1998) were found. Arcury (1990) found a consistent and positive relationship and reported that the strong relationship between education and both knowledge about the environment and attitude towards the environment would emphasise knowledge leading over attitude. Then, as Köse et al. (2011) pointed out: environmental education (EE) has been viewed as an important way to educate students about environmental issues in identifying and challenging environmental problems in all educational levels including university level (Uzun and Sağlam 2006; Fernandez-Manzanal et al. 2007; Tuncer et al. 2009). In attaining this goal, one of the important outcomes of an effective EE is to lead positive changes in students' attitudes and behaviours towards environment.

In case of Turkey, studying Turkey as a developing country case (İstanbul, largest city of Turkey), Furman (1998) reported environmental knowledge to be consistently and strongly related to the new environmental paradigm (NEP); the respondents who knew more about the environment and nature tended to give stronger endorsements to NEP statements. Analysing data from their 1998 survey of environmental attitudes in İstanbul, Turkey, Adaman et al. (2003) found that İstanbul residents supported environmental causes when they were knowledgeable about them, but generally displayed unfamiliar response for specific environmental problems. Education level reliably predicted environmental concern, though respondents' incomes did not. Similarly, Tuna (2004), again in İstanbul, found that respondents' educational levels and occupation had significant positive impacts on environmental commitment scores; their wealth, however, did not have a significant effect. Actually, there are several studies showing the relationship between environmental knowledge and pro-environmental behaviours conducted with all levels of students: from primary to high schools with teachers and pre-service teachers. However, studies concerning university students' environmental knowledge and behaviour relationship are

very limited. Özdemir et al. (2004) aimed at identifying the awareness and sensitibility levels of medical school students about environmental problems, as they were to be the main actors in the delivery of health care services in future. They concluded that the awareness levels of the 'physicians to be' about environmental problems which pose global threat are far less than anticipated. Among the university students from quite different programmes, Ek et al. (2009) investigated first year and senior students' attitudes and sensibilities towards environmental problems and reached a mean difference among academic programmes in which students enrolled mainly due to vocational school of automotive and health school of nursery. Köse et al. (2011) explored undergraduate students' environmental attitude after completing 'Environment, Human and Society' course and found that undergraduate students indicated positive environmental attitudes. However, although it is expected to be near to the higher points after they enrolled in the environmental course, scores were clustered just above the mid-point.

Depending on the results of cited studies implemented in Turkey, the main aim of this study is to examine the university students' levels of environmental knowledge and behaviours depending on their specialisation on natural, health and social sciences. Students enrolled to natural science programmes are more exposed to environment-related courses. Whereas participants from health (environmental health and nursing) and social sciences (social science education, accounting, management, theology and religion) programmes practically do not have ecology and/or related environment-based courses in their curricula unless the student individually enrolls to a non-science major elective course. Environmental health technicians present an exception since they have some of their courses related to environmental issues but with an engineering orientation. Higher education in social sciences remains relatively critical and enlightening process, upsetting old prejudices, imparting knowledge, broadening social experience and developing self-confidence and skills of critical analysis (Rootes 1995). However, we are expecting natural science students to have more environmental knowledge and behave accordingly since they are exposed to environmental issues during their education. Therefore, to determine the difference among students from different fields of study, in addition to evaluation of all data for all students, respondents were grouped in the second part of the study into three distinct target groups as: health sciences, natural sciences and social sciences.

Gardner and Stern (1996), in a psychologically oriented study, have concluded that educational efforts, if compatible with people's values, might have important effects on attitude change, but make no effects on behaviour change. In light of such evidence, the question of 'to what extent environmental education effects have been directly translated into environmentally responsible behaviors' remains to be answered. Searching for the answer to this question, or a correlation between 'environmental knowledge' and 'environmental behaviour', students were also asked about their actions towards environment.

Given the importance of environmental behaviours, the main purpose of this study is to gather baseline data on the level of environmental knowledge and behaviours of university/college students in Turkey and to examine the correlations between those variables. Since our target groups are university/college students, we expect them to have a certain level of environmental background and behave environmentally. More specifically, research questions for this study can be summarised as:

(1) Is there any difference between the mean scores of university students among different fields of study – natural, social and health sciences – on environmental knowledge and environmental behaviours?

