THE FACTORS EFFECTING THE TURKISH STUDENTS' ENVIRONMENTAL OPTIMISM AND AWARENESS LEVEL IN PISA 2015[1)]

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Abstract. Rapid changes in the world arising from the technological development not only have made everything easier but also created different problems. The first and maybe the most crucial problem is environmental deterioration and this is a global issue, so the solutions have been seeking with global level, especially with the programs in education. PISA is one of the large scale testing programs which is applied more than 60 countries in the period of three years. In PISA, not only cognitive tests but also affective features of students are tested and environmental awareness and optimism are the fields that have been included since 2006 in PISA. In this study, it was aimed to define the factors effecting Turkish students' attended environmental optimism and awareness levels. This study was organized as a correlation survey and multiple regression method was used so as to determine factors affecting environmental awareness and optimism levels of students. The data of the study was retrieved from PISA data base and the study group was composed of 5150 students, which is the sample of Turkey in PISA 2015. As for results, it was found that environmental awareness and optimism of Turkish students are affected from their success in Science lessons and cultural wealth at home significantly.

Keywords: Environmental awareness; Environmental optimism; Multi-regression analysis; PISA 2015.

Introduction

There have been lots of questions about how to make the children environmentally literate through the education system especially after the environmental devastating events such as climate changes, extinction of animal species and plants and melting glaciers. Nearly fifty years ago, environmental education was accepted as a tool for environmental protection (Brundtland, 1987; United Nations [UN], 1992; United Nations Environment Program [UNEP], 1972). Because of the continuing decline in global eco systems, environmental education has become more crucial

and by the environmental education, it has been aimed to help students develop the necessary types of environmental knowledge, awareness, attitudes, and critical thinking skills. These skills have key roles especially in sustainable development and thanks to these skills children can take part in actively civic actions for the benefit of environment (Hungerford & Volk, 1990; OECD, 2009).

After the acceptance of environmental education as a part of formal and mandatory education nearly all over the world, research have started to investigate the factors that affect the students' environmental literacy levels'. Shen and Saijo (2008) have stated that personal and social awareness is at the heart of environmental protection. Their views have been verified by so many research and the findings of the research have showed that student attitudes towards environmental issues are highly related with their socio-demographic variables (Dietz, Kalof & Stern, 2002; Eisler, Eisler & Yoshida, 2003; Negev, Sagy, Garb, Salzberg, & Tal, 2008; Olli, Grendstad & Wollebaek, 2001; Schultz & Zelezny, 1999; Shen & Saijo, 2008; Stern, Dietz, & Kalof, 1993; Zelezny, Chua, & Aldrich, 2000). Also the studies have analyzed different factors from student background characteristics such as school activities (instructional methods, curricular implementation) related to environmental literacy levels. Although the findings of the researches from various cultures reveal inconsistent results, it is commonly accepted fact that students' attitudes affect their behaviors towards environmental issues. Considering this situation, in 2006, environmental attitudes were incorporated into Program for International Student Assessment (PISA) as a component of scientific literacy. At this application of PISA, environmental literacy was tested and from this date, in every application of the test, it has been included into the student and parent survey. In PISA 2015, environmental awareness and optimism of students were tested both student and parent questionnaire.

Considering the importance of PISA for this research, this project has to be introduced in more detailed way. PISA is an initiative of the Organization for Economic Cooperation and Development (OECD) in Paris and it arouse the need for regular and reliable information on educational outcomes across countries. It aims to measure how well 15-year-old students approaching the end of compulsory schooling are prepared to meet the challenges of today's knowledge societies. PISA surveys take place every three year since 2000 and for each assessment, reading, mathematics or science is selected as the major domain and is given greater emphasis than the remaining two minor domains. Also PISA assessments take a literacy perspective, focusing on the extent to which students can apply the knowledge and skills they have learned and practiced at school when confronted with situations and challenges for which that knowledge may be relevant. In addition to the literacy tests, PISA uses student, parent and school administrative questionnaires to collect information from the all shareholders' of education. In student questionnaire, it is aimed to collect data on various aspects of students'

lives which can be related with their educational lives, such as their home, family and school background. Also students' different attitudes are trying to be defined with this questionnaire and environmental awareness and optimism are two of the tested characteristics of students' in this questionnaire. In the awareness concept, students are asked to express their knowledge level about so global environmental issues such as, green gases effect, nuclear waste and declining rate of forests etc. As for optimism, students are asked to predict the 20 year future of the environmental events which are the same tested in the awareness concept. Their ideas about the future of these issues are trying to be defined and according to their views whether it will worse or improve, their optimism levels are determined.

