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Acquisition of Operational Environmental Literacy in Social Studies Course*

Nuray Kurtdede Fidan[a], and Tuğba Selanik Ay[a]

[a]Afyon Kocatepe University, Afyonkarahisar, TURKEY

ABSTRACT

Environmental literacy can be defined as having necessary perceptions and competency of health and environmental systems and as being active in developing necessary acts about them. Individuals are expected to use their knowledge and concepts in daily life. The aim of this study is to determine students' views about operational environmental literacy activities and the effects of these activities on students responsible environmental behavior. The study was used a mixed method. The participants of the study were 22 fourth grade students. Two scales used to determine the effect of responsible environmental behavior. Also, diaries were kept by the students and by the authors about the process of the research. Finally, a significant difference was stated on the attitudes and responsible behaviors of the students concerning the environment. The participants' views about the process were stated as fun and interesting. Activities to improve operational environmental literacy may be designed to allow for students to actively take part in these activities. Quantitative data collection tools may be developed to analyze operational environmental literacy. Student teachers may be informed about operational environmental literacy in the teacher training programs and teachers may be informed about it through in-service training activities. In addition, parents, school community and non-governmental organizations may also participate in the activities about operational environmental literacy.

KEYWORDS
Basic education students, mixed method, operational environmental literacy, social studies education

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Introduction

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CORRESPONDENCE Nuray Kurtdede Fidan ✉ nkurt@aku.edu.tr

Environmental education is a direction of the Green Plan [the environmental protectionpolicy for Singapore- authors]. Cultivatingknowledge of the scientific and social significance of the environment is the first step in the founding of an environmentally friendly society. It is through knowledge and awareness that positive values and attitudes emerge, values and attitudes that will prompt action to make the adjustments to lifestyles and consumption habits that will reduce the burden we place on the environment (Ministry of Environment, 1993 cited in Kwan and Stimpson, 2010).

Environmental literacy can be defined as having necessary perceptions and competency of health and environmental systems and as being active in developing necessary acts about them. Individuals are expected to use their knowledge and concepts in daily life. The term "environmental literacy" was first used by Marcinkovski (1991) and this term is defined by UNESCO as knowledge, attitude and active participation about environment (Stables and Bishop, 2001). Then Roth (1992) used the term in the official programs of Wales in 1993. Roth (1992) categorized enviornmental literacy into three groups: nominal, functional and operational environmental literacy. Each category is defined as follows:

Nominal environmental literacy: Nominal environmental literacy refers to using basic terms in the interaction with the environment and defining these terms at a simple level (Roth, 1992). Those individuals who have nominal environmental literacy are expected to have awareness and sensitivity towards the environment as well as a positive attitude towards nature and to be sensitive about the effects of people in the environment (Loubser, Swanepoel and Chacko, 2001).

Functional environmental literacy covers the competencies of understanding the relationships between social systems and natural systems, and of having and improving information about these interactions (Roth, 1992). Individuals with functional environmental literacy can identify basic environmental problems based on their own values and ethical judgements, share their views about them with other people based on evidence they find, and develop solutions using their observations, information and basic strategies (Loubser, Swanepoel and Chacko, 2001).

Operational environmental literacy refers to the expansion of information and skills covered in functional environmental literacy. Individuals having operational environmental literacy are expected to have higher levels of information, attitudes and act responsibility in reference to the environment (Roth, 1992). They are also expected to have the feelings of responsibility about reducing environmental hazards, to plan and implement activities to achieve it, and to work with local and international non-governmental organizations to this end (Loubser, Swanepoel and Chacko, 2001). McBeth and Volk (2009) argued that there are eight different variables in environmental literacy, namely ecological information, verbal approval, environmental awareness, environmental sensitivity, skill of categorization of environmental issues, skill of analysing these issues, planning activities and implementing these activities. Therefore, it can be stated that an individual with operational environmental literacy should have the competency in each of these variables.

