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Air Pollution Awareness in the Scope of the Community Service Practices Course: An Interdisciplinary Study

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Abstract

The aim of this study is to determine the effect of the interdisciplinary (the disciplines of Turkish, Social Science, Natural Sciences, Mathematics and Public Administration) activities performed in the scope of the Community Service Practices Course on the air pollution awareness (APW). This study has been performed as a multiple case study. Participants consisted of 32 pre-service elementary school teachers and 122 elementary school students enrolled in a 4th grade. Data were collected using the Air Pollution Awareness Questionnaire, Know-Want-Learn forms and interviews. Content analysis was used for analysis of data. The APW of participants have increased. It has been determined that the pre-service elementary school teachers have evaluated the implementation as being generally successful. Also it has been seen that the implementation has served different purposes out of the study aim for the pre-service elementary school teachers like providing teaching experience and how to teach the interdisciplinary subjects.

Keywords: Air Pollution Awareness, Community Service Practices Course, Interdisciplinary Approach, Pre-Service Teachers, Primary School Students

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Introduction

Alongside being an increasingly important problem, air pollution is a major issue regarding various fields such as environment, health, economy and politics. Numerous definitions of air pollution exist in the literature (Güney, 2004; Özey, 2009; Devinny, Deshusses & Webster, 1998; Flagan & Seinfeld, 2013, etc.). Combining these definitions, air pollution in general can be described as the increase in the rate of harmful gases and particles in the atmosphere (Özey, 2009). This increase has negative impact on the living conditions. For example, according to World Health Organization (WHO), millions of people have lost their lives due to causes related to air pollution in 2012 (URL-1). It can also be stated that while air pollution affects human health as well as other living organisms (Oanh et al., 2006), it also has negative effects on historical artifacts, technological devices and buildings (Ridker & Henrick, 1967; Paulos, Honicky & Goodman, 2007; Hyslop, 2009). Moreover, since it causes economical and legal problems for countries (Rothbard, 1982; Best & Collins, 1982; Selden & Song, 1994), emergency measures have to be taken regarding air pollution. For this purpose, in order to reduce the air pollution and bring its negative effects to a minimum on an international scale, various studies are being conducted (Oanh et al., 2006; Paulos, et al., 2007; Semenza et al. 2008), laws and legislations are being prepared (exhaust emission law, etc.), and various studies are conducted in order to assess the current situation and determine the possible steps to be taken (e.g. KYOTO Protocole, 1997; Paris Convention, 2015). Additionally, it is also part of educational curricula as a subject or theme, in order to develop public knowledge and raise awareness (Ministry of National Education [MNE], 2013, 2009a; National Council of Mathematics Teachers [NCTM], n.d., etc.).

Improving the educational level and raising environmental awareness are essential for reducing the air pollution (Selden & Song 1994). In studies conducted in various fields, air pollution is found to be one of the major important problems regarding the environment according to students and pre-service teachers (Demirbaş & Pektaş 2009; Özdemir, Yıldız, Ocaktan, & Sarışen 2004; Vaizoğlu, et al., 2005; Uluçınar-Sağır, Aslan, & Cansaran, 2008). On the other hand, it is also evident that the knowledge levels of students and pre-service teachers about the air pollution are low, and they lack the scientific point of view (Darçın & Sert Çıbık, 2009; Sert Cibik & Darcin 2009; Thornber, Stanisstreet, & Boyes, 1999; Yeung, Boyes, & Stanisstreet, 2004). Therefore, increasing the knowledge level and awareness of not only the students but also the pre-service teachers who will teach them, by way of providing guidance with a purposeful and planned education is highly important(Demirbaş & Pektaş, 2009; Güven & Aydoğdu, 2012).Although there are various studies in the literature about the impact of active learning on the knowledge of students about air pollution (Önal & Güngördü, 2008) and about determining the understanding of the participants about air pollution/quality (Bickerstaff & Walker, 2001, 2003; Şahin, 2004; Paulos et al., 2007), no study can be found that is planned and implemented in order to raise air pollution awareness only. Hence, despite it is considered that the individuals acquire awareness about air pollution generally through media or publicity campaigns (Hyslop, 2009; Beaumont, Hamilton, Machin, Perks, & Williams, 1999; Bonnett & Williams, 1998); Bickerstaff & Walker (2001) determined that personal experiences have more impact on raising awareness on pollution. This fact suggests that the awareness can only be acquired after the pollution takes place. The reason to raise awareness of the individuals on air pollution is to ensure that they take the necessary measures against the air pollution before it takes place. Therefore, awareness practices should be implemented with the cooperation of the government and the educators (Alp, Ertepınar, Tekkaya, & Yılmaz, 2008).

During the formal education, air pollution is part of the curriculum both as a subject in various courses and as a theme in discipline specific subjects (see MNE, 2013, 2009a; NCTM, n.d., etc.). This education process starts with differentiating between the clean and polluted environment, and continues in the primary school level with increasing the details of contents. Classroom teachers who are proficient in different disciplines are expected to raise awareness on the subject by carrying out learning/teaching activities in schools. Since air pollution awareness raising practices are socio-scientific and interdisciplinary in nature, they can be conducted with an interdisciplinary approach (Bonnett & Williams, 1998; Hamalosmanoğlu & Güven, 2014; Karataş & Aslan, 2012).

Community Service Practices Course (CSPC) is one of the courses where the interdisciplinary approach can be applied during the education of teachers. CSPC is a course that aims the pre-service teachers to acquire social responsibility in theory and practice, and ensure to enhance their cooperation, solidarity, effective communication and self-evaluation skills. In accordance with this purpose, the pre-service teachers are expected to determine the current social problems and work towards solutions for these problems (Tezbaşaran, 2009). While this course is covered as service-learning course in countries such as USA and England (Beldağ, Yaylacı, Gök, & İpek, 2015), it is conducted as 1 hour theory and 2 hour practice course in Turkey. During the course, pre-service teachers organize social activities or participate in such activities under the guidance of a faculty member (Council of Higher Education [CHE], 2006). The pre-service teachers take active roles, and the faculty member observes and guides the activities of the students. Moreover, they provide the pre-service teachers with opportunities to work on the subjects they are interested in and want to learn by ensuring that they work with the public in person, rather than doing course work in a classroom environment (Aksoy, Çetin, & Sönmez, 2009). Gökçe (2012, p.589) states that within the scope of CSPC, activities targeted at addressing the environmental issues which enable the students to actively participate can also be carried out. Hence, through this course, the pre-service teachers can raise awareness in the public on various areas, including environmental issues (Talas & Karataş, 2012); because CSPC is a course that enables both interdisciplinary studies and where issues which affect the society such as air pollution can be addressed.

There are various studies in the literature that use interdisciplinary approach to environmental issues. These studies have various different subjects such as the contribution of doing activities about various environmental themes that are designed by the researchers and carried out by the classroom teachers with their students on raising their awareness (Güven 2012; Hamalosmanoğlu & Güven 2014), and the reaction of the schools to such studies (Şimşekli, 2004), awareness raising activities via Ecology Based Summer Camp Project as a novel implementation towards teachers and students (Karataş & Aslan, 2012), or determining the impact of environmental education in primary schools towards the attitudes of the students towards nature and environment (Bonnett & Williams, 1998). These practices have been carried out under the guidance of one or more faculty members or teachers, and pre-service teachers or students attended these practices as participants. These studies which are about raising awareness are mostly carried out under a more general theme that can include various different such as environment or environmental pollution, rather than focusing on specific subjects as air pollution. However, in this study, instead of addressing all sub-themes under a general theme, the theme of air pollution is directly at the focus in all the activities. Generally, the studies on CSPC in the literature focus on evaluating the course by determining the opinions of participating pre-service teacher about the course process (Arcagök & Şahin, 2013; Uğurlu & Kıral, 2012; Gökçe, 2011; Sönmez, 2010; Çetin & Sönmez, 2009; Kesten, 2012; Ekşi & Cinoğlu, 2012; Özdemir & Tokcan, 2010). The aim of this study is to determine the impact of the activities on both the pre-service teachers and the students who are the target audience for the community

practices carried out within the scope of the course. From these two perspectives, this study can be considered a novel work in this area.

In light of all these facts, the aim of this study is to determine the impact of interdisciplinary activities carried out within the scope of CSPC on the air pollution awareness. In order to achieve this goal, actions have been taken towards three main objectives as listed below:

- Determining the level of awareness on air pollution of pre-service teachers
- Determining the level of awareness on air pollution of fourth grade primary school students
- Determining the opinions of pre-service teachers about the CSPC

Methodology

Since this study contains two separate study groups that are related with each other, and it investigates the differences emerging from two interrelated cases, it is considered as a nested multiple case study, which is one of the qualitative research methods. The changes in the air pollution awareness of both study groups are investigated by comparing the data obtained before and after the study.

Study Groups

The study group of the research consists of 32 pre-service teachers who are in the third year of university education, and 122 primary school fourth grade students. The aim of the study is to raise a public awareness on air pollution which is an interdisciplinary subject. For this purpose, the study was conducted with pre-service teachers who will be the future educators in various different disciplines. CSPC is considered the most suitable course for the purpose of community service.