(2) Are there any differences in natural, social and health sciences students' environmental knowledge and behaviours in terms of their gender and age?
(3) What are the Turkish university students' pro-environmental behaviours?
(4) Is there any relationship between environmental knowledge and behaviours?

Methods

As explained above, Hines et al. (1986/1987), in a review of relationships between environmental worldview and pro-environmental behaviours, analysing 128 studies have grouped the predictor variables as (a) knowledge, (b) psycho-social variables (attitude, locus of control, verbal commitment, personal reliability and economic orientation), and (c) demographic variables (education level, income, age, gender, etc.). Results indicated that 'environmental knowledge' was the second important variable related to responsible environmental behaviour following verbal commitment; gender was the least important ($r = 0.08$). Based on their results, the questionnaire/scale below, consisting of three sections, was constructed to gather information about environmental knowledge and behaviours of students.

- Section A. Socio-demographic characteristics
- Section B. Environmental knowledge
- Section C. Environmentally significant behaviour

Section A included questions of socio-demographic characteristics such as age and gender. As stated above, one of the ways social scientists can promote environmentalism is to understand the relationship between demographic variables and environmental knowledge and behaviours. In other words, it is necessary to ask how different sections of the population differ in regard to environmental knowledge and behaviour (Scott and Willits 1994). In this study, since most of the students were from the same income level (low) and unwilling to answer such questions, income level was not included in the questionnaire.

Section B measures the students' level of understanding of environmental facts and concepts, in other words, their environmental knowledge. Environmental knowledge refers to the knowledge and understanding of facts, concepts and generalisations related to the 'environmental concern and worldview'. In this section of the questionnaire, 15 statements were given to the respondents based on the studies of Furman (1998), Ivy et al. (1998) and Loges and Kidder (2000). To distinguish respondents who have integrated their environmental awareness into their knowledge, five of the eight questions (statements) were worded in reverse, somehow in a tricky manner. The scale reliability, validity and dimentionality were examined by Karakoc Yücel (2005), and shown to be valid and unidimentional. Reliability analysis of the research instrument modified for this study (Section B) indicated a Cronbach's alpha of 0.72.

Students were asked whether each statement was 'yes', 'undecided' or 'no'; the responses were used to measure environmental knowledge. Statements were scored as: yes = 3, undecided = 2 and no = 1. In this manner, the responses to the various items are quantified and summed across statements to give a total score for the individual on the scale. Positive statements were scored from 1 to 3; negative statements were scored in reverse.

In Section C, environmentally significant behaviours were assessed using 14 questions constructed specifically for the purpose of this study according to conditions in Turkey. Students were asked whether each statement was 'yes', 'sometimes' or 'no' in terms of

their routine activities and were used to measure environmental behaviour. Statements were scored as follows: yes = 3, sometimes = 2 and no = 1. In all statements, the affirmative answer 'yes' reflected a pro-environmental position and 'sometimes' reflected that the individual sometimes performed that behaviour and sometimes did not, and with 'no' signifying that the individual does not perform the behaviour. Questionnaires were distributed to the students via email or direct contact during lectures. Both descriptive and inferential statistics were utilised for the analyses. Reliability analysis of the research instrument modified for this study (Section C) indicated a Cronbach's alpha of 0.81.

Frequencies were used to show the distributional characteristics of each scale as a variable. Moreover, descriptive statistics provides measures of central tendency and variability such as mean, maximum, minimum and standard deviation.

For 'hypothesis testing', *t*-test and one-way analysis of variance were used to differentiate the effects of gender and education on environmental attitudes, knowledge and behaviours. The value of 0.05 was adopted as the critical significance level in all analyses.

Results and discussion

Interpretation of socio-demographic characteristics of students

As summarised in Table 1, gender of the students was 273 males (38.7%) and 433 females (61.3%) and 706 in total.

As can be observed from Table 1 male–female ratio is far from 1 in the 'health sciences' group. Since students in the sample group from 'health sciences' were mostly from vocational school of nursery; there were disproportionately more females.

Age of the respondents varied between 17 and 38. The mean age (± standard deviation) was 20.900 (±2.002) and the modal age was 21. As can be seen from Table 1, 71.1% of the respondents were under or 21, about 27.6% of them were in the 22–26 age range, followed by 0.9% in the range of 27–31 years old and 0.4% were 32 or older (Table 2).