Environmental optimism and awareness, which are the components of student questionnaire of PISA they are related concepts and can be taken as primary explanatory source of one's environmentally literate. Although there are so different proposed in this field, it generally accepted that being environmentally literate students means that "capacity to use scientific knowledge, to identify questions and to draw evidence-based conclusions in order to understand and help make decisions about the natural world and the changes made to it through human activity" (OECD, 2007, p.25). Considering the definition of the environmental literacy, it is not so hard to be inferred that this concept is composed of different interrelated domains, such as cognitive (knowledge, skills and awareness), affective (attitudes) and environmentally responsible behaviors (actions, motivations) (Hungerford & Volk, 1990; OECD, 2007, Wilke, 1995). In order to understand environmental literacy, its component should be analyzed firstly. Environmental knowledge refers both knowledge of and knowledge about the environment (Lucas, 1979). The term "knowledge of" means that students' capacity to remember and understand environmental concepts, problems and issues. The other part of the definition-knowledge about- refers to knowledge of the means (scientific enquiry) and goals (scientific explanations) (OECD, 2007). Environmental awareness, which is the cognitive component of environmental literacy, can be expressed being aware of the environmental problems, events, changes and everything not only at local level but also for global level. It involves the degree of sensitivity to the total environment, its issues and problems. Accordingly environmental optimism is highly related with one's environmental awareness level. Thanks to the increasing awareness, one can understand the issues, explain it and predicate the future results of it. Hence it can be said that environmental optimism occurs as a result of environmental awareness thereby environmental literacy. The environmental attitudes of people are the composite of their environmental and general attitudes but social context should not be neglected (Stern et al, 1998). People's cultural backgrounds, families and friends have role on the development of their environmental attitudes and schools are the most important part of children and teenagers socialization contexts. Also students' attitudes were found to differ in between educational tracks (Klaczynski & Reese, 1990). Consequently it is

a fact that peoples' attitudes and awareness about environmental are affected from various sources and for this reason, in order to create environmental literate it is an important issue to define the factors that affecting the students' environmental awareness and optimism levels.

There are so many studies investigating the factors affecting environmental literacy levels of students, but the domains of environmental literacy and the relationships between these components are still being examined. Some researchers have argued that literacy develops along a continuum and it cannot be categorized in binary terms, either environmentally literate or illiterate (Iozzi, 1989; Roth, 1992). Some others defend that increasing student' knowledge and awareness, students' affective characteristics can be strengthened and they can gain competencies which can further transform more refined and sophisticated behaviors (North American Association for Environmental Education NAAEE, 2011). It is still under discussion whether the components of environmental literacy are reacting with each other in a linear trend or not. The other discussion point in raising environmental literate students what are the factors impacts on this feature. Kollmus and Agyeman (2002) state that environmental behaviors are complex mix of environmental knowledge, values, attitudes and even emotions and pro-environmental factors, such as personality traits, individual backgrounds have great importance on environmental behaviors. Also external factors including peoples' social, cultural, economic and educational factors are crucial in development of environmental literacy. Considering these various reviews, it is clear that being environmental literate is a complex feature and it is dependent on so many variables both internal and external. In abroad, there are so many studies investigating these factors especially in students who are in mandatory education, but as for Turkey, there is limited number of study. Especially after PISA 2006, in which environmental literacy was a major domain, there has not been any study about Turkish students' environmental attitudes and awareness. For this reason, this study examined the levels of Turkish 15 year old students' environmental literacy level and analyzes the factors influencing the students' environmental awareness and optimism level.

Purpose

The main goal of this study is to define the students level factors that are effective on students' environmental optimism and awareness level had tested in PISA 2015. Determining the factors effecting students' environmental optimism and awareness will be so informative to develop this kind of behaviors in students. Additionally, defining the levels' of students' according to these features will give leading information to the curricula of the schools. Also, there is no study in the field analyzing this relationship in Turkey since 2006 and this situation has made the study more meaningful and crucial. Considering the overall purpose of the study, the research questions are listed below:

1. How are the levels of Turkish students' environmental optimism and awareness in PISA 2015 application?

2. What are the student related variables predicting the students' attended PISA 2015 environmental optimism and awareness levels in Turkey?