In Turkey, the classroom teachers teach in the primary school from 1st to 4th grades. In the educational curricula between 2014 and 2016, during which this study was conducted, the disciplines have begun to differentiate at the 4th grade. 4th graders are found to be the most suitable group to conduct the study, since their experience towards different disciplines make them ideal for handling the subject of air pollution with an interdisciplinary approach.

Data Collection Instruments

Three different data collection instruments have been used in this study. The first one is the Air Pollution Awareness Questionnaire (APAQ), which was developed by the researchers and comprised of seven questions. The aim of APAQ is to determine the view of air pollution of pre-service teachers and students with a general approach, the causes and effects of air pollution, the preventive measures that can be taken against air pollution and their level of awareness about the air pollution in their immediate surroundings. The city of Giresun which is by the Black Sea and the city in which the participants live is considered as the immediate surroundings. The questionnaire have been applied on both the pre-service teachers and primary school students before and after the implementation of the study, and the development stages of the questionnaire are elaborated in Authors (In review).

The second instrument is the Know-Want-Learn (KWL) form, applied to pre-service teachers in order to present the self-assessment of the pre-service teachers on air pollution. The first two questions of the KWL form have been answered in the first day of CSPC, and the last question has been answered in the last day by the pre-service teachers.

The third instrument is an interview form comprising of ten questions created by the researchers in order to determine the views of pre-service teachers on the CSPC process. After some trials, the form has been reevaluated and reduced to four questions. This form has been used in order to determine the opinions of pre-service teachers on the CPSC process, whether the coursework is successful in reaching the course aims, whether the course is successful in fulfilling its community service purpose, knowledge gained from different groups during the course and the opinions of pre-service teachers on the general process. The interviews have been conducted with 10 volunteer pre-service teachers, two from each discipline group in the study.

Implementation

At first, during the design phase of the study, in order to determine the essential focus points in raising awareness on air pollution, a needs analysis has been performed after applying APAQ to a different group. Basic concepts, causes, effects, future status and precautions are found to be the focus points as a result of the needs analysis. The contents of these focus points have been compared to the contents of the primary school fourth grade curriculum. As a result, a discipline has been appointed to each focus point. During the course of the study, a field expert has been appointed by the researchers for each discipline.

The study has been conducted in the faculty with CSPC and as seminars in the primary schools. As a result of the pilot applications, changes have been made to the data collection instruments, focus points, content and the order (Aydın Güç, et al., 2017). The relation between the air pollution and focus points, content and disciplines in the actual implementation are presented in Table 1.

Table 1.

Focus Points, Content and Disciplines

Focus Point	Content	Discipline
Basic concepts	Basic concepts on air pollution	Turkish
Causes and effects	The effects of air pollution on human health and social effects within the scope of natural sciences	Natural Sciences
Causes and effects	Natural and human causes and effects of air pollution	Social Sciences
Future status	The state of air pollution in the past and today, and predicting the future status based on the current conditions	Mathematics
Precautions	Clearing up/summarizing the presentations of previous groups, laws and legislations, implementations in different countries, public opinion	Public Administration

The activities performed during the implementation phase within the scope of the course have taken place in three stages, before, during and after seminars. Before and after stages have been conducted during the CSPC class time in the faculty, and the seminars have been conducted in the primary schools. The actual implementation plan of the study is presented in Table 2.

During the preparation stage before the seminars, the pre-service teachers conducted preliminary research on what air pollution is, its causes and effects, and national and international practices. Afterwards, groups have been created from below the average pre-service teachers. During this process, the related field experts have presented the contents of the focus points for each discipline, and the groups have been asked to research the relation between the focus points and the disciplines. The pre-service teachers have determined the gains for their disciplines and accordingly, developed

course plans for these focus points. Following the schedule in Table 2, the course plans have been presented to the other groups.

Table 2.

Community Service Practices Course and The Plan of Implementation of Service Practices

Week	Faculty of Education	School A	School B	School C
1	Pre-tests, preliminary research			
2	Creation of the groups			
3	Study with the consultants			
4	Distribution among groups			
5	Turkish group presentation	Pre-test		
6	Natural Sciences group presentation	Turkish	Pre-test	
7	Social Sciences group presentation	Natural Sciences	Turkish	Pre-test
8		None implementation (Midterm)		
9	Mathematics group presentation	Social Sciences	Natural Sciences	Turkish
10	Public Administration group presentation	Mathematics	Social Sciences	Natural Sciences
11	Sharing of experiences	Public Administration	Mathematics	Social Sciences
12	Sharing of experiences	Post-test	Public Administration	Mathematics
13	Sharing of experiences		Post-test	Public Administration
14	Sharing of experiences			Post-test
15	Post-tests			
16	Interviews			

The course plans have been finalized after the feedbacks from the consultants and other groups, and they are presented in Table 3.

During the seminars, the pre-service teachers have applied the course plans they prepared at primary schools in groups. The duration of these seminars are two class hours. Each group has completed their seminars in three weeks, at a different school each week. During this period, without telling them that they will conduct the course under different disciplines, the primary school students have been explained that they will be studying air pollution under different focus points in class. While the seminars are underway in primary schools, the groups who have not yet presented have kept their preparations for the seminar going. The groups which have completed their seminars shared their experiences of their work in the primary schools with consultants and other groups. The groups have tried to determine the negative and positive aspects of the implementation by discussions with other groups.

Table 3.

Disciplines, Gains Included in The Course Plans and Course Plan Summaries

Discipline	Gains in the course plan	Course plan summary
Turkish	Making deductions from what they listen to. Making comparisons based on what they listen to. Researching the meaning of words they do not know. Sharing the things they listen with others. Developing vocabulary by making use of visuals. Guessing the meanings of the words they do not know from what they listen to. (MNE, 2009b)	Watching a drama piece about basic concepts on air pollution, guessing the meaning of words from what the students listen to, making deductions and comparisons from what they listen to, examining images about basic concepts and improving vocabulary by making use of these images, trying to solve puzzles about basic concepts, researching the meanings of newly encountered words during this stage.
Natural Sciences	Comprehending the mutual interaction between humans and the environment. Keeping the immediate surroundings clean in order to prevent pollution of the environment. (MNE,2013)	Making experiments in order to observe air pollution, discussing the effects of the results of the experiment on the health of living beings together with the human causes and effects of air pollution, watching and discussing related animations, taking note of the importance of mutual interaction between humans and the environment.
Social Sciences	Making distinction of the natural and human elements seen in the surrounding environment. (MNE, 2009a)	Explaining the natural and human causes and effects of air pollution by including drama pieces and visual materials about the natural and human elements related to the causes and effects of air pollution.
Mathematics	Creating bar charts. Interpreting bar charts. (MNE, 2009c)	Investigating the data of air pollution from previous years in our city, creating and interpreting bar charts using these data, solving problems aimed at predicting the future status with the help of the charts.
Public Administration	Examining the laws and regulations on air pollution. Being curious about the opinions of the public and government officials about air pollution.	Watching drama pieces about national laws and regulations, international conventions made for prevention of air pollution, comparisons of the status of air pollution between different countries; watching and discussing interviews about the public opinion.

Data Analysis

The collected data have been evaluated with content analysis. Suitable codes are created and categories are determined accordingly, and thus the analysis is concluded. Analyses from two different researchers have been compared, their differences have been discussed and an agreement has been reached.

Results

In this section, the results obtained from the study are presented together with the related data collection instruments.

Results Obtained from KWL Form

The results on the self-evaluation of the pre-service teachers about their air pollution awareness are presented in Table 4.

Table 4.

The Self-Evaluation of The Pre-Service Teachers About Their Air Pollution Awareness

Category	What do I know?	What do I want to learn?	What have I learnt?
Air pollution description	5	-	2
Causes of air pollution	27	8	31
Effects of air pollution	18	6	19
Actions that can be taken in order to prevent air pollution	8	25	11
Awareness raising activities that can be done in order to prevent air pollution	-	15	6
Interdisciplinary nature of air pollution	-	-	2
Statistical information on air pollution	-	-	6
Government Policies/Projects/Institutions related to air pollution	-	7	12
The regional/national/international status regarding the air pollution	-	-	11

The results indicate that the pre-service teachers answer the question “What do I know?” with the causes of air pollution, effects of air pollution and actions that can be taken in order to prevent air pollution. It is also determined that a small number of pre-service teachers can describe air pollution. Examining the question “What do I want to learn?”, it can be seen that the pre-service teachers want mostly to be able to learn about the actions to be taken in order to prevent air pollution and awareness raising activities. In addition, it can also be determined that they are curious about the causes and effects of air pollution, and the government policies regarding the air pollution. For the question “What have I learnt?”, they state that they have learnt the causes and effects of air pollution, the current situation and government policies regarding the air pollution, and what actions to take in order to prevent air pollution (Table 4).

Results Obtained from APAQ

The answers given by the pre-service teachers and students to the question “What is air pollution?” are presented in Table 5. The table indicates that the pre-service teachers and students focus on the causes and effects while describing the air pollution.