Teachers play a significant role in environmental education. Teachers should have the necessary knowledge and readiness about the environment in order to have efficient activities in the classroom. However, it is reported that

teachers are not efficient in terms of introducing the goals of environmental education to students, having necessary information and skills, and having self-confidence in relation to environmental education. Several reasons for such incompetency by teachers are stated as follows (Loubser, Swanepoel and Chacko, 2001):

- Not strongly emphasizing environmental education in pre-service and in-service training for teachers (Hurry, 1982: 2; Irwin, 1982: 271; Loubser, 1994: 36; Richards, 1985:3).
- Teachers not being enthusiastic about having information about environmental education (Kuiper, 1995: 43; Pettus, 1982: 181; Simmons, 1989: 16).
- Teacher trainers who do not have enough information about environmental education (Kuiper, 1995: 43; Pettus, 1982:181; Simmons, 1989:16).
- Teachers not being enthusiastic about using learning and teaching methods and strategies which can be used in environmental education to create a difference in environmental awareness (Blignaut,1992: 254).
- Teachers' resistance to change (Irwin, 1993: 20; Papadimitriou, 1995: 88-89; Schreuder, 1995: 2).

In short, in order to deliver an efficient environmental education teachers should be informed and have skills about environmental education through pre-service training and in-service training and should employ proper teaching and learning methods and strategies in environmental education.

There are numerous studies dealing with students' and student teachers' environmental sensitivity and attitudes towards the environment (Roth, 1992; Stables, 1998; Grace and Sharp, 2000; McKeown-Ice, 2000; Cutter and Smith, 2001; Loubser, Swanepoel and Chacko, 2001; Çabuk and Karacaoglu 2003; Makki et. al., 2003; Huang and Yore 2003; Kwan and Stimpson, 2003; Yilmaz, Boone and Andersen 2004; Şimşekli, 2004; Mastrilli, 2005; Erol and Gezer 2006; Uzun and Sağlam, 2006; Başal, Doğan and Atasoy 2007; Hama et. al., 2007; Chu, Lee, Ko, Shin, Lee, Mee, Min and Kang 2007; Kaiser, Oerke and Bogner 2007; Kasimov et. al., 2007; Grodzinsca Juczak, 2008; Lubomira, 2004; Nördström, 2008; Alp et. al., 2008, Rickenson and Lundholm, 2008; Erdoğan, 2009; Tuncer et. al., 2009; Golman, 2010; Negev et. al., 2010; McBeth and Volk, 2009; Gülay, 2011; Tirri and Nokelainen 2011; Kahyaoğlu, 2011; Aydın and Kaya, 2011; Yaşaroğlu, 2012; Güven and Aydoğdu, 2012; Karatekin and Aksoy, 2012; Karakaya and Çobanoğlu, 2012; Aslan Efe et. al., 2012; Pektaş et. al., 2013; Yavuz et. al., 2014; Şan 2014; Bilge, 2015; Başal, Özen, and Bağçeli Kahraman, 2015; Genç, 2015). However, any study specifically dealing with operational environmental literacy has not been identified. Therefore, the aim of this study is to reveal the effects of learning activities in social studies courses about operational environmental literacy on primary education students' attitudes towards and responsible actions towards to the environment. The study employs a mixed method. The study implemented a series of activities about operational environmental literacy. Based on the aim stated above, the study attempts to answer the following research questions:

1. Is there any significant difference between students' pre-test and post-test mean scores in SEA?
2. Is there any significant difference between students' pre-test and post-test mean scores in SREB?

3. What are student views about the activities implemented to improve their operational environment literacy?
4. What are researcher views about the activities implemented to improve their operational environment literacy?