Methodology

In this section, type of research, determining the population and sample methods and data analysis are included. This study is a correlational one in which defining the factors effecting the 15 year old students' environmental optimism and awareness level in the context of PISA student questionnaire.

Population and Sample

The general population of the study is 15 –years old students under education in Turkey. As for the sample of the study, there has been nothing done extra to the sample os PISA 2015. In PISA application, samples are composed of by using random stratified sampling method and it is valid for Turkey sample. Turkey sample of PISA 2015 is composed of 5150 students and this sample had determined by considering so many factors such as development levels of the regions, population etc. So in this study, Turkey sample of PISA 2015 was accepted and all the analysis was applied by using the whole data set.

Data Gathering Process

The data of PISA 2015 were analyzed in this study. As before mentioned, PISA tests are composed of different types of tests, such as achievement tests, student, parent, teacher and school administrative questionnaires. In this study, only the student questionnaire items were analyzed, but not all the items, the items that are aimed to measure students' environmental optimism and awareness levels. Also there are some indexes generated by PISA such as index for cultural wealth, joy of science, they were included in the data set. The reason of that these values may be the predictors of the students' environmental optimism and awareness levels. As for the items measuring environmental awareness and optimism, there are 14 items and seven for each. The items are the same for both of the scales but the required answers are different. For two scales, greenhouse gases effect, genetically modified organism usage, nuclear waste, and the consequences of clearing forests, air pollution, extinction of plants' and animals and water shortage are asked to students. In awareness scale, students are expected to state their awareness levels from 1 to 4. One point means that student has never heard about it and 4 points mean that s/he is familiar with the issue and can explain this well. As for optimism scale, there is again 7 items and they are the same topic with the awareness. However students are asked to state their opinions about the issues. For example, one of the optimism question is that: Will the air pollution issue get worse or improve over

next 20 years? And the students are expected to define their opinions from 1 to 3. One point means that it will improve; 2 points mean that "stay about the same" and 3 points mean that "getting worse". By summing up the students' answers, total points were calculated from two scales separately. After getting the scale points, data analyses were done.

Data Analysis

The analysis of the data was done considering the purposes of the study. Firstly, the descriptive statistics were calculated in order to discover the students' environmental awareness and optimism levels. Descriptive statistics such as mean, median, mode, standard deviation were calculated and the levels of students according to the variables were determined. As for the second research question, firstly the explanatory factor analysis was applied to the whole data set. Principal components method was used in factor analysis and factor loadings and eigen values were interpreted after varimax rotation method. Factor analysis has been a widely used technique in social, educational sciences and medicine, psychology. It aims to reduce the number of variables that are related with each other but at the same time irrelevant from the ones in other factor in a new structure which is named as factor. The variables in the same factor explain the same structure and in test development; the variables are items (Baykul, 2000; Özdamar, 2002). In this study, the items in the environmental optimism and awareness questionnaires were accepted as items and factor analysis was applied. In order to determine the applicability of factor analysis, Kaiser-Meyer-Olkin (KMO) coefficient and Barlett Sphericity Test were applied and KMO was calculated as 0.927 and it is higher than the critical value of 0.60. It means that the sample size is excellent for factor analysis. As for Bartlett test, it was found significant and it means that factor analysis is applicable to the data set. As a result of factor analysis, it was found that environmental awareness and optimism can be accepted as a unidimensional scale. The factor loading of the items were ranged from 0,689 to 0,744 for environmental optimism and 0,470 to 0, 568 for awareness scale. As for total explained variance, for optimism scale, it was found that 37,23% and for awareness scale, it was calculated as 39,32%. These values are higher than the lower bound of 30% for a unidimensional scale (Tabachnick and Fidell, 2001), so the scales can be accepted as unidimensional scales.

