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Full Length Research Paper

Attitudes of secondary school students towards environmental and sustainable development issues: A case study from Turkey

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As a consequence of the industrial revolution, countries around the world began to exploit natural resources more than ever before without regard for maintaining a balance between development and nature. The problems stemming from these human actions has compromised the ability of subsequent generations to meet their needs from the earth and in the last few decades, have obliged them to re-structure their educational systems in terms of environmental and sustainability education. Turkey has also introduced a new high school geography program that emphasizes environmental and sustainability education. At present, there is an urgent need to test the relationships between theory and practice to understand whether Turkish schools provide sufficient education on the environment and sustainable development (SD). This study used survey research in an attempt to measure student knowledge levels in environmental and sustainability issues as well as student opinions about the importance, place and future of SD in Turkish high schools. The results suggest that students were relatively knowledgeable about environmental issues, but their knowledge of SD was not satisfactory. The students had significant knowledge gaps concerning certain environmental and sustainability issues. It is quite promising however, that the surveyed students believed that SD was an important concept for their future. Moreover, the students seemed ready to take part in any activity promoting SD.

Key words: Environmental and sustainability education, secondary schools, secondary school students, Turkey.

INTRODUCTION

After the industrial revolution, the human-induced alterations to the natural environment and the exploitation of its resources intensified and a consensus began to emerge among many institutions and individuals concerning the relationships between development and environmental issues, otherwise known as sustainable development (SD). This consensus about SD leads to greater awareness of the importance of safeguarding the natural environment. SD was introduced in a report (in our common future) of the world commission on environment and development (WCED) in 1987. The Brundtland report, as it is known, defines SD as "the development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987: 8). In the wake of this report, many institutions and initiatives have dealt with environmental issues and SD with the aim of providing for the economic, environmental and social development needs of the present and future generations. Since the mid-1980's, numerous SD initiatives have been undertaken throughout the world to promote improved quality of life, ecological protection, social justice and economic equity. Despite this intense activity, Tilbury and Coke stress that progress has been modest and there appears to be little evidence of positive achievement (Tilbury and Coke, 2005).

Azapagic et al. (2005) and Stevenson (2007) support Tilbury and Coke's assertion, noting that despite the implementation of environmental and sustainability education in schools, which constitutes one of the most significant goals of teaching programs in the last few

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decades, they have not yet achieved expected results, as progress has been slow and much more remains to be done (Azapagic et al., 2005; Stevenson, 2007). However, other researchers believe that SD education is not a specific goal to be reached but rather a changing process, the results of which may take months or years to realize (Lidstone and Stoltman, 2007; Tilbury and Coke, 2005).

Many studies have been conducted on environmental and sustainability education from various perspectives, including the following: (1)The perceptions, opinions and knowledge of students regarding environment and SD education at different levels of education (Alp et al., 2006; Norizan, 2010; Taylor et al., 2003); (2) the debate about the concept itself (Cotton et al., 2007; Corney, 2006; Cecioni, 2005); (3) the importance of SD in student learning and in taking responsibility (Nikel, 2007; Cavas et al., 2009; Tuncer et al., 2007); (4) the relationships between environmental and sustainability education (Summers et al., 2004); (5) the integration of SD into teaching programs (Firth and Winter, 2007; Reinfried, 2009); (6) the three pillars of SD (Summers et al., 2004); (7) the knowledge gaps of students on environmental and SD issues (Azapagic et al., 2005; Norizan, 2010) and (8) the issues that gain administrative support for SD at all levels of education (Cotton et al., 2007).

Significantly, the UN declared the period between year 2005 and 2015 as “a decade for sustainable development (SD)”. Since then, more efforts have been made to incorporate sustainable development issues into the curricula, teaching materials and classroom practices of all educational levels to provide the best sustainable development education (Reinfried, 2009). As a result of these endeavors, there are a greater number of studies discussing SD in the geography curricula, which illustrates the increasing integration of SD into the geography teaching and learning processes in many countries of the world (Haubrich, 2007; Firth and Winter, 2007; Higgitt et al., 2005; Houtsonen, 2004; Wood, 2004).