Method

The study used a mixed method. This method allows for combining and using both quantatitive and qualitative research techniques together. The underlying point under the method is that quantatitive and qualitative research techniques complement each other and can be used in the same study (Christensen, Johnson and Turner, 2015; 423). Any researcher using this method collects and analyses both quantative and qualitative data; they blend these two types of data combining them, or uses one of them on the other, making one of them more focused or making both focused based on the aims of the study (Aypay, 2014; 6). Aypay (2014; 76) argued that there are four major mixed design types, namely converging parallel pattern, exploratory sequential patterns, innovative designs and sequential nested mixed pattern. In the current study the exploratory sequential patterns were employed. In accordance with this technique, the quantitative data were first collected and then the qualitative data were gathered. The quantitative data were gathered through pre- and post-tests. The qualitative data were collected through diaries and interviews.

Participants

The participants of the study were 22 fourth grade students attending a public school in Afyon, in Turkey during the school year of 2014-2015. Table 1 indicates the characteristics of the participants.

Table 1. Characteristics of participants

		F
Gender	Male	11
	Female	9
Educational background of mothers	Primary school	13
	High school	3
	University	4
Educational background of fathers	Primary school	8
	High school	6
	University	6
Mother's occupation	Civil servant	3
	Worker	3
	Housewife	1
Father's occupation	Civil servant	8
	Worker	5
	Farmer	6
	Retired	1

Data collection tools

As stated earlier the data of the study were collected through two scales developed by Yaşaroğlu (2012), namely the "scale of environmental attitude" (SEA) and the "scale of responsible environmental behaviour" (SREB). In addition, the study used diaries kept by the students and the researchers as well as interviews in which five open-ended items included provided the qualitative

data for the study. The interview form was reviewed by field specialists to establish its internal validity. They analyzed the form in terms of intelligibility of the items and consistency between items and the study topic. Based on their feedback the interview form was revised. The interview form included the following items:

- Which environmental problems do you recognize in your neighborhood, school and city?
- What can be done to avoid environmental pollution?
- Of the activities delivered which one was the most interesting for you? Why?
- How can these activities improve your environmental awareness? Why?
- As a citizen what can you do to reduce environmental pollution in the future?

In order to carry out activities related to operational environmental literacy in social studies courses the related fields of learning, such as values, gains, skills and units should be identified. The fourth grade social studies programme was analyzed in terms of these points and the following table was produced indicating the related fields of learning, values, gains, skills and unites.

As can be seen in Table 1 environmental literacy can be related to eight gains of the unit "the place we live in" part of the learning field of "people, places and environments", two gains of the unit "happily it exits" part of the learning field of "science, technology and society" and five gains of the unit "together" part of the learning field of "groups, institutions and social organizations". Figure 1 shows the data collection process.