Table 1. Socio-demographic characteristics of respondents.

Gender	*N*	%
Health sciences		
Female	206	95.4
Male	10	04.6
Natural sciences		
Female	96	40.6
Male	139	59.4
Social sciences		
Female	131	51.4
Male	124	48.6
Total	706	
Female	433	61.3
Male	273	38.7
Age		
21 or under	491	71.1
22–26	191	27.6
27–31	6	0.90
32 or over	3	0.40

Table 2. Elaboration of gender differences.

Score	Gender	*N*	Mean ± SD	*t*	*p*
Environmental knowledge	Female	433	1.112 ± 0.198	−3.165	0.020
	Male	273	1.062 ± 0.215		
Environmental behaviour	Female	433	1.139 ± 0.302	−0.210	0.834
	Male	273	1.134 ± 0.300		

A statistically significant difference exists in environmental knowledge scores with respect to gender ($t = -3.165$; $p < 0.02$). Consistent with studies of Stern et al. (1995), Loges and Kidder (2000) and McCright (2010), women scored significantly higher than men, in items measuring environmental knowledge. However, contrary to the results of Scott and Willits (1994) study, no significant difference was found in behaviour scores among males and females (Table 3).

Pearson correlation analysis showed no significant relationship between age and environmental knowledge. However, there existed a statistically significant relationship between age and environmental behaviours. The most commonly accepted hypothesis is that environmental concern (knowledge in the present study) is stronger among younger individuals of the society (Vanliere and Dunlap 1980; Arcury 1990; Austin and Woolever 1994; Scott and Willits 1994; Furman 1998). In the present study, no correlation was found between age and environmental knowledge. However, younger students behaved in a more environmentally friendly way, showing a positive correlation between age and behaviours. Our study is in agreement with the referred authors only in this respect.

Elaboration of environmental knowledge and behaviour

As seen from Table 4, the means for environmental knowledge of the students indicated that most of the students were undecided about environmental knowledge items. The max. and min. scores of the knowledge scale (Section B) were 38 and 30, respectively (mean = 31.9 ± 1.3). For Section C, these values were 42 and 30 (mean = 37.7 ± 2.2). The maximum score a participant can aquire is 45 for Section B and 42 for Section C. This might be explained as natural mechanisms of the ecosystem and environmental facts are not conceptualised by majority of the students, and therefore they may still have unclear points/concepts concerning natural processes. However, one-way analysis of variance results showed statistically significant differences among groups. Group (1), namely 'health sciences' students as opposed to Özdemir et al.(2004), differs from the other two groups in terms of environmental knowledge. Group (3) is significantly different only

Table 3. Elaboration of relationships with age.

Score	Age		
	N	Sig. (2-tailed)	Pearson correlation
Environmental knowledge	691	0.020	−0.088
Environmental behaviour	691	0.797	0.01**

**Correlation is significant at the 0.01 level.

Table 4. Evaluation of the differences among target groups of 'environmental knowledge' and 'environmental behaviours' scores.

									95% Confidence interval	
	Groups	*N*	Mean	SD	Gr. (*I*)	Gr. (*J*)	Mean difference (*I* − *J*)	Std. error	Lower bound	Upper bound
Environmental knowledge	Health sciences	216	1.140	0.1986	(1)	(2)	0.088(*)	0.0193	0.0420	0.1332
						(3)	0.050(*)	0.0184	0.0069	0.0936
	Natural sciences	235	1.052	0.2120	(2)	(1)	−0.088(*)	0.0193	−0.1332	−0.0420
						(3)	−0.037	0.0186	−0.0813	0.0065
	Social sciences	255	1.090	0.1990	(3)	(1)	−0.050(*)	0.0184	−0.0936	−0.0069
						(2)	0.037	0.0186	−0.0065	0.0813
	Overall	706	1.092	0.2060						
Environmental behaviours	Health sciences	216	1.129	0.2973	(1)	(2)	−0.028	0.0291	−0.0972	0.0403
						(3)	0.006	0.0270	−0.0582	0.0692
	Natural sciences	235	1.158	0.3212	(2)	(1)	0.028	0.0291	−0.0403	0.0972
						(3)	0.034	0.0275	−0.0310	0.0989
	Social sciences	255	1.124	0.2853	(3)	(1)	−0.006	0.0270	−0.0692	0.0582
						(2)	−0.034	0.0275	−0.0989	0.0310
	Overall	706	1.137	0.3012						

from Group (1). This is clearly depicted in the mean scores of the groups where Group (1) had the highest mean; whereas Group (3) had the lowest (Table 4). This may be due to 'health sciences' students being somehow exposed to environmental issues and protection concepts during their university education more than the other two groups, as clearly seen from their higher knowledge scores. No differences were found among groups in terms of behaviours.