Under the causes theme, both groups mention the causes “human activities” and “increase in harmful gases/polluters/foreign substances in the air, decrease in oxygen in the air” most, both before and after the implementation. For both groups, the frequency of explaining the air pollution with “increase in harmful gases/polluters/foreign substances in the air, decrease in oxygen in the air” increased after the implementation. Moreover, while the number of responses from students with “human activities” increases, it decreases for pre-service teachers. While neither groups mention the “natural causes” before the implementation, these causes get to be mentioned, although with low frequency, after the implementation.

It has been observed that in both groups, the number of students that describe the air pollution by taking the effects into account decrease after the implementation. In addition, the codes “pollution of clean air”, “weather activities/dust clouds” and “negative environmental conditions” under the causes theme, and “material damage”, “extinction of living beings”, and “foul odor” codes under the effects theme are only addressed by the students.

Table 5.

Description of Air Pollution According to Pre-Service Teachers and Students

Theme	Code	Pre-service Teach.				Students			
		Pre		Post		Pre		Post	
		f	%	f	%	f	%	f	%
Cause	Human activities	16	50	9	28,1	57	46,7	68	55,7
	Natural causes	-	-	5	15,6	-	-	1	0,8
	Increase in harmful gases/polluters/foreign substances in the air, decrease in oxygen in the air	22	68,8	29	90,6	51	41,8	54	44,3
	Pollution of clean air	1	3,1	-	-	7	5,7	8	6,6
	Weather activities (such as smog)/dust clouds	-	-	-	-	5	4,1	6	4,9
	Negative environmental conditions	-	-	-	-	4	3,3	3	2,5
Effect	Harm to living beings/health	5	15,6	13	40,6	16	13,1	8	6,6
	Harm to humans/human health	8	25,0	4	12,5	9	7,4	1	0,8
	Harm to ecosystem	3	9,4	6	18,8	-	-	1	0,8
	Visual pollution	1	3,1	-	-	-	-	-	-
	Material damage	-	-	-	-	6	4,9	4	3,3
	Extinction of living beings	-	-	-	-	1	0,8	1	0,8
	Foul odors	-	-	-	-	2	1,6	-	-

Note. Pre and Post: Pre-implementation and post-implementation

The answers given by the pre-service teachers and students to the question “What can be the causes of air pollution?” are presented in Table 6. According to this table, the causes of air pollution are gathered under two main themes as human and natural causes.

Under the human causes theme, both groups mention mostly “exhaust smoke”, “industry”, “heating” and “personal care” as the causes for air pollution before and after the implementation. It can be seen that “unsuitable agricultural activities” is only stated after the implementation. “Unplanned urbanization” is only mentioned by the pre-service teachers before the implementation. Moreover, it should be noted that the frequency of mentioning “destruction of forests” by both groups decrease after the implementation. The code “lack of education” is also addressed less by the pre-service teachers after the implementation.

The natural causes theme is addressed relatively less than the human causes by both groups. In addition, it can be observed that the pre-service teachers mention the natural causes more after the implementation. It should also be noted that in contrast to pre-service teachers, no “volcano eruptions”, “earthquakes”, “methane gases”, “flood” and “global warming” codes come up in the answers of the students.

Table 6.

Causes of Air Pollution According to Pre-Service Teachers And Students

Theme	Code	Pre-service Teach.				Students			
		Pre		Post		Pre		Post	
		f	%	f	%	f	%	f	%
Human causes	Humans	4	12,5	1	3,1	4	3,3	3	2,5
	Exhaust smoke	21	65,6	26	81,3	65	53,3	80	65,6
	Industry	25	78,1	23	71,9	56	45,9	88	72,1
	Heating	13	40,6	18	56,3	60	49,2	59	48,4
	Personal Care	11	34,4	19	59,4	3	2,5	23	18,9
	Destroying forests	4	12,5	1	3,1	16	13,1	1	0,8
	Unplanned urbanization	3	9,4	-	-	-	-	-	-
	Lack of education	9	28,1	1	3,1	2	1,6	2	1,6
	Wastes	5	15,6	1	3,1	6	4,9	7	5,7
	Unsuitable agricultural activities	-	-	3	9,4	-	-	1	0,8
	Smoking	1	3,1	1	3,1	4	3,3	13	10,7
	Fires	2	6,3	4	12,5	4	3,3	9	7,4
	Population increase	2	6,3	1	3,1	1	0,8	-	-
Natural causes	Volcano eruptions	-	-	8	25,0	-	-	-	-
	Earthquake	-	-	1	3,1	-	-	-	-
	Methane gas emission	-	-	1	3,1	-	-	-	-
	Flood	1	3,1	-	-	-	-	-	-
	Global warming	1	3,1	-	-	-	-	-	-
	Geographical location	-	-	1	3,1	3	2,5	5	4,1
	Dust storms	-	-	-	-	3	2,5	2	1,6

The answers given by the pre-service teachers and students to the question “What could be the effects of air pollution?” are presented in Table 7. The table indicates that both groups state outcomes regarding bringing harm to the living beings, environment and cultural environment.

Under the harming the living beings, both groups mention the code “health” the most before and after the implementation. It is noteworthy that while the pre-service teachers do not mention the harm to the “plants” due to air pollution before the implementation, they do mention this code after the implementation. In the harming the environment theme, it can be seen that the responses from both groups show no noticeable difference before and after the implementation. After examination of harming the cultural environment theme, it can be seen that while the opinions of pre-service teachers on this the increase in the post-test, the opinions from the students on this theme decrease.

Table 7.

The Effects of Air Pollution According to Pre-Service Teachers and Students

		Pre-service Teach.				Students			
		Pre		Post		Pre		Post	
Theme	Code	f	%	f	%	f	%	f	%
Harming living beings	Health	28	87,5	29	90,6	73	59,8	76	62,3
	All living beings	7	21,9	9	28,1	8	6,6	9	7,4
	Plants	-	-	7	21,9	2	1,6	8	6,6
	Animals	2	6,3	1	3,1	3	2,5	1	0,8
	Extinction	1	3,1	6	18,8	2	1,6	2	1,6
	Life time	2	6,3	3	9,4	8	6,6	18	14,8
	Mental health	1	3,1	-	-	3	2,5	1	0,8
	Social life	3	9,4	1	3,1	-	-	-	-
	Genetic degradation	1	3,1	-	-	-	-	-	-
	Humans	3	9,4	1	3,1	-	-	1	0,8
Harming the environment	Global warming	4	12,5	3	9,4	3	2,5	-	-
	Disturbing the ecological balance	2	6,3	3	9,4	1	0,8	1	0,8
	Climate change	1	3,1	1	3,1	2	1,6	-	-
	Ozone layer/atmosphere depletion	2	6,3	3	9,4	6	4,9	1	0,8
	Acid rains	2	6,3	2	6,3	2	1,6	4	3,3
	Pollution of other environmental elements (water, land)	3	9,4	3	9,4	6	4,9	10	8,2
	Visual pollution	3	9,4	-	-	2	1,6	-	-
	Decrease in/lack of oxygen	2	6,3	1	3,1	7	5,7	11	9,0
	Melting of the polar icecaps and rising water levels	-	-	-	-	1	0,8	-	-
	Foul odors engulfing the environment	-	-	-	-	6	4,9	2	1,6
Harming the cultural environment		1	3,1	9	28,1	5	4,1	3	2,5

The answers given by the pre-service teachers and students to the question “What can be done in order to prevent air pollution?” are presented in Table 8. In this table, it can be seen that both groups state that precautions can be taken under the themes of education, fuel usage, nature, individual activities and government policies.

For the case of precautions to be taken regarding education, it can be seen that both groups mention “awareness raising activities” the most. The “formal education” code is only addressed by the pre-service teachers after the implementation.

It is noteworthy that regarding the precautions towards air pollution, both groups have the most awareness on the theme of fuel usage, both before and after the implementation. In both pre-service teachers and students, the awareness on using filters, under the theme of fuel usage increases after the implementation, and this increase is especially more prominent for the students. Moreover, after the implementation, “quality/responsible fuel usage” code is addressed more by the pre-service teachers and less by the students.

Table 8.