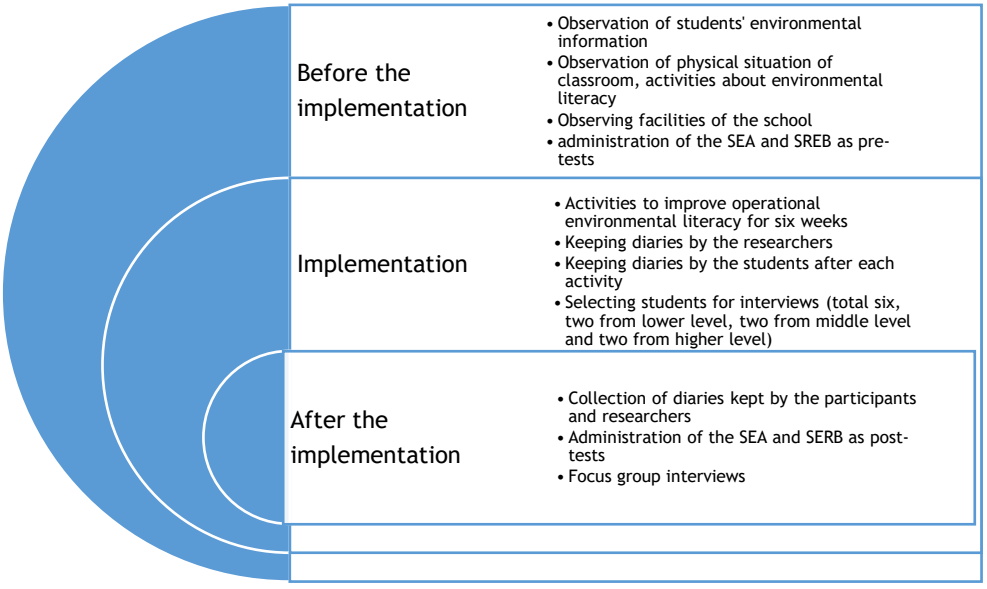

Figure 1. Data collection process

Figure 1 shows which data collection tools were used at which level. Figure 2 below indicates the activities carried out in the study and the related gains.

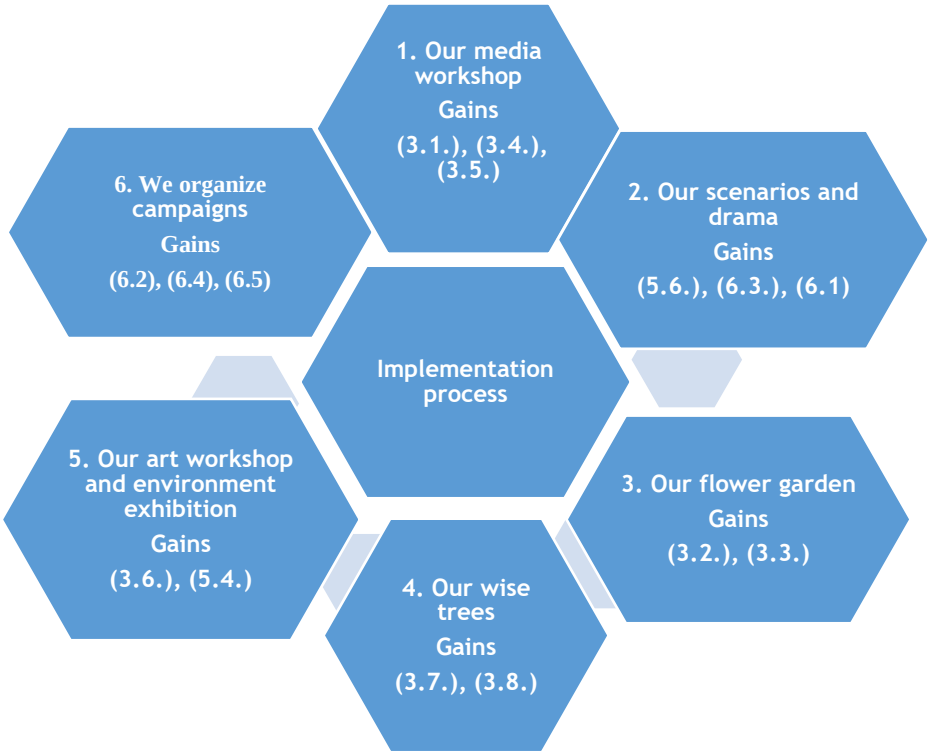

Figure 2. Activities carried out to improve operational environmental literacy

As can be seen in Figure 2, a total of six activities were implemented which lasted for six weeks.

Data analysis

In order to identify which statistical analyses were needed to examine the data obtained from the SEA and SREB, the Kolmogorov-Smirnov (K-S) test was used. The test is a nonparametric test regarding the equality of continuous, one-dimensional probability distributions that can be used to compare a sample with a reference probability distribution (one-sample K–S test), or to compare two samples (two-sample K–S test). The K-S test is based on the comparison of the distributions of the data collected from the sample with those of the related universe. In general, the K-S test is used to test normality of the distribution (Baştürk, 2011). In the study was determined that data distribution was normally (Kolmogorov-Smirnov Z= 1,227; p>0.05). Therefore, t-test was used to see whether or not there is a significant difference in the mean scores of the two groups.