As stated before, the notion of this study is that a person's environmentally significant behaviours are functions of environmental knowledge. Therefore, evaluations of relationships between environmental knowledge and behaviours to clarify whether respondents having a higher level of environmental knowledge behave in an environmentally significant manner are necessary. These relationships for all students and each group of students were examined and given in Table 5.

The most impressive result is that there is a statistically significant negative correlation between environmental behaviour and environmental knowledge for all students and especially for 'health sciences' ($r = -.208$; $p < 0.01$) and 'natural sciences' students ($r = -.131$; $p < 0.05$), contrary to our expectations. In fact, results show that correlation coefficients of both groups are less than 0.80; therefore, there is very weak correlation. Although negative correlation was not expected especially for natural sciences students, the results produced such low and negative correlation. This group contains students from engineering (most participants were from mechanical and chemical engineering programmes) and biology (life sciences, biology education) departments. Evidently, the environmental knowledge acquired by engineering students is very limited and mostly consists of textbook material and whatever is discussed in the classroom. As given above, health sciences students are more exposed to environmental concepts, and have more chance to connect to nature and natural phenomena compared to the other two groups. This group contains environmental health technicians who have higher level of knowledge and applied EE, and therefore contributes positively to the group mean score. This is also reflected in their higher knowledge scores. In line with this, the social sciences group scores are positively increased by the geography students who have both natural science courses and field excursions in their programme. In case of engineering, nature conservation and environmental protection do not become their first priority; in addition, if they had been exposed to nature-connected field-type education during their high school and prior education, they would be more connected to nature and this would lead us to expect pro-environmental behaviour. However, structure of Group (2) has significant contribution by the biology sub-group (life sciences, biology education). Similar results were reported by Hungerford and Volk (1990), Thapa (1999), Kollmuss and Agyeman (2002), Loughland et al. (2003), Littledyke (2008), Mobley et al. (2010) and Ernst and Theimer (2011): connectedness to nature is a necessity for pro-environmental behaviour of individuals

Table 5. Correlation coefficients between 'environmental knowledge' and 'environment behaviours' among groups.

Group	Correlation score	*N*	*p*-Values
Health sciences	−0.208**	216	0.002
Natural sciences	−0.131*	235	0.045
Social sciences	−0.082	255	0.189
Overall	−0.146**	706	0.000

Notes: *Correlation is significant at the 0.05 level; **correlation is significant at the 0.01 level

starting from primary school, all the way to university and adult life. From a similar study carried out in Turkey with pre-service teachers (a wider target group than the present study since primary school and pre-school teachers were also participants), nature education raised environmental awareness and hence behaviour of the participants in a 10-day nature education programme almost exclusively carried out in the field (Uzun and Keleş 2012). According to Ernst and Theimer (2011), EE should include connectedness to nature among its aims, due to its relationship to environmental sensitivity and its potential link to environmental behaviour.

Kitzmüller (2009) also found negative correlation and reported 'environmental knowledge score' not correlated to the 'behavioural score' as supported by Sadık and Sadık (2014); having environmental knowledge and having positive thoughts are not enough for people to show responsible behaviour for their environment. Sadık and Sadık (2014) reported moderate-level knowledge correlated with more positive attitude but low level of behaviour. From this point of view, Kitzmüller (2009) agrees both with our results and those of Sadık and Sadık (2014) where the major aim is responsible environmental behaviour. This is only possible with environmental awareness based on knowledge but one has to keep in mind that knowledge has indirect effect on behaviour. In addition, Schahn et al. (1993) accentuated the necessity of 'environmental knowledge' for environmental action, which will eventually lead to responsible behaviour: 'without knowledge, no change can take place'. This framework agrees with references cited above: 'environmental education should include connectedness to nature among its aims, due to its relationship to environmental sensitivity and its potential link to environmental behavior'.