The national studies that have been performed on environmental and SD education have generally echoed the following points: there is limited literature about SD, teachers and students are not sufficiently familiar with this concept and the 2005 geography curriculum places more emphasis on environmental and SD education (Tuncer, 2008; Sahin et al., 2007; Alkis and Ozturk, 2007; Alp et al., 2006, Alkis, 2009). The main motive behind the study was the urgent need to investigate the knowledge level and perceptions of high school students with respect to environmental education and SD to establish the extent to which the new curriculum changes have affected the secondary school geography education.

METHODOLOGY

This study aimed to determine the attitudes of Turkish secondary school students towards environmental and sustainable development issues through three specific research questions: (1) what is the knowledge level of high schools students regarding the environment and SD? (2) What are the most significant knowledge gaps about environmental and sustainability issues? (3) What are student opinions on the importance, need and benefits of SD?

To seek answers to the stated questions, 37 item questionnaires were prepared and distributed to 113 fourth year (senior year) high school students within the Cankiri province of Turkey. The questionnaire consisted of the following five sections: (1) Demographic questions, including questions regarding the gender and study area of the students. In Turkey, after finishing the 9th grade, all students must choose one of the areas of study including Turkish language-mathematics, science and social sciences. The courses students take are based on the selected study area; (2) an environmental issues section in which students were given 14 environmental issues, including climate change, deforestation and desertification, and asked to rate their knowledge level of these issues according to the following scale: not heard of, heard of but could not explain, have some knowledge and know a lot.

Eight issues pertaining to SD, including population growth and earth's carrying capacity, were presented to students to allow them to rate their level of knowledge on these issues. Students used the same self-rating scale as in the environmental issues section; a question section, which was designed to measure student knowledge on the definition and components of SD, the SD activities they have attended and their previous education in SD; a statement section, which was designed to investigate what the students think about the importance of, need for and benefits of SD.

In this study, the self-rating scale was adapted from Azapagic et al. (2005). Descriptive statistics were used to calculate frequencies, while Mann-Whitney U and Kruskal-Wallis H tests were used to analyze the inferential statistics because of the data according to a one-sample Kolmogorov-Smirnov test which did not have a normally distributed interval variable ($p < 0.05$). The reliability coefficient was 79.2% based on a factor reliability analysis of the dependent variables (Cronbach’s alpha coefficient: 0.792).

RESULTS

Demographic data

According to the descriptive statistics, out of 113 students polled, 52.2% were female and 47.8% were male. Analysis of the students’ study areas revealed that 48.7% of the students were studying Turkish language-mathematics, 39.9% were studying science and the remaining 12.4% were studying social sciences.

Student knowledge of environmental issues

According to the descriptive analysis of students’ self-rating scores on environmental issues, the average knowledge level for all environmental issues was 3.1 out of 4, which corresponded to “have some knowledge”. In this section, there was no environmental issue about which students stated “know a lot” or “not heard of” if the average scores were taken into account. However, the average student score for the issue of salinity corresponded to the statement “heard of but could not explain” (Figure 1).