After than factor analysis, for the second sub-problem of the research, procedural multi-regression analysis was used to determine the variables that predict the environmental awareness and optimism levels' of students'. Multi-regression analysis is a technique that can be used two or more independent variables are in the model in order to predict the dependent variable. Regression analysis focuses on the power of estimation and the main purpose of this analysis is to determine the effects of independent variables on the dependent one. In this research, dependent variables are students' scores of environmental awareness

and optimism scales and the independent variables were selected from the student questionnaire of PISA 2015 by considering the related research. The all predicator variables included in multi-regression analysis are indexes calculated from PISA developers and they are; Enjoyment of Science, Science Self-efficacy, Epistemological beliefs, Index of highest parental occupational status, Cultural Possessions At Home (WLE), Plausible Value In System Subscale Of Science-Earth And Science And Subscale Of Science-Living. Also in this study, forward procedural method of regression was preferred and the reason of that this forward technique allows to determine the best variable that accounting for the most variance on the dependent variable and in each step, the whole regression model can be evaluated again. So a dependent variable which seems most important at first may be the least important in the model (Pedhazur, 1982). For this reason, in order to define the separate contribution of the variables to the model, forward procedural technique was used.

Findings

In this part of research, the findings will be presented considering the order of the problems. The first problem of the study is to describe the levels of environmental optimism and awareness Turkish students' attended PISA 2015. Before mentioned, for this purpose of the study, descriptive statistics were calculated and the findings were given in the Table 1.

Table 1. Descriptive Statistics of Turkish Students' Environmental Optimism and Awareness Levels'

Scales	N	Mean	Median	Mode	Std. Deviation	Skewness	Kurtosis	Min.	Max.
Environmental Optimism	5150	10,06	8,00	7,00	7,00	1,32	0,51	7	28
Environmental Awareness	5150	21,69	22,00	28,00	4,98	-,80	,30	7	28

Given above Table 1, the descriptive statistics about environmental awareness and optimism can be seen. When analyzing the values, it is clear that Turkish students' attended PISA 2015 environmental awareness level is so high. Maximum point that can be gotten from the scale is 28 and the mode of Turkish student sample is 28, too. Also the mean is 21,69 and it is really high, too. As for environmental optimism, the values are quite different form the awareness values. The mean of optimism is 10, 06 and the mode is 7 which is the minimum score that can be gained from the whole scale. So it can be inferred that Turkish students' environmental optimism level is so lower

than their awareness level and this is an expected finding due to the negative correlation between these variables. In other words, as it is stated in literature review, environmental optimism tends to be lower while the awareness is on the rise. To sum up, 15-years old Turkish students have great environmental awareness but they are lack of environmental optimism according to the PISA 2015 data set. It should be stated that these items are applied as self-assessment and so these results may be overrated.

The second research question is that "What are the student related variables predicting the students' attended PISA 2015 environmental optimism and awareness levels in Turkey?" and in order to the find an answer for this question, multi-regression analysis was applied. As noted earlier, the student related variables were determined according to the related research. By using these variables as predicators, regression models were composed in attempt to determine the effects of the variables on the levels of students' environmental awareness and optimism.

Prior to the regression analysis, the relations between the variables were analyzed by using multi- correlation method. The correlation coefficients are given Table 2 below.

Table 2. The Correlations between the Variables

Spearman Brown Correlation Coefficients	Environmental Awareness	Environmental Optimism	Enjoyment of Science	Science Self-efficacy	Epistemological Beliefs	Index highest parental occupational status	Cultural Possessions at Home	Subscale Of Science-Living
Environmental Awareness	1							
Environmental Optimism	-,276**	1						
Enjoyment of Science	,330**	-,086**	1					
Science Self-efficacy	,191**	-,006	,149**	1				
Epistemological Beliefs	,278**	-,165**	,298**	,064**	1			
Index highest parental occupational status	,081**	-,087*	,009	,057**	,071**	1		

Cultural Possessions at Home	,157**	-,054**	,091**	,147**	,101**	,294**	1	
Subscale Of Science-Living	,300*	-,363*	,175**	,112**	,250**	,269**	,184**	1
Subscale Of Science-Earth	,308*	-,331*	,170*	,074**	,230*	,249**	,168**	,883*

**p<0,001

When analyzing Table 2, it is seen that the highest correlation coefficients were calculated from the science subscales of Earth and Living and they are at moderate level. Except from index highest parental occupational status, all of the coefficients were found significant at p<0,001 level but most of them are too low. The moderate and significant correlations between the dependent and independent variables is the indicator of the applicability regression analysis (Büyüköztürk, 2002). So after analyzing the correlation coefficients, multi-regression analysis were applied to the data. For two dependent variables, two analyses were done and the results will be given firstly for environmental awareness and then for environmental optimism. The results taken for environmental awareness will be given in Table 3.