Actions to be Taken in Order To Prevent Air Pollution According to Pre-Service Teachers and Students

Theme	Code	Pre-service Teach.				Students			
		Pre		Post		Pre		Post	
		f	%	f	%	f	%	f	%
Education	Awareness raising activities	18	56,2	18	56,2	4	3,3	3	2,4
	Formal Education	-	-	2	6,3	-	-	-	-
Fuel usage	Filters	20	62,5	26	81,3	46	37,7	82	67,2
	Chimney cleaning	-	-	1	3,1	2	1,6	3	2,5
	Reducing gas emissions	-	-	-	-	1	0,8	1	0,8
	Reducing fossil fuel usage	2	6,3	-	-	-	-	-	-
	Heat isolation	1	3,1	-	-	-	-	-	-
	Quality/responsible fuel usage	9	28,1	12	37,5	36	29,5	22	18,0
Activities towards nature	Forestation	5	15,6	4	12,5	24	19,7	13	10,7
	Preventing forest fires	3	9,4	4	12,5	1	0,8	5	4,1
	Protecting the nature	-	-	-	-	2	1,6	1	0,8
Individual activities	Recycling	1	3,1	-	-	-	-	1	0,8
	Reducing chemical substance usage	4	12,5	9	28,1	1	0,8	4	3,3
	Using public transportation	5	15,6	14	43,8	17	13,9	17	13,9
	Using renewable energy sources	-	-	-	-	3	2,5	3	2,5
Government policies	Criminal action	-	-	2	6,3	1	0,8	1	0,8
	Inspection	4	12,5	1	3,1	-	-	3	2,5
	Laws	1	3,1	1	3,1	-	-	1	0,8
	Urban planning	2	6,3	1	3,1	5	4,1	1	0,8
	Situation assessment, planning	1	3,1	-	-	-	-	-	-
	Banning smoking	-	-	-	-	1	0,8	1	0,8

In the individual activities theme, while an increase can be observed for the “reducing the usage of chemical substances” and “using public transport” codes in pre-service teachers after the implementation, no significant change is observed for the students.

In the activities towards nature and government policies themes, small changes are encountered in the frequency of codes for both groups before and after the implementation. While in the question about the causes of air pollution the students responded with the “destruction of forests” code less after the implementation, in this question, the “preventing forest fires” code is mentioned more frequently for preventing air pollution.

The answers given by the pre-service teachers and students on the question “Do you think there is air pollution in Giresun?” are presented in Table 9. In this table, it can be seen that both groups state their opinions under the themes of “yes” “no” and “partially”.

Table 9.

Air Pollution in Giresun According to Pre-Service Teachers and Students

Theme	Code	Pre-service Teach.				Students			
		Pre		Post		Pre		Post	
		f	%	f	%	f	%	f	%
Yes	Air color	-	-	-	-	2	1,6	3	2,5
	Foul odor	-	-	-	-	4	3,3	2	1,6
	Coal usage	19	59,4	13	40,6	22	18,0	13	10,7
	Unfiltered chimneys	1	3,1	1	3,1	7	5,7	10	8,2
	Wastes	1	3,1	-	-	3	2,5	6	4,9
	Bad quality/irresponsible fuel usage	2	6,3	2	6,3	14	11,5	9	7,4
	Smoke	11	34,4	5	15,6	77	63,1	60	49,2
	Forest destruction	-	-	-	-	10	8,2	9	7,4
	Harm to living beings	3	9,4	3	9,4	4	3,3	4	3,3
	Not using public transportation (there are too many private vehicles)	-	-	-	-	9	7,4	12	9,8
	Irresponsible behavior	-	-	-	-	12	9,8	12	9,8
	Personal care	-	-	-	-	1	0,8	4	3,3
	Scientific deduction (the experiments we have done)	-	-	-	-	-	-	2	1,6
	Geographical structure/location	-	-	4	12,5	2	1,6	2	1,6
	No reason	-	-	-	-	9	7,4	11	9,0
No	No factories	1	3,1	-	-	4	3,3	12	9,8
	Woodland	-	-	-	-	-	-	4	3,3
	Transition to natural gas	-	-	-	-	-	-	4	3,3
	Small city	1	3,1	-	-	-	-	4	3,3
	Little industry	1	3,1	-	-	-	-	-	-
	Responsible behavior	-	-	-	-	-	-	6	4,9
	Clean environment	-	-	-	-	6	4,9	-	-
	Small number of vehicles	-	-	-	-	-	-	4	3,3
	Scientific deduction (values between 0-53, reports)	-	-	-	-	-	-	8	6,6
	No reason	1	3,1	-	-	2	1,6	8	6,6
Partially	There is none, according to the measurement reports; however, the color of the air/coal usage	-	-	2	6,3	-	-	-	-
	There is none, according to the measurement reports; however geographical structure/location	-	-	1	3,1	-	-	-	-
	Seasonal	-	-	1	3,1	-	-	-	-

Before and after the implementation, the pre-service teachers who think that there is air pollution in Giresun show “coal usage” as the reason, and the students show “smoke in the air” as the reason the most. In both groups, the mentioning frequency of the other codes under the “yes” theme, and codes under “no” and “partially” themes are significantly low before and after the implementation. However, especially in the codes under the “there is not” theme, there is an increase for the students.

The answers given by the pre-service teachers and students to the question "What kinds of regional or national activities/events do you encounter in your daily life about air pollution?" are presented in Table 10. It can be seen in this table that both groups respond under the themes of education, social events, heating, government policies, situation assessment and agricultural activities.

Table 10.

Regional or National Activities and Events That The Pre-Service Teachers and Students Encounter in Their Daily Lives About Air Pollution

Theme	Code	Pre-service Teach.				Students			
		Pre		Post		Pre		Post	
		f	%	f	%	f	%	f	%
Education	Scientific activities (panel, symposium, conference, meeting)	-	-	1	3,1	-	-	-	-
	Awareness raising activities (campaigns, slogans, public service announcements, seminars, presentations, theatre plays, poems, application practices, our project, TV, newspapers, advertisements)	1	3,1	13	40,7	21	17,2	28	22,9
	Information from teachers	-	-	-	-	1	0,8	-	-
Social events	Rally, protest, awareness activities (trekking)	2	6,3	1	3,1	4	3,3	10	8,2
	Institutions/clubs, associations, environment protectors, Greenpeace, World Health Organization	5	15,6	6	18,8	20	16,4	12	9,8
Heating	Filter usage preference	-	-	-	-	2	1,6	2	1,6
	Natural gas usage preference	2	6,3	-	-	1	0,8	-	-
Government Policies	Smoking ban, smoke-free air space project	-	-	6	18,8	-	-	1	0,8
	Exhaust/criminal action, increasing public transportation	-	-	-	-	1	0,8	2	1,6
	Activities of ministry of environment and urbanization	-	-	-	-	4	3,3	6	4,9
	Protocols between countries, treaties, KYOTO	-	-	2	6,3	-	-	2	1,6
	Important days and weeks	-	-	-	-	1	0,8	1	0,8
Situation Assessment (Surveys)		2	6,3	-	-	13	10,7	7	5,7
Agricultural activities (Forestation)		5	15,6	5	15,6	11	9,0	7	5,7
I do not encounter any		5	15,6	5	15,6	18	14,8	15	12,3

It can be seen that in both groups, the frequency of mentioning the codes under the education theme is quite low before the implementation, and there is a noticeable increase especially in the "awareness raising activities" code for the pre-service teachers after the implementation. Moreover, the codes under social events, heating, government policies, situation assessment and agricultural activities themes show no significant change in mentioning frequency after the implementation.

Results Obtained from Semi Structured Interviews

The interviews indicate the evaluation of the pre-service teachers about the CSPC process. The responses of the pre-service teachers to the question "Do you think the work you have done is successful?" are presented in Table 11.

Table 11.

The Opinions of The Pre-Service Teachers on Whether The Work Done Within The Scope of The Course is Successful

Theme	Category	Code	f
General aim	Successful	Raising awareness on air pollution	1
		Receiving positive feedbacks from the students	3
		The implementation in general going well	1
	Partially successful	The concepts about air pollution not being at a suitable level for the students	1
		Learning process not being fully actualized	1
		Working in different places during the implementation	1
	I don't know	Not watching the seminars given by the other groups at schools	1
Aim of the groups	Successful	The seminars given at schools being effective	6
		The seminars given at schools going well	3
		Receiving positive feedbacks from the students	2
	Partially successful	Difficulty in attracting the attention of the students in seminars	3
		The physical conditions in which the seminars were conducted being different	1

According to Table 11, the pre-service teachers in general have responded that the work done has been successful in terms of the general aim and group aims. Moreover, the pre-service teachers have stated that the concepts about the air pollution are not at suitable levels for the students, the learning process have not been fully actualized and they conducted the work at different locations throughout the implementation; all of which have negative impact in achieving the general aims of the study. One of the pre-service teachers has stated that he/she has not attended the seminars given by the other groups at schools as audience and therefore has no idea whether the study has been successful in general terms. In addition, pre-service teachers also have stated that they have partially succeeded due to difficulties in attracting the attention of the students during seminars and the fact that the physical conditions of the locations of seminars being different each time. The answers given by the pre-service teachers to the question "Do you think you serve the community with this study?" are presented in Table 12.

Table 12.

The Opinions of The Pre-Service Teachers on The Aim of The Course For Serving The Community

Category	Code	f
Serve the community	Raising air pollution awareness at a young age	6
	Attracting the community's attention to the subject of air pollution	1
Partially serve the community	The target audience being restricted to primary school students	2
	The subject being restricted to air pollution	1

The pre-service teachers frequently mention raising awareness on air pollution at a young age and attracting the community's attention to the subject of air pollution, and consider themselves serving the community in this respect with the work they have done for the course. There are also some pre-service teachers who think that the

course work partially served the community due to the subject and target audience choice (Table 12).