The data collected through diaries were examined using a descriptive analysis technique. In addition, statements about environmental pollution, environmental awareness and environmental literacy in diaries were reviewed by a field specialist and authors and items which were “mutually agreed” and those which were not “mutually agreed” were identified. The formula developed by Miles and Huberman (1994) was used and P= 93 was found, indicating that the study was reliable.

Table 2. Related fields of learning, values, gains, skills and unites in social studies course in terms of operational environmental literacy

Field of learning	Unit	Gains	Skills	Values
People, places and environments	3. Unit: Place we live in	3.1. Finding the direction of any object using several methods 3.2. Narrating the objects using shapes and schemas 3.3. In shapes and schemas a section for symbols used is included to explain these symbols 3.4. Drawing the outline of any place 3.5. Observing weather events and drawing graphics for them 3.6. Making a distinction between natural and human factors 3.7. Making predictions about the geographical characteristics of the place they live in using myths, stories, folk songs and poems 3.8. Preparation for natural disasters	Spatial perception	Nature love
Science, technology and society	5. Unit: Happily it exists	5.4. Taking into consideration the contributions of technological products in daily life and making comparions between past and present day in terms of it 5.6. Using technological products without giving any damage to himself, others and the nature	Making comparisons	Being scientific
Groups, institutions and social organizations	6. Unit: Together	6.1. Recognising social organizations, institutions and groups 6.2. Associating certain social problems around them or needs with groups, institutions and social organizations using previous knowledge and life experience 6.3. Exlemplifying the interaction between themselves and groups, institutions and social organizations 6.4. Making decisions over which social and educational activities they participate in 6.5. Making suggestions about educational and social activities	Recognising cause-effect relationship	Helpfulness

Interviews with the participants were recorded. The data obtained from interviews were also examined using a descriptive analysis technique. The recorded data were transcribed and read by the authors. The data were coded by them and their codes were compared. The codes were also categorized those "mutually agreed" and those not "mutually agreed." Reliability of the study was

established through the formula developed by Miles and Huberman (1994) and a value of 92 % was found, indicating that the study was reliable.

Findings

This section provides the findings of the study. As stated earlier, one of the pre-tests was the SEA developed by Yaşaroğlu (2012). It was also administrated to the participants as a post-test following six-week implementation of activities to improve the operational environmental literacy of the participants. Table 3 shows the results of t-test on the SEA.

Table 3. Results of t-test on SEA

Test type	N	X	Sd	Std. ErrorMean	T	P
Pre-test	20	75.2500	4.37547	.97838	-9.726	.000
Post-test	20	90.3000	5.36166	1.19890		

Table 3 shows that the mean pre-test scores of the participants is 75,2500 while the mean post-test score is 90,3000. The difference between mean pre-test scores and mean post-test scores was found to be statistically significant (0,00 ‹ 0,005). Therefore, it is safe to argue that the activities implemented to raise operational environmental literacy of the participants had a significant effect on their attitudes towards the environment.

As stated earlier, one of the pre-tests was the SREB developed by Yaşaroğlu (2012). It was also administrated to the participants as a post-test following six-week implementation of activities to improve the operational environmental literacy of the participants. Table 4 shows the pre- and post-test scores of the participants in the SREB.

Table 4. Results of t-test on SREB

Results of t-test on SREB						
Test type	N	X	SD	Std. ErrorMean	T	P
Pre-test	20	71.3000	13.85679	3.09847	-4.320	.000
Post-test	20	89.3000	12.4689	2.78634		

As can be seen in Table 4, the mean pre-test score of the participants is 71.3000. The mean post-test score is found to be 89.3000. It is found that the difference between these two mean scores was statistically significant (0,00 ‹ 0,005). Therefore, it is safe to argue that the activities implemented to raise operational environmental literacy of the participants had a significant effect on their responsible acts about environment.