Table 3. The Results of Multi-Regression Analyzing Factors Effecting Environmental Awareness

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	R2
		B	Std. Error	Beta			
1	(Constant)	,517	,019		27,308	,000	
	Enjoyment of science (WLE)	,411	,016	,330	25,633	,000	,109
2	(Constant)	-1,430	,097		-14,678	,000	
	Enjoyment of science (WLE)	,358	,016	,287	22,801	,000	,172
	Plausible Value 1 in System Subscale of Science - Earth & Science	,005	,000	,256	20,342	,000	
3	(Constant)	-1,089	,099		-11,038	,000	
	Enjoyment of science (WLE)	,350	,015	,281	22,728	,000	
	Plausible Value 1 in System Subscale of Science - Earth & Science	,004	,000	,197	15,178	,000	,202
	Environmental optimism (WLE)	-,186	,013	-,182	-14,175	,000	

4	(Constant)	-1,074	097		-11,030	,000	
	Enjoyment of science (WLE)	,324	,015	,260	21,096	,000	
4	Plausible Value 1 in System Subscale of Science - Earth & Science	,003	,000	,188	14,648	,000	,223
	Environmental optimism (WLE)	-,191	,013	-,187	-14,679	,000	
	Science self-efficacy (WLE)	,163	,014	,147	12,070	,000	
5	(Constant)	-,871	,098		-8,868	,000	
	Enjoyment of science (WLE)	,280	,016	,225	17,786	,000	
	Plausible Value 1 in System Subscale of Science - Earth & Science	,003	,000	,167	13,005	,000	,239
	Environmental optimism (WLE)	-,179	,013	-,175	-13,837	,000	
	Science self-efficacy (WLE)	,161	,013	,145	12,068	,000	
	Epistemological beliefs (WLE)	,167	,016	,135	10,610	,000	
6	(Constant)	-,763	,100		-7,640	,000	
	Enjoyment of science (WLE)	,277	,016	,222	17,647	,000	
	Plausible Value 1 in System Subscale of Science - Earth & Science	,003	,000	,158	12,152	,000	
	Environmental optimism (WLE)	-,179	,013	-,175	-13,893	,000	,243
	Science self-efficacy (WLE)	,152	,013	,137	11,287	,000	
	Epistemological beliefs (WLE)	,163	,016	,132	10,367	,000	
	Cultural possessions at home (WLE)	,116	,021	,068	5,620	,000	

In Table 3, the values obtained from hierarchical multi-regression analysis for environmental awareness were given. Six models were composed and the first one is comprised of constant value and Enjoyment of Science index, which has the highest Beta score. In the second model, Subscale of Science - Earth & Science score is added to the model and the explained variance of this model is calculated as 0,172. In the third model, environmental optimism is added to the former model and the variance becomes 0,202. In the fourth model, science self-efficacy index is added and the explained variance increases to 0,22. After self-efficacy index, epistemological beliefs and cultural possessions at home indexes are included the models respectively and in the las model is composed of six indexes and the total explained variance is 0,243. It means that

the composed model is accounting for 24% of Turkish students' environmental awareness.

Considering the standardized regression coefficients, the predictors' order of importance is like that: enjoyment of science index, the score of subscale of science – Earth & Science, environmental optimism, self-efficacy, epistemological beliefs and cultural possessions at home. The equation developed according to the regression analysis is given below.

Y=-0,763+0,277*(Enjoyment of Science Index)+0,003*(Subscale Score of Earth and Science)+-0,179*(Environmental Optimism Index)+0,152*(Science self-efficacy Index)+0,163*(Epistemological Beliefs Index)+0,116*(Cultural Possessions At Home Index).

According to the multi-regression analysis results, for environmental awareness, enjoyment of science index is found as the most critic predictor. It has the greatest Beta value and for this reason, it is included the model at first. After than the other crucial predictors are the subscale score of Earth & Science and environmental optimism index. They formed the third model and this model explains the 20% variance of total explained variance. The least effective predictor is cultural possessions at home and its contribution to the explained variance is less than 1%. Considering these results, it can be said that Turkish 15-year-old students' environmental awareness level is mostly affected by their enjoyment of science, knowledge about Earth and science and their environmental optimism levels.