The answers given by the pre-service teachers to the question “Has the work done by the other groups contributed to your knowledge?” are presented in Table 13.

Table 13.

Opinions of Pre-Service Teachers About The Knowledge Gained From Other Groups Within The Context of The Course

Group	Code	f
Turkish	Gasses that have roles in air pollution (CFC, CO2, …)	2
	Concepts and definitions for air pollution	3
	Definition of air pollution	2
	No explanation	1
Social Sciences	Natural and human causes of air pollution	1
	Levels of air pollution in different countries	1
	Nothing (familiar topics)	1
	No explanation	5
Natural Sciences	Effects of air pollution (negative effects on living beings, humans, nature)	2
	Possible experiments about air pollution	1
	Which gas causes which disease	1
	Nothing (familiar topics)	1
	No explanation	3
Mathematics	Demonstrating the rates of gases over the years with tables and graphs	3
	Limit values for air pollution	4
	No explanation	1
Public Administration	Impact of air pollution in different countries	2
	Action taken by various countries in order to prevent air pollution	1
	Nothing (familiar topics)	1
	No explanation	4

It should be noted that the knowledge gained by the pre-service teachers from the other groups about air pollution throughout this course is generally in accordance with the focus points, content and discipline of the groups (Table 13). One of the participants state that he/she has learnt about “levels of air pollution in different countries” from the social sciences group, while the topic is in fact covered in the public administration discipline. It can be seen that pre-service teachers especially mention the contents covered by the groups working on Turkish and Mathematics disciplines. Some of the pre-service teachers make no mention of the topics learnt from social sciences, natural sciences and public administration groups. The answers given by the pre-service teachers to the question “What are your thoughts on the implementation of this study?” are presented in Table 14.

Table 14.

Opinions of the Pre-Service Teachers on The Implementation of The Course

Theme	Category	Code	f
Positive opinion	Experience	Gaining teaching experience	8
		Encountering students in an early stage of teacher education	10
		Realizing the importance of providing feedback to the students	2
	Learning	Being permanent	1
		Learning new things	6
	Group work	Having balanced workload among group members	5
		The group work being successful	1
	Consultant's attitude	Motivation from consultants	1
	Interdisciplinary education	Learning how to teach interdisciplinary subjects	8
	Feelings	Entertaining/pleasing	4
		Group work being pleasing	2
		Teaching without the stress of grading	2
Negative opinion	Group work	The group work not being balanced	1
		Groups being too crowded	1
		Failing to achieve group integrity during seminars	1
		Having troubles in gathering together	2
	Consultant's attitude	Making negative comments	3
		Having problems with the consultants	1
	Teacher's attitude	Negative attitudes from primary school teachers	3
	Time	The implementation period being too long	1
	Volunteering	Not being willing to conduct such study	2
	Interdisciplinary education	The chosen subject not being suitable for interdisciplinary study	2
	Feelings	The whole process being tiresome	1
		The whole process being hard	2
		The whole process being stressful	1

It should be noted that the positive opinions of the pre-service teachers on the implementation are more than the negative opinions (Table 14). It can be seen that the most frequently mentioned positive aspect is gaining teaching experience and the least frequent positive aspect is the attitude of the consultants. On the other hand, most frequent negative opinions are on the group work and least frequent are on timing. It can be observed that the participants state both negative and positive opinions on group work, consultant's attitude, interdisciplinary education and feelings throughout the implementation.

Discussion

In this section, the results obtained from this study which has been devised in order to determine the impact of interdisciplinary activities performed within the context of CSPC on the air pollution awareness is discussed under several aspects.

Determining the Awareness of Pre-service Teachers on Air Pollution

The results from the KWL form indicate that the pre-service teachers do not have knowledge on the activities for raising awareness for actions to take in order to prevent air pollution and related government policies prior to the implementation of the study, but have the willingness to learn more on this matter. After the implementation, the pre-service teachers have stated that they gained knowledge on these subjects. Beaumont et al. (1999) establish that the society has an expectation to be informed on air pollution and in this respect, state that the increase in level of knowledge would raise awareness and this in turn can be effective in acting more carefully. The fact that the pre-service teachers of today, who will become the teachers in the future, are aware of their lack of knowledge on air pollution and with this study have compensated for this to some extent, is a light of hope for the living conditions of future generations. Despite not being among their expectations prior to the implementation, the pre-service teachers have stated in the KWL form that by the end of the study, they have learnt new statistical information about the current situation of air pollution. Statistical information can often be the driving force for noticing the direness of the current situation and taking preventive actions accordingly. Ostro (2004)' states that in order for the society to have awareness on air pollution and take precautions for the future, sharing statistical information on the effects of air pollution is beneficial.

Comparing the pre- and post-application results of the APAQ form, it can be noted that although pre-service teachers see lack of education as the main cause of air pollution prior to the implementation, they almost never mention this subject after the implementation. This situation can be attributed to the increase in frequency of mentioning other factors, as well as to the fact that they hold other aspects more important than education. Moreover, it is evident that the pre-service teachers mostly mention the necessity of education as actions to take in order to prevent pollution, both before and after the implementation. Works in the literature also indicate education as the most essential solution for the problems regarding the environment (Şimşekli, 2004; Değirmenci, 2012).

In addition, the pre-service teachers have also gained awareness on the interdisciplinary nature of the subject of air pollution. Uğurlu & Demirer (2008) who emphasize the importance of noting the interdisciplinary nature of environmental issues, demonstrate this with the example of an environmental engineer and a manager dealing with the environmental issues. While the steps taken by the environmental engineer can be ineffective due to lacking knowledge on management or economy, the case is also similar with the manager who may be just as ineffective due to lack of knowledge on engineering. Therefore, environmental issues should be handled with an interdisciplinary approach in order to prevent such inconveniences. In various studies on environment education, it has been emphasized that this education should be given with an interdisciplinary approach, and it is noted that otherwise specific concerns inherent to disciplines may prevent raising awareness (Bonnett & Williams, 1998; Hamalosmanoğlu & Güven 2014; Karataş & Aslan, 2012). In this respect, it can be stated that this study achieves raising awareness that overcomes the specific concerns of different disciplines to some extent.

It is noted that after the implementation, both in KWL form and in APAQ, the pre-service teachers lean more towards the scientific definition of air pollution, and provide detailed answers. This may indicate that the knowledge of pre-service teachers on the scientifically accurate description of air pollution has increased. Moreover, after the implementation, the pre-service teachers focus more on the causes of air pollution, which may imply that without ignoring the effects of air pollution, they think the causes are more important. This can be interpreted as there is an increase in the awareness of pre-service teachers on taking preventive measures before the pollution takes place. Removing the source of the problem before the emergence of the problem is essential

and this practice requires education (Şimşekli, 2004). Low levels of knowledge and awareness of individuals on environmental problems are important causes of negative attitude and behavior towards these problems, so it is highly essential that the pre-service teachers, who are the educators of future generations, are guided with a goal oriented and planned education in order to prevent the environmental problems (Güven & Aydoğdu, 2012).

In the APAQ form applied after the implementation, the pre-service teachers mention both natural and human causes of air pollution and they can explain these causes in a more comprehensive manner than before the implementation. Similarly, while stating the causes of air pollution in the KWL form, they mention the harmful gases by their names. The fact that the pre-service teachers can explain the causes of air pollution in a systematical manner by using scientific expressions indicate the increase in their knowledge on the subject as well as the development in their awareness. In order for pre-service teachers who want to share the regional studies on air pollution with their students should know the related basic concepts in order to comprehend what they read on the subject. In this respect, it can be said that this study is successful. On the other hand, the implementation is not as effective at the expected level in raising awareness on natural causes, because other than volcanic eruptions, natural causes are not mentioned much after the implementation. This can be due to the fact that there are not many natural causes leading to air pollution in the region where the study has been conducted. On the other hand, the pre-service teachers can be regarding the human causes to be more effective than the natural causes in creating pollution. Nevertheless, the pre-service teachers being more aware of the natural causes, even partially after the implementation, will in turn lead them to be more aware on the necessity of taking precautions against possible related issues. There is a study in the literature that explains the lethal impact of the air pollution in Malaysia caused by a forest fire that occurred in Indonesia due to natural causes (Sastry, 2002). It is also seen that both before and after the implementation, very few pre-service teachers mention the code for deforestation/destruction of forests as the cause of pollution and as means of preventing pollution, as well as not mentioning the forest destruction as the cause of air pollution in Giresun region at all. In light of these three cases and also taking the fact that Giresun is famous for its green nature and has large pine forest areas, it can be inferred that the pre-service teachers do not consider forest destruction as one of the causes of pollution.

It is noteworthy that the frequency of mentioning exhaust smoke emission, heating and personal care as human causes for pollution increased more than industry after the implementation. This situation can be interpreted as the pre-service teachers being more aware of their contribution or the contribution of individuals of around them to the air pollution. Similarly, while talking about the precautions against air pollution, the pre-service teachers mostly mention the individual efforts that they can perform more after the implementation. Since it would be a utopic approach to expect a small number of individuals and institutions who are experts on environment to prevent the environment/air that everyone pollutes, it is necessary that each individual is aware of the responsibility in carrying his/her individual activities by taking care of the environment (Uğurlu & Demirer, 2008). In this respect, it is hoped that the pre-service teachers who are aware of the human causes of air pollution would be one step ahead of other pre-service teachers in both controlling their own actions and raising awareness on their future students.