Diaries by the authors were kept a week before the implementation process (13-17 April 2015). Table 5 shows major points observed by the authors as follows:

Table 5. Findings from the researchers' observations before the implementation process

Students had an intermediate level of information about the topics of environmental literacy.
Students were not interested in documentaries about environment or in news about it.
Students had a nominal environmental literacy about immediate environmental problems, but they did not feel any responsibility to solve these problems.
In the classroom, there was no sign of any activity about environmental literacy.

Although the school had a large garden, it was neglected and seemed not to be used for environmental education and related activities.

As can be seen in Table 5, students were observed to have an intermediate level of environmental information and environmental literacy. They seemed not to be interested in documentaries and news about the environment. In addition, it was noted that the students had a nominal environmental literacy about immediate environmental problems, but they did not feel any responsibility to solve these problems. On the other hand, in the classroom, there was no sign of any activity about environmental literacy.

As stated above, the implementation lasted for six weeks and a total of six activities covered in the study. The following findings are from the diaries kept by the participants and the authors about each activity.

In the activity, "our media workshop" students reviewed news stories, documentaries, cartoons, films and animations about environmental awareness in the media, environmental pollution, weather events, finding the correct direction, drawing sketches and environmental organizations. Table 6 shows the related statements from the student diaries about this activity.

Table 6. Findings from the student diaries about the "our media workshop activity"

I liked presentations about the environmental pollution.
I learned what we should do to protect environment
I learned how people polluted the environment
I learned what non-governmental organizations do to protect the environment
I learned how to find the correct direction
I learned how weather events affected daily life

As can be seen in Table 6 the participants focused on the teaching dimension of this activity. Therefore, it can be stated that this activity is influential in improving the nominal environmental literacy. But no statement was found in the student diaries regarding operational environmental literacy in regard to this activity. The remarks by the authors related to this activity (dated 20 April 2015) are given as follows:

"It was observed that the students were happy after the activity and that they would like to take part in similar activities much more frequently. Following the activity, it was observed that they make conversations with their friends about the environment and their responsibility toward it. Therefore, they began to develop a responsible approach towards the environment…"

In the second activity, namely *"our scenarios and dramas"* the students were grouped into six to produce scenarios about environmental pollution and environmentalism. The students were informed that the scenarios they would write would be used in dramas during the class of next week. They were also asked to prepare the necessary costumes and equipment for the drama. Table 5 shows the related statements from the student diaries about this activity.

Table 7. Findings from the student diaries about "our scenarios and dramas activity"

It was fun to write a scenario about the environment
It was fun to act in dramas based on the scenarios that we wrote about the topics of environmentalism and environmental pollution
I learned which activities enviromentalists should do
I will be an environmetalist in the future
I will always protect nature and warn those people who do not protect it

I will be a member of ÇEVKO (Environmental Protection and Recycling Association) and an environment club
In the dramas activities, I learned about my responsibility to protect the environment and I became much closer with my peers

As can be seen in Table 7 the students report some views reflecting both nominal and functional environmental literacy about the activity "our scenarios and dramas". It is also seen that there are views about affective level and also, about cognitive levels. At the levels of taking action they reported some future plans such as becoming a member of environmentalist organizations, being an environmentalist and warning other people about the protection of the environment. The following statements were taken from the diary kept by the authors following the activity "our scenarios and dramas" (date 27 April 2015):

"The activity attracted the student interest; however, they seemed to have difficulty in expressing their views… It was also observed that they liked the drama activity …"

In the activity *"our flower garden"* each student planted a flower in the school yard. They were asked to observe their flowers and the development process. Table 8 shows the related statements from the student diaries about this activity.