Students had higher scores for air pollution,

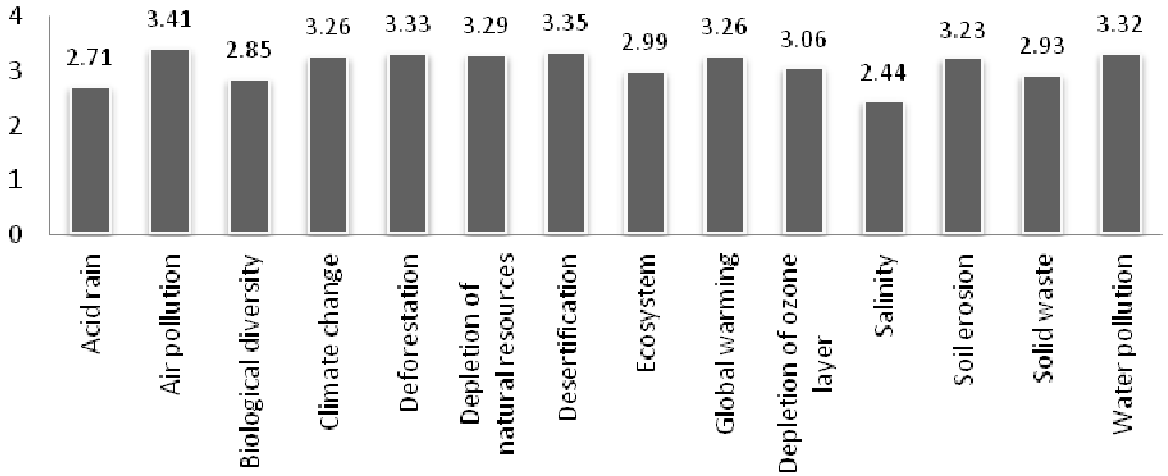

Figure 1. Student knowledge levels in environmental issues. The average score of 3.1 out of 4 corresponds to "have some knowledge".

Table 1. Kruskal-Wallis test results for student knowledge levels in deforestation based on study area.

Study area	Number	Mean rank	Df	X^2	P
Social sciences	11	67.04			
Turkish-mathematics	55	63.17	2	10.308	0.006
Science	44	46.09			

desertification, deforestation, water pollution and depletion of natural resources than for salinity, acid rain, biological diversity, solid waste and ecosystem. To investigate whether there was a significant difference between the gender and self-rating scores of students on environmental issues, Mann-Whitney U tests were performed because the dependent variables were ordinal and variances were unequal. Analysis indicated that males and females did not differ in self-rating their knowledge level of the environment ($p > 0.005$).

A Kruskal-Wallis analysis of variance indicated that, there was a statistically significant difference among the three study areas (Turkish language-mathematics, science and social sciences) with respect to student knowledge levels of the fifth environmental issue of deforestation due to the fact that the p value was smaller than 0.05 ($p = 0.006$) (Table 1).

To determine which of the pairs of study area means differed with respect to "deforestation", three post hoc Mann-Whitney tests were used to compare students' study areas to their knowledge levels about this issue to indicate statistical significance (Table 2).

There was a significant difference in the deforestation issue between students in social sciences (37.18) and those in sciences (27.06); $z = -2.189$, $p = 0.029$, r value ($r = z/\sqrt{n}$) indicates a small-to-medium effect ($r = 0.028$), as defined by Cohen (1988). Moreover, the mean rank of students in Turkish-mathematics (56.77, $n = 55$) was significantly higher than those in sciences (41.53, $n = 44$) in terms of their knowledge level of deforestation ($z = -2.996$, $p = 0.003$, $r = 0.30$) and a small-to-medium effect Table 2.

Student knowledge of SD and related issues

Analysis suggested that, the average student knowledge level about SD and related issues was lower than their knowledge level about environmental issues (the average score was 3.1 out of 4). With an average score of 2.4, the student knowledge level corresponded to "heard of but could not explain". There was no SD issue about which students stated "know a lot". However, their knowledge level was lowest for stakeholder participation, with the average score of 1.43 corresponding to "not heard of" (Figure 2).

Additional Mann-Whitney U tests were performed to determine whether gender was a significant factor in the students' knowledge level about SD and related issues. The results indicated that there was no statistical difference between the independent and dependent variables ($p > 0.05$).

Another additional Kruskal-Wallis analysis tests were performed to indicate whether there were differences in terms of the students' study area and self-rating regarding their knowledge level about SD issues. The outcomes suggested that, there were statistically significant