The pre-service teachers mostly mention the harm done on humans for the effects of air pollution. While no pre-service teacher mentions the harms caused by the air pollution on plant life before the implementation, they mention this issue afterwards, which implies that they no longer view the issue with just the human aspects and they

have become aware to the fact that other living organisms can also be negatively affected by air pollution. Similarly, while almost none of them mention the impact of pollution on the cultural heritage before the implementation, it is observed that the pre-service teachers address this issue among the negative effects of air pollution after the implementation. The views of pre-service teachers about the air pollution in the Giresun region in which the study has been conducted have not changed much after the implementation. Since it was winter time for Giresun during the implementation, the smoke and pollution accumulating due to solid fuel consumption in the densely populated areas of the city can be observed even with the naked eye. According to Giresun Province Environmental Status Report (MEU, 2012), Giresun encounters air pollution throughout the year and the air around the province can be considered quite clean, but there is seasonal air pollution due to coal consumption during winter. Although activities have been conducted that emphasize the air pollution in Giresun at the time of the implementation is seasonal, these activities have not been effective as expected in raising the awareness to the desired level. Individuals being aware of the fact that the air pollution is seasonal would be beneficial for acting more responsibly regarding the preventive measures (Mayer, 1999).

It is observed that before the implementation, the pre-service teachers are almost completely unaware of regional or national activities related to air pollution in their daily lives. Mentioning the awareness raising activities after the implementation can be an indication of the fact that the conducted study has a positive impact in this regard. Moreover, despite the fact that none of the pre-service teachers mention the practices regarding the government policies, after the implementation, they mention the indoors and outdoors smoking ban enforced with the “Protect Your Air: Smoke-free Air Space” project (URL-2; URL-3) developed by the Ministry of Health under the context of their campaign against tobacco usage. On the other hand, expected level of awareness could not be raised with this study on the international institutions, protocols or treaties. It is observed that the pre-service social sciences teachers do not include international institutions or convention in their remarks about the social participation for environmental issues (Karatekin, Kuş, & Merey, 2014). This situation indicates that not only pre-service classroom teachers but also pre-service teachers from various branches have low level of awareness in similar issues.

Determining the Level of Awareness on Air Pollution in Primary School Students

According to the results obtained from APAQ, after the implementation, similar to pre-service teachers, students also tend towards the scientific description of air pollution and provide detailed answers, and they mention the causes more than the effects in order to explain the pollution. They most frequently mentioned human causes and the increase in harmful gases or polluters in the atmosphere in order to define the air pollution. In contrast to pre-service teachers, after the implementation, there is an increase in the frequency of the answer of industry for the cause of air pollution. In addition, similar to the pre-service teachers, there is an increase in the frequency of exhaust emissions and personal care products answers as the causes for pollution, while the frequency of mentioning heating has remained nearly constant after the implementation. As the youngest members of the society today and decision makers of the future, the primary school students being aware of the causes of air pollution and knowing the roles of human activities in this issue brings hope for the future livable environmental conditions. Although environmental education can be given to people at all ages, an education starting at a young age (primary school) can have more successful outcomes (Budak, 2008; Değirmenci, 2012; Karataş & Aslan, 2012; Darçın & Sert Çıbık, 2009; Seçgin, Yalvaç, & Çetin, 2010; Ünal & Dımışlı, 1999). However, as with the case of pre-service teachers, the conducted practices are not effective in raising awareness on the natural causes of air pollution. This can give an idea on the

importance of teachers in raising awareness of students on an issue. Insufficient level of awareness in pre-service teachers as well as in the students can be due to the fact that these issues have not been properly emphasized during the seminars. However, since the students are unable to respond to the pollution from natural causes, they may have overlooked this issue, or they may be considering the human causes to be more important than the natural causes. Air pollution from natural causes should not be undermined, because pollution is not only an outcome of human causes, but rather a complex interaction of natural and human causes (Mayer, 1999).

Regarding the precautions against air pollution, it is proposed that there is a relation between the decrease in the answers of the students related to the quality/responsible fuel consumption and increase in the answers related to filter usage after the implementation. Due to the fact that the study groups are in Giresun and the usage of natural gas in this city is not yet widespread, the precautions against low quality fuel consumption are emphasized during the implementation. In this context, this result is expected. The students mention very little about the educational activities that can be carried out in order to prevent air pollution, despite the fact that teachers frequently address this topic after the implementation. The difference can be caused from the differences in the points of views of the students and pre-service teachers. The pre-service teachers may have addressed this issue frequently because they will be able to carry out educational activities as the future teachers. Similar to the pre-service teachers, students also show no increase in their awareness about the precautions that can be taken against air pollution. This may again be attributed to the importance of the teacher in raising awareness and the fact that these issues have not been properly addressed during the activities performed.

Prior to the implementation, while almost all the students have stated that there is air pollution in Giresun, there is a significant increase in the number of students who state that there is no pollution after the implementation. This outcome is close to expectations, but is not exactly the anticipated result, because according to the Giresun Province Environmental Status Report (MEU, 2012), there is seasonal air pollution in Giresun, in which the study has been conducted. However, there is no mention of year round air pollution. Therefore, it is expected that the students answer this question as “partially”. This can be interpreted as the pre-service teachers not addressing the topic of seasonal pollution in their activities, as well as the students giving a general answer to a question asked in a general manner.

In the answers related to the regional or national events and activities about air pollution the students encounter in their daily lives, there is significant increase only in the answers about the education theme. This may imply that the educational activities have impact on the students. However, the fact that there is no increase in other themes indicates that the students’ attention could not be attracted to activities around these themes during the implementation. Since a similar situation is also the case for pre-service teachers, it is also expected for the students, because it is the teachers who will raise the awareness of the students, and one cannot expect the teachers raise the awareness of the students when they lack the awareness themselves. Therefore, in environmental education, it is essential that the primarily the pre-service teachers receive an education/training that will enable them to gain knowledge and awareness about the subject (Alım, 2006; Özdemir & Yapıcı, 2010; Sert Cibik & Darcin, 2009; Ünal & *Dımışlı, 1999).*

Determining the Opinions of the Pre-service Teachers on CSPC

According to the results of the interviews, the activities carried out by the pre-service teachers within the scope of the course have been successful, community service purpose has been fulfilled, and the different groups created have gained fresh

knowledge. Regarding the implementation of CPSC, the pre-service teachers usually expressed positive opinions on matters such as encountering the students at an early stage of teacher education and learning how to teach interdisciplinary subjects.

Some of the pre-service teachers state that the conducted practices have partially reached their aims. As the reason, they mention that they have experienced difficulty in attracting the attention to the subject in the primary schools and the differences in the physical conditions of schools. The difficulties encountered in dealing with these issues may be caused by the fact that the pre-service teachers have not previously come across students in a teaching-learning environment. In fact, they refer to the experiences they encountered during the course of the study as positive towards their personal development in the teaching profession, including their experiences with the students.

Some of the pre-service teachers state that the community service aim of the course is partially achieved. There seems to be two main reasons for this. Firstly, the society is not entirely made up of primary school students. Secondly, care for the elderly, activities that can be done in the child protection centers or cleaning activities are also necessary for community service. This may be due to the fact that the activities within the scope of CSPC are usually conducted in most education departments with the aforementioned groups and subjects. The pre-service teachers who think that the community service is achieved express the importance of raising awareness at a young age.

Regarding the knowledge gained from other groups during the course, it can be seen that the pre-service teachers usually mention the groups which work on Mathematics and Turkish disciplines. This may be due to the fact that despite they encounter the subject of air pollution in their courses related to natural sciences and social sciences disciplines, the subject is not mentioned during their Turkish and Mathematics courses. Accordingly, some of the pre-service teachers state that they never thought or imagined that air pollution can be a subject in a mathematics course. However, NCTM (n.d.) stated that data on air pollution can be used in the mathematics education in some subjects, and recommended teachers to do so.

Regarding the implementation of CSPC, the pre-service teachers expressed positive opinions the most on gaining teaching experience and the least on consultant attitude. In addition, they expressed negative opinions the most on group work and the least on time. There are both negative and positive opinions from the pre-service teachers on group work, consultant attitude, interdisciplinary education and their feelings during the process. Regarding the group work, the fact that the pre-service teachers stating there is both balanced and unbalanced work load among the group members can be explained through in-group dynamics. Similarly, the fact that there are both positive and negative experiences with the consultants can also be explained through in-group dynamics as well as differences between consultants' attitudes.