In summary, environmentally responsible behaviour, when present, is the desired result; however, many factors impacting environmental behaviour, although not preferred, do act as barriers. Similar to society in general, only a small portion of university students see the environment as supporting and enhancing their living and thus they are to integrate ecological values into their thinking and contribute to protecting the environment by caring and supporting (He et al. 2011; Eilam and Trop 2007). All works cited above agree that EE will be an important contributor to positive bahavior towards nature/environment. In some extreme cases, high level of environmental knowledge is not reflected in behaviour.

In case of this study, most probably, the negative correlation is a result of educational process where 'health sciences' and 'natural sciences' groups do not always concentrate on natural environment during coursework, and therefore do not feel themselves as part of the environment. A possible explanation to this is: these students do have a certain level of environmental knowledge, are aware of the exploitation of nature by man and also are aware of the fact that 'natural resources should be protected'. However, when nature protection conflicts with their own interests, the situation is reversed. They do not behave sensitive to the environment and do not act in an ecologically significant manner. This behavioural conflict might be explained partly in terms of 'consumer bahaviors' as given in items 3, 4, 5, 12 of the Section B of the questionnaire. Economic reasons might be more predictive than ecological reasons. This might be explained in terms of *environmental ethics* (Dunlap and Van Liere 1978). Therefore, we suggest that EE and/or environment-based courses in all levels/backgrounds should have value oriented and need to be targeted as giving ecocentric approaches to students. Lacking the intrinsic value of nature may not lead to transfer of knowledge into behaviours.

Turkish EE system is mostly text-based and face-to-face classroom training, neither closely connected to nature nor environmentally participative. This is in agreement with Thapa (1999), where a proposal is made for professional environmentalists to work with campus environmental groups (i.e. graduate and undergraduate students) to facilitate and

boost campus activism leading to environmentally responsible behaviours. Turkish education system has an intrinsic approach based on anthropocentric ethics, in contrary to Thapa(1999) findings that ecocentric and dualcentric attitude bearing students were more likely than persons with technocentric attitudes to engage in recycling behaviour. The only similarity to our results is that; attitude–behaviour relations were weak or modest.

Furthermore Chawla and Cushing (2007) reported that people need to value protection of the environment for its sake per se or because they understand the benefits for human society leading them to understand consequences for themselves and their close environment. De Chano (2006), Oreg and Katz-Gerro (2006) emphasise cultural and country-specific value orientations impacting environmental behaviour in an ethical context. In case of Turkey, i.e. the present study, values, priorities and beliefs are decisive on ethical component of environmental behaviour, irrespective of knowledge in the field, since Turkey is a developing country and different from the western world (Ignatow 2005).

Following the evaluation of 'environmental knowledge' and 'environmentally significant behaviours' scales and correlations between them; each item in both scales was investigated one by one and the results are given as 'frequency of responses to each item' in Tables 6 and 7, respectively.

For comparison of each item included in the environmental knowledge scale among groups of students, Pearson chi-square analysis was applied. The results showed statistically significant differences among all groups for almost all items, except in items 7 and 8. In fact, no differences were expected in the item concerned with recycling (item 8) since the importance of recycling is well understood and established among all university students regardless of their field of study (Schultz et al. 1995). Majority of the students (91.4%) agreed with the idea of supporting recycling economically and ecologically. In addition, item 5 with a response ratio of 84.7% showed the importance of the results of ozone layer depletion for Turkey is well appreciated. Natural sciences group was more knowledgeable with a ratio of 88.9%. This may be explained with their prior exposure to this issue during their professional education. Items 4 and 15 had the highest response rates of 82.5% and 82.1%, respectively, indicating that students are knowledgeable in causes of ozone depletion and that plants are facing the risk of extinction along with animals.

Environmental fact with the lowest correct response rate of 34.8% was item 1, leading us to conclude that students were not aware of the difference between ozone layer depletion and global warming as environmental problems. Based on years of experience during teaching courses with environmental problems content to very diverse undergraduate/graduate programmes offered in different departments, the authors have come to the conclusion/opinion that misconceptions in this item concerning 'ozone layer depletion' and 'global warming' exist in all student groups at a higher than expected ratio including doctoral students. Students conceive these two distinct global environmental problems as separate 'terms' given to the same problem.