The other dependent variable analyzed in this research with multi-regression is environmental optimism. Nearly the same predictors were included in the analysis, and environmental awareness is added to the analysis. The results obtained from hierarchical multi-regression analysis are given Table 4 below.

Table 4. The Results of Multi-Regression Analyzing Factors Effecting Environmental Optimism

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	R2
		B	Std. Error	Beta			
1	(Constant)	2,177	,099		22,049	,000	
	Plausible Value 1 in System Subscale of Science - Living	-,006	,000	-,359	-28,234	,000	,129
2	(Constant)	1,871	,100		18,797	,000	
	Plausible Value 1 in System Subscale of Science - Living	-,005	,000	-,306	-23,367	,000	,158
	Environmental Awareness (WLE)	-,177	,013	-,180	-13,797	,000	

3	(Constant)	1,884	,099		18,970	,000	
	Plausible Value 1 in System Subscale of Science - Living	-,006	,000	-,310	-23,704	,000	
	Environmental Awareness (WLE)	-,189	,013	-,193	-14,578	,000	,163
	Science self-efficacy (WLE)	,075	,014	,069	5,444	,000	
4	(Constant)	1,817	,102		17,846	,000	
	Plausible Value 1 in System Subscale of Science - Living	-,005	,000	-,303	-22,799	,000	
	Environmental Awareness (WLE)	-,181	,013	-,185	-13,613	,000	,164
	Science self-efficacy (WLE)	,075	,014	,069	5,439	,000	
	Epistemological beliefs (WLE)	-,046	,016	-,038	-2,900	,004	
5	(Constant)	1,826	,102		17,928	,000	
	Plausible Value 1 in System Subscale of Science - Living	-,005	,000	-,304	-22,891	,000	
	Environmental Awareness (WLE)	-,189	,014	-,193	-13,819	,000	,165
	Science self-efficacy (WLE)	,072	,014	,066	5,198	,000	
	Epistemological beliefs (WLE)	-,055	,016	-,045	-3,366	,001	
	Enjoyment of science (WLE)	,041	,017	,034	2,476	,013	

Table 4 shows the composed models in order to determine the factors effecting environmental optimism. It is seen that five different models were composed and the first one is comprised of constant value and Subscale of Science-Living score, which has the highest Beta score in the other predictors. In the second model, the index of environmental awareness is added to the model and the explained variance of this model is calculated as 0,158 and this R square change is the biggest change occurring in all of the models. In the third model, the index of self- efficacy is added to the former model and the variance becomes 0,163 and this is a remarkable increase in the explained variance ration, too. In the fourth model, epistemological beliefs index is included into the model and the explained variance becomes 0,164. After epistemological beliefs index, lastly, in the fifth model enjoyment of science index is accompanied to the model and again the variance change is too small. It increases nearly 0.001 in the last two models and the total explained variance is calculated as 0,165, which is pretty low than the model composed for environmental awareness. Moreover, before mentioned the same predictors are included for each dependent variables and for optimism, index of cultural possessions at home is found insignificant and it is not included into the model, which is the other difference of the model explaining environmental optimism from the environmental awareness. Despite of the low explained variance, each model composed for environmental

optimism is found significant and the composed model is accounting for nearly 17% of Turkish students' environmental optimism levels.

Considering the standardized regression coefficients, the predictors' order of importance is like that: the score of subscale of science – Living, environmental awareness index, self-efficacy, epistemological beliefs and enjoyment of science index. The equation developed according to the regression analysis results is given below.

Y=-0,304+(-0,304*(Subscale Score of Living)+(-0,193*(Environmental Awareness Index)+-0,066*(Science Self-efficacy Index)+(-0,45*(Epistemological Beliefs Index)+0,034*(Enjoyment of Science Index)

According to the multi-regression analysis results, for environmental optimism, sub-scale of Science-Living score is found as the most crucial predictor. It has the greatest Beta value and for this reason, it is included into the model at first. After than the other important predictors are the environmental awareness and self-efficacy indexes They formed the third model and this model explains the 16% variance of total 17% variance. The least effective predictors are epistemological beliefs and enjoyment of science indexes. Their contribution to the explained variance is less than 1%. According to these values, it was decided to discard these least effective variables out of the model and the analysis was repeated with enter method. The repeated results are not so much different from the first analysis, only these two indexes were not included into the model. The results that gained from the repeated mult-regression analysis are given Table 5 below.