Conclusion

The conclusions drawn from this study, which aims to determine the impact of interdisciplinary activities carried out within the scope of CSPC on air pollution awareness, are as follows:

The awareness on air pollution of both the pre-service teachers and the students has increased. This increase is more for the pre-service teachers compared to the students:

- At the end of the implementation, both in KWL form and APAQ, it is observed that the pre-service teachers lean more towards the scientific definition of air pollution and provide detailed answers.
- In both groups, before the implementation, there is awareness on the human causes of air pollution, and they do not mention the natural causes. However, after the implementation, it is observed that there is an increase in awareness on natural causes although not as significant as on human causes.
- Both before and after the implementation, regarding the effects of air pollution, it is observed that both groups mention the human health problems more than other effects. After the implementation, it is observed that the pre-service teachers have gained awareness on the harm caused by the pollution to the plant life as well.
- It is determined that in both groups and both before and after the implementation, there is awareness most on exhaust emission, industry, heating and personal care as the human causes of pollution. In addition there is a development in awareness on unsuitable agricultural activities after the implementation.
- In pre-service teachers, the awareness of the harm caused by the air pollution on cultural environment has increased after the implementation; however, the expected increase in awareness of the students is not observed.
- Regarding the precautions against air pollution, it is observed that both before and after the implementation, both groups have most awareness on fuel usage. While the awareness of pre-service teachers on reducing the usage of chemical substances and using public transportation have increased, no significant change for the awareness of students on this issue is observed.
- Regarding the precautions, while for both groups, the awareness for the necessity of education is quite low before the implementation, there is an increase of awareness in this issue, especially of pre-service teachers.

The implementation is not sufficient to improve the awareness on some issues about air pollution:

- It is observed that the awareness of the pre-service teachers and students about the precautions against air pollution has not improved to an expected level.
- For both groups the awareness on the natural causes of air pollution has not improved to an expected level.
- For both groups the awareness on the existence of air pollution in Giresun has not improved to an expected level.

Pre-service teachers in general find the implementation to be successful:

- It is observed that prior to the implementation, the pre-service teachers have no knowledge on the possible awareness raising activities that can be done in order to prevent air pollution and the related government policies, but are eager to have more knowledge on these issues. At the end of the implementation, they state that they gained knowledge on these issues.
- The pre-service teachers think that the activities conducted within the scope of the course have been successful.
- The pre-service teachers think that the implementation achieves its aim in terms of community service.

The implementation also served causes other than its original purpose:

- The implementation enabled the pre-service teachers to have the teaching experience in their early years of teacher training before starting their profession.
- The implementation has contributed to the pre-service teachers in learning how to teach interdisciplinary subjects.

Recommendations

In this interdisciplinary study, although the focus points are determined according to the needs analysis, the expected success in raising awareness in some subjects could not be achieved. If another study is conducted in the similar context, more emphasis can be given to how the air quality is determined and air pollution measuring stations in the city can be visited. Similar interdisciplinary learning environments can be designed by making use of the results of this study.

The pre-service teachers state that they had difficulty in attracting the attention of the students to the subject. Moreover, some of the pre-service teachers think that the varying physical conditions in which the seminars are conducted, namely the fact that they have worked at different schools throughout the project have negative impact in reaching the aims of the project. In order to overcome this advantage, the implementation can be designed such that one group conducts all the seminars in one school, in contrast to this study. Hence, each group can make use of course plans from other groups and interdisciplinary education can be conducted in a single school. It should however be noted that this kind of learning environment may pose different advantages and disadvantages, since it has not been tried out before.

Determining the impact of the study on the parents of the primary school students and other segments of the society is not in the content of this study. For similar studies in the future, it is recommendated that the researchers should also take this aspect into consideration in order to improve the extent of the impact of the study. It is proposed that similar kinds of projects on many different socio-scientific subjects that involve the community can be carried out within the context of CSPC.

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References

Aksoy, B., Çetin, T., and Sönmez, Ö. F. (2009). *Community Service Practices*. Ankara: Pegem Akademi Yayıncılık.

Alım, M. (2006). Environment and environmental education in primary school in Turkey within the process of the membership of European Union. *Kastamonu Education Journal*, 14(2), 599-616.

Alp, E., Ertepinar, H., Tekkaya, C., and Yilmaz, A. (2008). A survey on Turkish elementary school students' environmental friendly behaviours and associated variables. *Environmental Education Research*, 14(2), 129-143.

Arcagök, S. and Şahin, Ç. (2013). Teacher trainers and pre service teachers views of service learning course. *Ondokuz Mayıs University Journal of Faculty of Education*, 32(2), 21-54.

Aydın Güç, F., Aygün, M., Ceylan, D., Çavuş Güngüren, S., Durukan, Ü. G., Hacıoğlu, Y. & Yekler, A. (2017). The project of air pollution awareness: Interdisciplinary community service practices. *Çukurova University Journal of Faculty of Education*, 46(1), 2017, 85-133.

Beaumont, R., Hamilton, R. S., Machin, N., Perks, J. and Williams, I. D. (1999). Social awareness of air quality information. *Science of the Total Environment*, 235(1), 319-329.

Beldağ, A., Yaylacı, A.F., Gök E. and İpek, C. (2015). Evaluation of community service practices course in terms of university-society cooperation. *Journal of Kirsehir Education Faculty*, 16(2), 161-178.

Best, R. K. and Collins, J. I. (1982). Legal Issues in Pollution-Engendered Torts. *Cato Journal*, 2(1), 101-136.

Bickerstaff, K. and Walker, G. (2001). Public understandings of air pollution: The 'localisation' of environmental risk. *Global Environmental Change*, 11(2), 133-145.

Bickerstaff, K. and Walker, G. (2003). The place(s) of matter: Matter out of place–public understandings of air pollution. *Progress in Human Geography*, 27(1), 45-67.

Bonnett, M. and Williams, J. (1998). Environmental education and primary children's attitudes towards nature and the environment. *Cambridge Journal of Education*, 28(2), 159-174.

Budak, B. (2008). *The status of environmental education in primary school and application studies.* Unpublished master thesis, Ege University, İzmir.

CHE [Council of Higher Education], (2006). Explanation of new programs to be implemented in education faculties. Cited from: http://www.yok.gov.tr/documents/10279/49665/aciklama_programlar/aa7bd091-9328-4df7-aafa-2b99edb6872f

Çetin, T. and Sönmez, Ö. F. (2009). The evaluation of the opinions of social sciences teacher candidates about the practices in social services lesson in terms of aims and contents. *Journal of Gazi Educational Faculty*, 29(3), 851-875.

Darçın, E. S. and Çıbık, A. S. (2009). Examining elementary second grade students' knowledge levels about air pollution according to their socioeconomic situations. *The Journal of SAU Education Faculty*, (17), 183-204.

Değirmenci, M. (2012). A study of elementary students' attitudes towards environment according to different variables (Example of the province of Kayseri). *Journal of European Education*, 2(2), 47-53.

Demirbaş, M. and Pektaş, H. M. (2009). Elementary students' levels of realization of basic concepts related with environment problem. *Necatibey Faculty of Education Electronic Journal of Science and Mathematics Education*, 3(2), 195-211.

Devinny, J.S., Deshusses, M.A. and Webster, T.S. (1998). *Biofiltration for Air Pollution Control.* Newyork: Lewis Publishers.

Ekşi, Z. and Cinoğlu, M. (2012). An evaluation of the community service applications course. *Celal Bayar University Journal of Social Sciences*, 10(2), 3-22.

Flagan, R. C. and Seinfeld, J. H. (2013). *Fundamentals of Air Pollution Engineering.* New Jersey. Courier Corporation.

Gökçe, N. (2011). Social studies teacher candidates' opinions about the practice of community service. *Journal of Human Sciences*, 8(2), 176-194.

Gökçe, N. (2012). Community service practices in social sciences teaching. M. Safran, (Ed.). *Social Sciences Teaching* içinde (p. 586-606). Ankara: Pegem Akademi.

Güney, E. (2004). *Geography of Environmental Issues*. Ankara: Gündüz Eğitim ve Yayıncılık.

Güven, E. (2012). *Investigation of the effects of environmental education based on interdisciplinary approach on environmental attitudes and behaviors of 4th*

grade primary school students. Unpublished master thesis, Erciyes University, Kayseri.

Güven, E. and Aydoğdu, M. (2012). Development of an awareness scale and determination of teacher candidates' awareness levels regarding environmental problems. *Journal of Teacher Education and Educators,* 1(2), 185-202.

Hamalosmanoğlu, M. and Güven, E. (2014). The effect of environmental education based on interdisciplinary approach to students' environmental attitudes and behaviours. *Journal of Turkish Science Education*, 11(4), 47-62.

Hyslop, N.P. (2009). Impaired visibility: The air pollution people see. *Atmospheric Environment,* 43(1), 182-195.

Karatas, A. and Aslan, G. (2012). The role of environmental education in gaining environmental awareness for elementary school students: the sample of ecology based summer camp project. *Zeitschrift für die Welt der Türken/Journal of World of Turks*, 4(2), 259-276.

Karatekin, K., Kuş, Z. and Merey, Z. (2014). Social studies pre-service teachers' social participation in solutions to environmental problems. *Elementary Education Online*, 13(2), 345-361.

Kesten, A. (2012). The evaluation of community service-learning course in terms of prospective teachers' and instructors' opinions. *Educational Sciences: Theory & Practice,* 12(3), 2125-2148.