The most striking difference among groups was found in item 12. Greenpeace, a famous global activist group well known for their interesting protests worldwide, was not generally conceived as a worldwide NGO, but an organisation based only in the USA. Only 46.8% of all students responded correctly. This might be explained according to the findings of Dalton (2005):

> environmental concerns in less developed nations will have difficulty mobilising broad public involvement because they often lack the proper infrastructure, are frequently occurring in undemocratic circumstances and green NGOs will have difficulty using appeals based on ecologism to recruit members.

Table 6. Frequency of responses (as percentage) to each knowledge item.

Item: Paraphrase of question	Department	Correct response		Incorrect response		Undecided	
		N	% of group	*N*	% of group	*N*	% of group
(1) The 'greenhouse effect' and 'ozone depletion' are, as a matter of fact, the same phenomena. (*)	Overall	243	34.8	397	56.9	58	8.3
	Health sciences	58	27.0	132	61.4	25	11.6
	Natural sciences	92	39.7	134	57.8	6	2.6
	Social sciences	93	37.1	131	52.2	27	10.8
(2) The 'greenhouse effect' is a result of burning coal and oil. (*)	Overall	410	59.2	100	14.5	182	26.3
	Health sciences	138	64.5	16	7.5	60	8.7
	Natural sciences	168	72.7	29	12.6	34	4.9
	Social sciences	104	42.1	55	22.3	88	12.7
(3) The 'greenhouse effect' causes an increase of the Earth's average temperature. (*)	Overall	480	68.5	55	7.8	166	23.7
	Health sciences	157	73.0	11	5.1	47	21.9
	Natural sciences	195	83.3	5	2.1	34	14.5
	Social sciences	128	50.8	39	15.5	85	33.7
(4) Chloroflorocarbons (CFCs) are responsible for ozone depletion (*)	Overall	580	82.5	12	1.7	111	15.8
	Health sciences	181	84.2	3	1.4	31	14.4
	Natural sciences	209	88.9	3	1.3	23	9.8
	Social sciences	190	75.1	6	2.4	57	22.5
(5) Depletion of ozone does not effect people in Europe and Turkey (*)	Overall	597	84.7	41	5.8	67	9.5
	Health sciences	177	82.3	15	7.0	23	10.7
	Natural sciences	209	88.9	5	2.1	21	8.9
	Social sciences	211	82.7	21	8.2	23	9.0
(6) Deforrestation adds up to the greenhouse effect (*)	Overall	532	76.8	54	7.8	107	15.4
	Health sciences	177	83.5	7	3.3	28	13.2
	Natural sciences	191	82.0	14	6.0	28	12.0
	Social sciences	164	66.1	33	13.3	51	20.6
(7) Using high octane gasoline (super) in cars helps to reduce air pollution	Overall	264	37.7	154	22.0	282	40.3
	Health sciences	76	35.5	47	22.0	91	76
	Natural sciences	103	43.8	50	21.3	82	103
	Social sciences	85	33.9	57	22.7	109	85
(8) Recycling should be encouraged for the protection of environmental resources as well as economical advantages	Overall	639	91.4	5	0.7	55	7.9
	Health sciences	193	91.0	1	0.5	18	193
	Natural sciences	224	95.3	2	0.9	9	224
	Social sciences	222	88.1	2	0.8	28	222
(9) Increase in CO_2 concentration in the air causes acid rains (*)	Overall	500	71.3	14	2.0	187	26.7
	Health sciences	162	75.3	4	1.9	49	22.8
	Natural sciences	198	84.6	3	1.3	33	14.1
	Social sciences	140	55.6	7	2.8	105	41.7
(10) Almost 90% of our energy comes from fossil fuels (coal, oil and gas)(*)	Overall	349	50.2	99	14.2	247	35.5
	Health sciences	90	41.9	24	11.2	101	47.0
	Natural sciences	135	58.4	28	12.1	68	29.4
	Social sciences	124	49.8	47	18.9	78	31.3
(11) Plastics decompose in the nature by time (*)	Overall	506	72.7	139	20.0	51	7.3
	Health sciences	149	70.6	35	16.6	27	12.8
	Natural sciences	173	74.6	48	20.7	11	4.7
	Social sciences	184	72.7	56	22.1	13	5.1
(12) Greenpeace is a non-governmental organisation acting only in the USA for nature conservation issues (*)	Overall	328	46.8	120	17.1	253	36.1
	Health sciences	50	23.3	42	19.5	123	57.2
	Natural sciences	153	65.1	43	18.3	39	16.6
	Social sciences	125	49.8	35	13.9	91	36.3