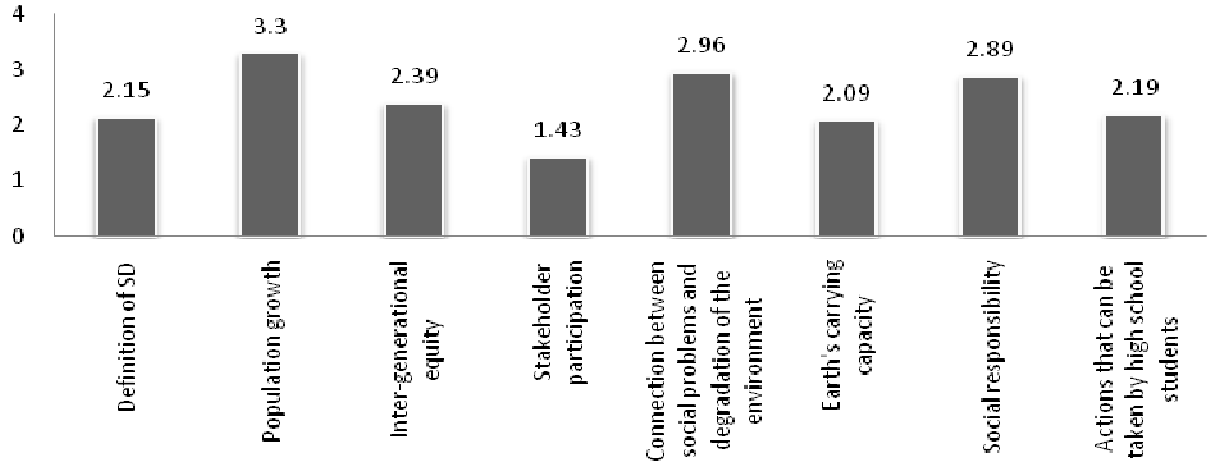

Figure 2. Student knowledge levels in SD and related issues (the average score was 2.42 out of 4 for all students and corresponds to the statement "heard of but could not explain").

Table 2. Post hoc Mann-Whitney U test results comparing the three student study areas on the fifth environmental issue of deforestation.

Study area	N	Mean rank	Sum of rank	U	Z	P
Social sciences	14	37.18	520.50	200.500	-2.189	0.29
Science	44	27.06	1190.50			
Turkish-mathematics	55	56.77	3122.50	837.500	-2.996	0.003
Science	44	41.53	1827.50			

Table 3. Kruskal-Wallis test results for SD issues 3, 4, 7, and 8 based on student study areas.

SD issue*	Study area	Number	Mean rank	Df	X^2	P
3	Social sciences	14	67.75	2	10.557	0.005
	Turkish-mathematics	51	61.00			
	Science	44	43.99			
4	Social sciences	14	72.86	2	8.162	0.017
	Turkish-mathematics	52	54.74			
	Science	44	50.88			
7	Social sciences	13	59.88	2	9.180	0.010
	Turkish-mathematics	55	64.28			
	Science	44	45.77			
8	Social sciences	13	72.50	2	7.675	0.022
	Turkish-mathematics	53	56.27			
	Science	42	46.69			

*See Figure 2 for SD issues.

differences among the students in the three study areas on SD issues 3, 4, 7, and 8 (Table 3).

To determine which of the pairs of study area means differed with respect to SD issues, three post hoc Mann-Whitney tests were used to compare each of the study areas to SD issues 3, 4, 7, and 8 to find statistical significance (Table 4). Results indicated that, there was a significant difference between the mean ranks of students in social sciences (38.71, n = 14) and in sciences (26.57, n = 44) with respect to their knowledge level of the third SD issue of inter-generational equity, which favored the former group; z = -2.460, p = 0.014. In addition, the mean rank of students in Turkish-mathematics (54.97, n = 51) was significantly higher than the mean rank of those in sciences (39.92, n = 44) on the same issue; z = -2.797 and p = 0.005 (Table 4).

Table 4. Post hoc Mann-Whitney U test results comparing the study areas with respect to student knowledge levels in SD issues 3, 4, 7, and 8.

SD issue*	Study area	Number	Mean rank	Sum of rank	U	Z	P
3	Social Sciences	14	38.71	542.00	179.000	-2.460	0.014
	Science	44	26.57	1169.00			
	Turkish-Math	51	54.97	2803.50	766.500	-2.797	0.005
	Science	44	39.92	1156.50			
4	Social Sciences	14	42.11	589.50	243.500	-2.266	0.023
	Turkish-Math	52	31.18	1621.50			
	Social Sciences	14	38.25	535.50	185.500	-2.778	0.005
	Science	44	26.72	1175.50			
7	Turkish-Math	55	57.28	3150.50	809.500	-3.004	0.003
	Science	44	40.90	1799.50			
8	Social Sciences	13	38.85	505.00	132.000	-2.935	0.003
	Science	42	24.64	1035.00			

Regarding student knowledge levels in the fourth SD issue of stakeholder participation, the analysis showed that the mean rank of students in social sciences (42.11, n = 14) was statistically higher than those in Turkish-mathematics (31.18, n = 52); z = -2.266 and p = 0.023, while the students in social sciences had significantly higher mean rank (38.25, n = 14) than those in sciences (26.72, n = 44) on the same SD issue; z = -2.778, p = 0.005 (Table 4).