Table 5. The Results of the Second Multi-Regression Analyzing Factors Effecting Environmental Optimism

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	R2
		B	Std. Error	Beta			
1	(Constant)	1,926	,098		19,584	,000	
	Environmental Awareness (WLE)	-,194	,013	-,198	-15,211	,000	
	Science self-efficacy (WLE)	,074	,014	,068	5,420	,000	,167
	Plausible Value 1 in System Subscale of Science – Living	-,006	,000	-,311	-24,197	,000	

In Table 5, it can be seen the second multi-regression analysis results for environmental optimism. This time Enter method was used and this means that all of the predictors are included into the model at the same time, not in an hierarchical order. The Beta coefficients of predictors are not so much different from the first analysis. The highest Beta value was calculated for the score of

Living subscale, the index of environmental awareness follows it. The least effective predictor is science self-efficacy index. The total variance explained by the model is different from the value calculated in the first analysis. The first variance was 0,163 and this value is made up with five predictors. In the second analysis, the total explained variance is found higher, 0,167 with three predictors. This situation shows that excluding the epistemological beliefs and enjoyment of science indexes leads to compose more accurate model. Because of the predictors change, the equation has changed too. The new regression equation for environmental optimism is given below.

Y=-1,926+(-0,311*(Subscale Score of Living)+(-0,198*(Environmental Awareness Index)+-0,068*(Science Self-efficacy Index)

Comparing the equations developed for two different analyses, in the second equation, the Beta values are a little bit higher than the first one and this leads to increase in total explained variance. Lastly, considering the results obtained from the multi-regression, it has been found that nearly 17% of environmental optimism level of 15 year old Turkish students' is determined their success at Living subtest, environmental awareness and science self- efficacy index.

Discussion

According to the results obtained from the multi-regression analysis, it has been found that students' parent occupational status has no significant effect on students' environmental awareness and optimism levels. The index of highest parental occupation status was not included into any model neither environmental optimism nor awareness. Only the cultural possessions at home were found significant in the model composed for environmental awareness. However its effect was not high, too and this findings are not compatible with the results declaring the significant relationship with parental occupations and children environmental literacy level (Dietz, Kalof & Stern, 2002; Eisler, Eisler & Yoshida, 2003). The reasons of this unconformity may be cultural differences and also in this study, due to the structure of linear regression, only the continuous variables were composed. This led to incorporating so limited parental variables and it can be the reason of not defining a significant relationship between environmental behaviors and parental variables. Consequently it can be said that in this study, only the students' cognitive and affective features were found effective on their environmental awareness and optimism levels. Especially the cognitive variables such as success at science tests were found the most powerful predictor and this finding supports the findings most of the studies in literature such as; Kollmus and Agyeman (2002), Hungerford & Volk(1990), OECD (2007), Wilke, (1995). Just like stated in these sources, it has found that one's optimism is strongly dependent on his/her awareness which arises from knowledge. Also it was found that both

awareness and optimism are affected on students' self-efficacy in science, so it depends on affective factors, too. Hence, like in Kollmus and Agyeman's (2002) statements, environmental literacy is a mixture of one's knowledge, values, attitudes and even emotions. Also as for environmental awareness, in addition to the self-efficacy, enjoyment of science and epistemological beliefs of students were found as significant predictors and this finding is in accordance with Lucas (1979) ideas. Lucas's definition of environmental literacy requires one's knowledge of means-scientific enquiry and it was verified in this study too. One's environmental awareness level is influenced his/her scientific enquiry which was presented with enjoyment of science in this study. To sum up, in this study, it was found that Turkish 15 year old students' environmental awareness and optimism levels are related with their science knowledge, their interest in science and their epistemological believes accordingly with many studies in this field. It can be recommended that in order to raise environmental literate individuals, first of all, environmental education should be administered formally and inclusively at the mandatory education level especially in early ages. The reason of that it is clear facts that environmental behaviors are depend on not only knowledge but also individuals' attitudes and values. In order to make our children bring in values and attitudes toward environment, education should be started at early ages and only by this way, it is possible to create environmental literate individuals.

NOTES

1. This article was presented as verbal announcement in the 1st International Basic Education Congress (UTEK 2018) performed by Bursa Uludag University, Faculty of Education, in 2018.

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