(*Continued*)

Table 6 – *continued*

Item: Paraphrase of question	Department	Correct response		Incorrect response		Undecided	
		N	% of group	*N*	% of group	*N*	% of group
(13) Mediterrenean monk seals are on the brink of extinction (*)	Overall	514	73.2	16	2.3	172	24.5
	Health sciences	144	66.7	3	1.4	69	31.9
	Natural sciences	177	76.0	8	3.4	48	20.6
	Social sciences	193	76.3	5	2.0	55	21.7
(14) In the last 40 years, population of the world has nearly doubled (*)	Overall	424	60.7	43	6.2	232	33.2
	Health sciences	114	53.3	10	4.7	90	42.1
	Natural sciences	132	56.7	13	5.6	88	37.8
	Social sciences	178	70.6	20	7.9	54	21.4
(15) Only some animals are in danger of extinction. Plants are not (*)	Overall	575	82.1	62	8.9	63	9.0
	Health sciences	172	80.4	15	7.0	27	12.6
	Natural sciences	199	86.1	15	6.5	17	7.4
	Social sciences	294	80.0	32	12.5	19	7.5

*Statistically significant correct responce rate difference.

Major differences between groups were recorded in this item. The corresponding rates were: health sciences 23.3%, natural sciences 65.1% and social sciences 49.8%. This may be due to Greenpeace NGO being known more in the Turkish upper-class elites and green activists. For respondents of the health sciences group ($\geq$90% from rural families), organisations such as Greenpeace are not in their priority list; they focus on the aim to 'finish school and get a job'. However, natural science target group (especially engineers) come from white collar worker and higher beuracracy families who value both education and social participation in activities such as environmental conservation.

After the evaluation of environmentally significant behaviour scale, each behaviour item in the scale was investigated case by case and the results are summarised in Table 7.

For items supporting 'consumer behaviours', majority of the students indicated that they had engaged in environmentally protective behaviours. For example, 90.4% of all students agreed with the statement 'I turn off unneccessary lights' (item 4); 80.5% reported that they turned the tap off while brushing their teeth (item 3) and 79.1% of the students tried to use both sides of papers (item 12) and finally 77.9% of the students preferred public transportation facilities in their daily life (item 5). However, these high scores might be interpreted cautiously since they may be answered more in terms of economical benefits rather than behaving environmentally.

Although behaviour items 3 and 5 did not show significant differences among the three groups of students, items 4 (91.5%) and 12 (87.2%) were conceived at higher rates in natural sciences students and social sciences students (91.4% – item 4 and 76.8% – item 12) than health sciences students (88.0% – item 4 and 73.0% – item 12).

The lowest percentages were obtained with statements 'I support environmental NGO (s) financially' (6.9%) and 'I am a member of environmental NGOs' (9.1%), meaning that people are not engaged in environmental activities voluntarily and they are not willing to make donations/contributions to NGOs. This might be explained with the economical constraints. While people have difficulty in tackling with the problem of poverty in developing countries such as Turkey, supporting NGOs financially may be a luxury for them.

Table 7. Summary of responses to each behaviour item.