As for student knowledge levels for the seventh SD issue of social responsibility, Turkish-mathematics students had significantly higher mean rank (57.28, n = 55) than science students (40.90, n = 44); z = -3.004, p = 0.003. Considering the mean ranks of students with respect to the eighth SD issue of actions that can be taken by high school students to promote SD, it was shown that the 13 social sciences students had significantly higher mean rank (38.85) than the 42 science students (24.64); z = -2.935, p = 0.003 (Table 4).

Additionally, the r values which varied between 0.28 and 0.32 indicated a small-to-medium effect size, as defined by Cohen (1988). However, the r value of 0.37, which reflects the significant differences between the mean ranks of students in social sciences and sciences with regard to the fourth and eighth SD issues, respectively, indicated a medium-to-large effect.

Questions

Considering the student responses to the multiple-choice and yes-no questions, it was observed that more than 74.3% (n = 84) of students selected the correct answer to the question “What is the definition of SD?” Only 15.9% of the students chose the wrong answer, while the remaining 9.7% did not respond to this question. Students were not as successful in identifying the three fundamental components of SD (environment, economy and society), as these were only answered correctly by 43.3% of the students.

The responses to the question “Have you ever attended any activity (panel, symposium, conference, seminar or project) regarding SD?”, were quite discouraging in the sense that, only two students indicated that they had attended a SD activity. When asked whether they had received any SD education in both primary and secondary school, only four of them answered affirmatively (3.6%).

Statements regarding the importance of the need for and benefits from SD

The agreement levels of the students with the statements regarding the importance, place and future of SD, the need for SD and the benefits of SD were quite pleasing in the sense that, more than 84% of the respondents thought that SD was an important subject and more than 87% believed that it was especially important for the future of the society. Almost 80% of respondents agreed or strongly agreed that SD should have been given more emphasis in education in Turkey; however, only 30.4% of the respondents thought that SD was given enough emphasis in Turkey.

More than 75% of the students disagreed or strongly disagreed with the notion that SD was not of interest to the common people but only for the concerned decision makers. Again, almost 77% of the high school students thought that SD was needed to create a better world. Moreover, 61.6% of the respondents believed that there was something that they could have done to promote SD, while more than 30% remained neutral in response to this

Table 5. Student opinions about SD and its importance, place, future, etc.

S/N	Statement		Level of agreement		
			Strongly agree/agree	Neutral	Strongly disagree/disagree
1	SD is an important subject	*f*	84% (95)	12.4% (14)	3.6% (4)
2	SD is given enough emphasis in Turkey	*f*	30.4% (34)	28.6% (32)	41% (46)
3	SD should be given more emphasis at all levels of education in Turkey	*f*	79.5% (89)	15.2% (17)	5.4% (6)
4	SD is especially important for the future of society	*f*	87.3% (97)	9.9% (11)	2.8% (3)
5	SD concerns decision makers and does not interest common people	*f*	2.8% (3)	22% (24)	75.2% (82)
6	There is no need for SD to create a better world	*f*	9% (10)	14.3% (16)	76.8% (86)
7	There is nothing I can do to promote SD	*f*	8.1% (9)	30.4% (34)	61.6% (69)

statement (Table 5).