Table 8. Findings from the student diaries about "our flower garden activity"

It was fun for me to plant a flower
I became happy to plant flowers in the school yard
I water my flower everyday
I wonder about the colour of the flower I planted
Let's fill our school garden with colorful flowers and trees and make our environment clean
I got excited in the activity
It was very nice to express about my observations about the flower I planted through drawings.
I learned that it depends on us to make our environment beautiful

As can be seen in Table 8, concerning this activity the participants reported some views that can be considered to be related to operational environmental literacy. It is also seen that this activity contributed to the affective dimension of environmental literacy. It is also possible to argue that this activity had positive effects on students' interest in the environment and their attitude towards the environment. The remarks about this activity from the diary kept by the authors are given as follows:

"…Following the activity it was observed that the students were much more sensitive to the school yard… Students developed responsible acts and positive behaviors …"

In the activity*"wise trees"* the participants were divided into groups and each group was assigned a task, such as finding idioms and poems about the environment, the protection of environment and the natural disasters; searching for biography of environmentalist people; and finding news stories about the activities of environmentalist organizations such as TEMA (The Turkish Foundation for Combating Soil Erosion for Reforestration and Protection of the Natural Habitats). Each group posted their products on the tree models which were called wise trees. Therefore, a forest containing wise trees was developed in the classroom. Table 9 shows the related statements from the student diaries about this activity.

Table 9 indicates that this activity aims to expand the score of the information about the environment at the nominal level into the functional level. The observations show that the activity achieved its goals. The remarks about this activity from the diary kept by the authors are given as follows:

Table 9. Findings from the student diaries about "wise trees activity"

I liked the activity
The activity was very informative and entertaining
I learned many nice idioms and poems about the environment
I learned the significance of recycling for the environment
I learned how we can reuse waste
I learned that the environmental pollution was many effects on human beings
I learned that it depends on people to avoid the environmental pollution
I will protect the environment
I will prevent animals from being affected in a negative way due to our actions

"… for the activity the students collected numerous poems, visual materials, news stories, etc.; in addition, they carried out small-size research about the activities of environmentalist organizations and the effects of environmental pollution …"

In the activity *"our art workshop and environment exhibition"* the students dealt with art work about environmental pollution and product designs using waste. The topics for art study included environmental pollution, environmentalist organizations, natural factors, human factors and recycling. The art work and designs by the participants were exhibited in an exhibition and the exhibition was visited by all students. The parents were also invited to visit the exhibition. Table 10 indicates the remarks by the participants in their diaries about this activity.

Table 10. Findings from the student diaries about "our art workshop and environment exhibition activity"

It was very nice to organize the environment exhibition
Some pictures and posters affected me
It was exciting that my parents visited the exhibition.
Our exhibition attracted the interest of other students
I liked to draw pictures about the environment and the environmental pollution.

Table 10 indicates that this activity makes it possible for the participants to expand their functional information about environment and to develop a product based on this expanded information. The related statement from the research diary is given below:

"…This activity made it possible to share the products of the students with other students; the visitors were guided by the participants in the exhibition and it contributed to the students' self-confidence and their skill to express their views …"

In the activity of *"we organize campaigns"* the students were asked to develop posters about the effects of environmental pollution and the significance of environmental protection and to post them outside the school to improve the environmental awareness of other people. Table 11 shows the related statements from the student diaries about this activity.

Table 11. Findings from the student diaries about the activitiy "we organize campaigns"

It was fun to develop posters
People around me would be more sensitive to protect environment
I got excited from the activity
Having a much cleaner environment makes me happy
I was proud of myself to do something good for environment

As can be seen in Table 11 the students organize campaigns to raise the environmental awareness of people using their products. They regard this activity as fun, exciting and that make them proud of themselves and happy. The related statement from the research diary is given below:

"… the activity of preparing posters and awareness made the students happy to make something outside the school. They developed slogans in the form of posters. It was observed that they liked this activity…"

The findings obtained from focus group interviews with six students which was carried out following the implementation are given in Table 12 below:

Table 12. Student views about environmental problems

Using unnecessary electronic equipment
Not completely turning off this equipment
Unconscious use of water
Unconscious use of electricity
Hazards produced by waste
Hazards of dumping grounds
Low levels of awareness about the significance of recycling
Low levels of awareness about battery waste
Human-related hazards to habitat of animals and plants
Not using bicycles as transportation vehicle
Uncommon bicycle roads
People's unfamiliarity with planting tress
People not attempting to beautify their yards and environment
Improper school yards to improve environmental awareness of students
Uncommon use of public transportation
People's irresponsible acts in the public places such as beaches, picnic areas, school yards

Table 12 shows that the participants are generally aware of environmental problems, indicating high levels of environmental awareness. This level refers to the nominal and functional environmental literacy. Table 13 shows the suggestions of the participants to reduce environmental pollution.