Item: Paraphrase of question	Department	Always		Never		S.t	
		N	% of Group	*N*	% of Group	*N*	% of Group
(1) I collect recyclable materials seperately at home	Overall	82	11.7	322	46.0	296	42.3
(2) I try to reduce the amount of waste produced at home (*)	Overall	327	46.6	191	27.2	184	26.2
	Health sciences	91	42.1	53	24.5	72	33.3
	Natural sciences	104	44.6	76	32.6	53	22.7
	Social sciences	132	52.2	62	24.5	59	23.3
(3) I close the tap while brushing my teeth	Overall	567	80.5	31	4.4	106	15.1
(4) I turn off unnecessary lights (*)	Overall	638	90.4	15	2.1	53	7.5
	Health sciences	190	88.0	3	1.4	23	10.6
	Natural sciences	215	91.5	9	3.8	11	4.7
	Social sciences	233	91.4	3	1.2	19	7.5
(5) I prefer public transport facilities in my daily life	Overall	549	77.9	35	5.0	121	17.2
(6) I am member of environmental NGOs	Overall	64	9.1	574	81.8	64	9.1
(7) I support environmental NGOs financially	Overall	48	6.9	519	74.1	133	19.0
(8) I take care of environmental policies of political parties into consideration while voting (*)	Overall	334	48.1	172	24.8	188	27.1
	Health sciences	110	51.9	54	25.5	48	22.6
	Natural sciences	93	40.3	62	26.8	76	32.9
	Social sciences	131	52.2	56	22.3	64	25.5
(9) I prefer to consume organic foods although they are expensive	Overall	212	30.6	143	20.6	338	48.8
(10) I prefer to consume environment-friendly products although they are expensive	Overall	261	37.2	94	13.4	346	49.4
(11) I do not prefer packaged products during shopping	Overall	125	17.9	345	49.3	230	32.9
(12) I try to use both sides of papers (*)	Overall	556	79.1	23	3.3	124	17.6
	Health sciences	157	73.0	5	2.3	53	24.7
	Natural sciences	204	87.2	6	2.6	24	10.3
	Social sciences	195	76.8	12	4.7	47	18.5
(13) I do not use perfumes, deodarants, etc. containining CFCs	Overall	237	34.4	223	32.4	228	33.1
(14) I try to attend conferences, films and meetings on environmental issues	Overall	121	15.1	156	22.6	414	59.9

*Statistically significant correct responce rate difference.

However, all these results may be indicators of economic concerns, still more empirical research is necessary in this field.

Students' perception of resources of environmental information

Overall, all three groups indicated that they gathered most of their environmental information from the media (39.3%), leading us to conclude the students think they can gather more information on environmental issues via media such as radio, television,

newspapers. The importance of the media on EE was also reconfirmed in Turkish Scientific and Technological Council report (TÜBİTAK 2003). Information resources following media were 'schools' with 20.0% response rate. The third in order was 'nature itself' with a percentage of 14.1%. Considering age range of the students, the contribution of media to their knowledge is expected with celebrities, famous singers and actresses showing up on TV commercials and other programmes. The 14.1% respondents of nature itself as an information source is promising for future improved level of public awareness on environmental issues. 'Friends and relatives' was 10.3%; 'NGOs' 9.7%; 'governmental institutions' 4.0%. The World Wide Web was the least preferred in this aspect with close ratios of 2.6%. This result opposes with the findings of Sadık and Sadık (2014); according to the teacher candidates, the most important factor of developing environmental awareness is the Internet and television (43.0%). For our study, the rationale behind such a low ratio of internet use are; security and confidence may have affected the responses concerning the Internet, along with infrequent Internet use and limited accessibility to academic resources; academic journals, scientific communities, distance education sites and some software, e-libraries. The limits of accessibility for students deprive them of academic sites. Many of the Internet resources are highly qualified but not accesible; adversely some of them are easily accessible but not reliable. Because of these constraints, information resources used by students are generally untrustworthy or students have been inaccurately forwarded and not prefered by the students (Sahin et al. 2010).

Conclusion

It is evident that knowledge–behaviour relationship is very complex and affected by several internal and outer factors.

According to the results of this study with a quite high number of respondents (706), it is evident that there is a need for a tool to change the code of behaviour and set of values which are internalised and adopted to actions by the individuals even in the world of capitalism. These values are being different from the laws: informal and unwritten value-based conduct of the individuals towards environment. In other words, it might be concluded that respondents do not have 'internalized ethical values' necessary to make individuals behave in an actually environmental way by feeling themselves as the part of it and feeling the nature inside themselves. To achieve this goal, we propose transformation of the Turkish national educational agenda mainly from focusing on 'the amount of knowledge and information' to promoting 'empowerment of the internalization of knowledge' to ensure behavioural change. For further implementation, a major goal should be a more man–nature relationship concept to be offered in EE programmes so that the learner conceptualises himsef/herself as part of nature and attaches intrinsic value to nature in Turkey. Moreover, results of this study would serve to provide decision makers a knowledge foundation upon which environmental policies, education programmes and communication strategies can be adequately established.

The study also provided a good indication of the importance of the role of media as a source of environmental knowledge perceived by the students. Therefore, visual and printed media should be used more effectively to facilitate the transfer of environmental knowledge and promote more environmentally responsible and sensitive behaviours.

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