DISCUSSION

Analysis of the students' knowledge about environmental issues indicated that, they rated their knowledge at the "have some knowledge" level with an average score of 3.1 out of 4, which is a reasonable result for high school students. Some knowledge gaps were identified however, particularly in the students' knowledge of salinity, acid rain, biological diversity, solid waste and ecosystem for which the average student scores were in the level of "have some knowledge". This finding underscores an important problem; students have insufficient knowledge about how the physical systems of the earth work (ecosystem and biological diversity). Because action is strictly based on "knowledge", there appears to be an urgent need for these knowledge gaps to be filled to mobilize students to take action to promote environmental quality and SD. Students are highly knowledgeable, however, in some environmental issues including air pollution, desertification and water pollution. In fact, these problems are among the most urgent problems in Turkey for which all stakeholders are trying to find long-term solutions.

The analysis of the relationship between student gender and knowledge levels did not suggest any significant difference. However, a Kruskal-Wallis analysis of variance indicated that students in social sciences and Turkish-mathematics were more knowledgeable about deforestation than students in sciences.

Considering the average self-rating scores of students for SD issues, they were rather low in comparison to their knowledge level of environmental issues (the average score was 3.1 out of 4), with a score of 2.4 out of 4, which corresponded to the level "heard of but could not explain". These results, indicate that not enough SD education have been provided in high schools and that setting up links between the environmental and sustainability education in the high school geography curricula and classrooms practices have failed and indeed, these give us clues regarding the directions for future research in this context. In this section, student self-ratings of their knowledge level on SD issues also suggested that there was no issue about which students indicated "know a lot", but their knowledge level was the lowest for the issue of stakeholder participation, which corresponded to "not heard of". In addition to stakeholder participation, the earth's carrying capacity, the definition of SD and the actions that can be taken to promote SD were among the issues about which students had important knowledge gaps.

Again, there was no statistical difference between gender and the self-rating scores of students with respect to their knowledge level about SD issues. However, additional Kruskal-Wallis analysis of variance tests that were performed to indicate whether there were differences in the students' study area and self-rating regarding their knowledge level on SD issues revealed that, social sciences and Turkish-mathematics students had more knowledge than science students on the SD issue of inter-generational equity, while social sciences students were more knowledgeable than Turkish-mathematics and science students about stakeholder participation. Furthermore, students in Turkish-mathematics and social sciences were also more knowledgeable than students in sciences regarding the SD issues of social responsibility and actions that can be taken by high school students.

As for student responses to the multiple-choice and yes-no questions, more than 74% of the students correctly answered the question about the definition of SD, and their average self-rating score about their knowledge of the definition of SD was 2.15, which corresponded to "heard of but could not explain". This result does not represent an inconsistency because in a multiple-choice format, they could have easily recognized the definition by glancing at the choices. The students' responses to the second multiple-choice question about the main

components of SD revealed their insufficient knowledge of these issues, as only slightly more than 43% of the students identified the correct answer. The responses of the students regarding their attendance to any SD activity and previous education on SD were quite discouraging in the sense that, only two students out of 113 stated that they had attended any activity regarding SD and only four students indicated that they had previous SD education. This result strongly supports the hypothesis that SD is not yet an important issue in Turkish society and in the teaching and learning processes in their schools.

The analysis of the statements section, which was designed to investigate student opinions on the importance of the need for and benefits of SD, suggested that students had positive attitudes towards SD, its importance and its place in education even though they had insufficient educational background and knowledge levels in SD. Results also indicated that, the vast majority of students believed that the SD concept was important for the present and future, it was of interest to all of society and more emphasis should be placed on SD at all levels of education. However, 41% thought that SD was not given the emphasis it deserved in Turkey. They also thought that there was something they could have done to promote SD. This finding suggests that students were ready to take action for SD even though they stated that they did not know how to do so.

In conclusion, this study revealed that the students surveyed had significant knowledge gaps in various environmental and SD issues and were facing urgent problems regarding their educational background in SD, despite having a reasonable background in environmental issues in general. Therefore, linking theory and practice about SD in teaching programs and classroom practices as well as encouraging schools and teachers to put SD on their teaching agendas are the most viable solutions to the problems concerning the promotion of SD in Turkey.

Finally, the results of this study have provided enough evidence to be hopeful about the future of SD in Turkey, since almost all of the students surveyed believed that SD was important for their own future and for that of Turkish society and were ready to take part in promoting SD in Turkey.

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