Mayer, H. (1999). Air pollution in cities. *Atmospheric Environment*, 33(24), 4029-4037.

Ministry of Environment and Urbanization, (2012). Giresun Province Environmental Status Report, Cited from: http://www.csb.gov.tr/turkce/dosya/ced/icdr2011/giresun_icdr2011.pdf

MNE [Ministry of National Education] (2009c). Elementary School Mathematics Curriculum (1-5th grades). Ankara, Turkey.

MNE [Ministry of National Education] (2013). Elemantary School (Primary and Secondary) Science Curriculum (3-4-5-6-7-8th grades). Ankara, Turkey.

MNE [Ministry of National Education], (2009a). Elemantary School Social Sciences Curriculum (4-5th grades). Ankara, Turkey.

MNE [Ministry of National Education], (2009b). Primary School Turkish Curriculum (1-2-3-4-5th grades). Ankara, Turkey.

NCTM [National Council of Teachers of Mathematics] n.d. Mathematics and Environmental Concerns. Cited from: https://illuminations.nctm.org/unit.aspx?id=6517

Oanh, N. K., Upadhyay, N., Zhuang, Y. H., Hao, Z. P., Murthy, D. V. S., Lestari, P., Villarin, J.T., Chengchua, K., Co, H.X., Dung, N.T. and Lindgren, E. S. (2006). Particulate air pollution in six Asian cities: Spatial and temporal distributions, and associated sources. *Atmospheric Environment*, 40(18), 3367-3380.

Ostro, B. (2004). *Outdoor Air Pollution: Assessing the Environmental Burden of Disease at National and Local Levels*. Geneva, Switzerland: World Health Organization; WHO Environmental Burden of Disease Series, No. 5.

Önal, H. and Güngördü, E. (2008). Active Learning Application of Geography Teaching (A Simple of Air Pollution). *Balıkesir University The Journal of Social Sciences Enstitute*, 11(19), 60-74.

Özdemir, A. and Yapıcı, E. (2010). Teacher candidates' levels of awareness and interest in environmental problems. *Journal of Anatolian Natural Sciences,* 1(1), 48-56.

Özdemir, O., Yıldız, A., Ocaktan, E. and Sarışen, Ö. (2004). Awareness and sensibility levels of medical students. *Journal of Ankara University Faculty of Medicine,* 57(3), 117-127.

Özdemir, S. M. and Tokcan, H. (2010). Evaluation of community service course according to pre-service teachers' views. *Selçuk University Journal of Ahmet Keleşoğlu Education Faculty*, 30, 41-61.

Özey, R. (2009). *Environmental Issues*. İstanbul: Aktif Yayınevi.

Paulos, E., Honicky, R. J. and Goodman, E. (2007). Sensing atmosphere. *ACM Conference on Embedded Networked Sensor Systems (SenSys 2007) 6-9 November 2007* in (p. 203-206), Sydney.

Ridker, R. G. and Henning, J. A. (1967). The determinants of residential property values with special reference to air pollution. *The Review of Economics and Statistics*, 49(2), 246-257.

Rothbard, M. N. (1982). Law, property rights, and air pollution. *Cato Journal,* 2, 55. Cited from: http://heinonline.org/HOL/LandingPage?handle=hein.journals/catoj2&div=8&id=&page=

Sastry, N. (2002). Forest fires, air pollution, and mortality in Southeast Asia. *Demography*, 39(1), 1-23.

Seçgin, F., Yalvaç, G. and Çetin, T. (2010). Perception of the 8th grade primary school students about the environmental problems through concept cartoons. *In International Conference on New Trends in Education and Their Implications 11-13 November 2010* (p.391-398). Antalya.

Selden, T. M. and Song, D. (1994). Environmental quality and development: Is there a Kuznets curve for air pollution emissions? *Journal of Environmental Economics and Management*, 27(2), 147-162.

Semenza, J. C., Wilson, D. J., Parra, J., Bontempo, B. D., Hart, M., Sailor, D. J. and George, L. A. (2008). Public perception and behavior change in relationship to hot weather and air pollution. *Environmental Research*, 107(3), 401-411.

Sert-Çıbık, A. and Darçın, E. S. (2009). Pre-service science teachers'knowledge level about some basic air pollutants. *Journal of Baltic Science Education*, 8(1), 22-34.

Sönmez, Ö.F. (2010). The evaluation of the ideas in the aspect of acaustion of social studies preservice teachers on the lecture of practice of the service to the public. *The Black Sea Journal of Social Sciences*, 2(2), 53-72.

Şahin, K. (2004). People's views to air pollution in Samsun. *Ekoloji*, 13(51), 7-12.

Şimşekli, Y. (2004). Sensitivity of elemantary schools to the environmental education activities for increasing environmental knowledge. *Journal of Uludag University Faculty of Education*, 17(1), 83-92.

Talas, M. and Karataş, A. (2012). The importance of community service practices course in improving environmental awareness: The example of Nigde University faculty of education. *Zeitschrift für die Welt der Türken/Journal of World of Turks*, 4(1), 107-124.

Tezbaşaran, A. (2009). Guidance on the community service practices in education faculties (Version 5). Mersin: Mersin University. Cited from: http://toplumahizmet.mersin.edu.tr/doc/thuy.pdf

Thornber, J., Stanisstreet, M. and Boyes, E. (1999). School students' ideas about air pollution: Hindrance or help for learning? *Journal of Science Education and Technology*, 8(1), 67-73.

Uğurlu, Ö. and Demirer, Y. (2008). National and international cases on the interdisciplinary environmental education: Scientific activity, political decision-making process and teaching-learning. *Education Science Society*, 6(23), 94-111.

Uğurlu, Z. and Kıral, E. (2012). The process of teacher candidates service-learning and the views relating with the attainments. *Karabük University Journal of the Instutute of Social Sciences*, 2(1), 59-93.

Uluçınar-Sağır, U., Aslan, O. and Cansaran, A. (2008). The examination of elementary school students' environmental knowledge and environmental attitudes with respect to the different variables. *Elementary Education Online*, 7(2), 496-511.

URL-1 World Health Organisation, 7 million premature deaths annually linked to air pollution. Cited from: http://www.who.int/mediacentre/news/releases/2014/air-pollution/en/

URL-2 Turkish Ministry of Health, Smokeless Zone. Cited from: http://www.havanikoru.org.tr/

URL-3 Turkish Ministry of Health, General Directorate of Health Promotion. Cited from: http://saglik.gov.tr/SGGM/belge/1-15738/kampanya-hakkinda.html?vurgu=dumans%C4%B1z+hava+sahas%C4%B1

Ünal, S. and Dımışlı, E. (1999). Development of environmental education under the auspices of UNESCO-UNEP and environmental education of secondary education in Turkey. *Hacettepe University Journal of Education*, 17, 142-154.

Vaizoğlu, S., Altıntaş, H., Temel, F., Ahrabi, A. F., Aydoğan, D., Bostancı, S., Duran, A., Koçkesen, D., Turan, N. and Güler, Ç. (2005). Evaluation of the environmental consciousness of the students in a medical faculty in Ankara. *TAF Preventive Medicine Bulletin,* 4(4), 151-171.

Yeung, S. P., Boyes, E. and Stanisstreet, M., (2004). Air pollution: The knowledge and attitudes of secondary school students in Hong Kong. *International Research in Geographical & Environmental Educatio*n, 13(1), 21-37.

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RESEARCH ARTICLE

Topluma Hizmet Uygulamaları Dersinde Hava Kirliliği Farkındalığı: Disiplinlerarası Bir Çalışma

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Özet

Bu çalışmanın amacı, Topluma Hizmet Uygulamaları Dersi kapsamında gerçekleştirilen disiplinlerarası (Türkçe, Sosyal Bilimler, Fen Bilimleri, Matematik ve Kamu Yönetimi disiplinleri) faaliyetlerin hava kirliliği farkındalığına etkisini belirlemektir. Bu çalışma çoklu durum çalışması olarak yürütülmüştür. Araştırmanın uygulaması, 32 sınıf öğretmeni adayı ve 122 ilkokul dördüncü sınıf öğrencisi ile gerçekleştirilmiştir. Veriler Hava Kirliliği Farkındalığı Anketi, Bil-İste-Öğren Formları ve mülakatlar ile toplanmıştır. Veriler içerik analizi ile değerlendirilmiştir. Araştırma sonucunda katılımcıların hava kirliliği konusundaki farkındalıkları artmıştır. Öğretmen adaylarının uygulamayı genel olarak başarılı olarak değerlendirdikleri saptanmıştır. Ayrıca, uygulamanın, öğretmen adayları için öğretmenlik deneyimi sağlamak ve disiplinler arası konuları öğretme gibi farklı amaçlara da hizmet ettiği görülmüştür.

Anahtar Kelimeler: Hava Kirliliği Farkındalığı, Disiplinlerarası Yaklaşım, Topluma Hizmet Uygulamaları Dersi, İlkokul Öğrencileri, Öğretmen Adayları

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