Table 13. Students' suggestions to reduce environmental pollution

Increasing the number of garbage containers
Making it common to use garbage container, for waste disposal
Making it mandatory to have hobby gardens in each neighborhood
Having more bicycle roads
Banning more than one car per house
Improving and expanding wooded areas
Flowering and forestration of public areas
Flowering and forestration of private areas

As can be seen in Table 13 the participants develop solutions in regard to the environmental problems they reported. These suggestions focus on planting trees and beautifying the environment. They refer to both public solutions and personal solutions for environmental problems.

Table 14. Best activity of operational environmental literacy for the participants

Consciousness-raising campaign
Activity of flower garden
Drama activity about environmental awareness and environmental pollution
Activity of "wise trees"
Writing scenarios about environmental awareness

Table 14 shows that for the participants the best activity is the one in which they were active participants, learned by doing and had a responsibility in solving the environmental problems. Therefore, activities to improve operational environmental literacy should focus on actions rather than information.

Table 15. Students' views about the effects of the activities on their environmental awareness

Everybody should experience these activities
I learned that environmental awareness does not only cover information, but also it is doing something useful for the environment
I learned that the environmental awareness makes it possible for us to survive
I learned that it is my task to warn and make my parents and other people more aware about the environment
I want to get involved in those projects to improve environmental awareness of people

Table 15 shows that the participants considered the activities to improve their operational environmental literacy to be influential in raising environmental awareness. It is seen that they expressed individual responsibility to protect the environment and also, readiness to inform other people about the environment and to make other people conscious about the environment. The participants also reported that they would like to take part in environment-related projects.

Table 16. Students' future plans related to operational environmental literacy

I will join as a member to environmental organizations such as environmental foundations in Turkey (Çevko, Çekül, Tema…etc.)
I will try to beautify our garden, neighborhood, city, country through planting trees and flowers
I will participate in the activities of the environment club in the school.
I will inform my family and friends
I will be sensitive to recycle
I will save oil waste and will bring it to a proper place
I will save battery waste and will bring them to a proper place
I will employ water and electricity consciously
I will ride my bicycle to go to nearby areas
I will completely turn off electronic equipment

In relation to the concept of global citizen it can be argued that operational environmental literacy is one of the significant ingredients of this concept. Global citizens are those people who are sensitive to problems in their local, national and international context and actively take part in solving these problems. In this context as can be seen in Table 14 the participants may gain some qualities of global citizenship in that they reported that they would join non-governmental organizations and they would assume active role in regard to environmental problems. In addition, they also reported that they would attempt to make other people aware of environmental problems.

Discussion, conclusions and suggestions

The scales developed by Yaşaroğlu (2012), namely the SEA and SREB, were used as pre- and post-test. The results of t-tests indicated that the activities designed and implemented to improve the operational environmental literacy of the participants had significant effects on their attitudes towards environment and their responsible acts towards environment. It was identified that the participants had an intermediate level of information about environmental literacy. Hungerford and Volk (1990) argued that necessary level of information is required to develop responsible actions about environment. Therefore, during the first week of the implementation the students were offered those activities which were informative about environment. They seemed not to be interested in documentaries about environment or in news about it. In addition, it was noted that the students had a nominal environmental literacy about immediate environmental problems, but they did not feel any responsibility to solve these problems. On the other hand, in the classroom there was no sign of any activity about environmental literacy.

The findings obtained from the implementation of the activities about operational environmental literacy for six weeks are as follows: In the beginning activities the students produced views about the nominal environmental literacy. In the other activities they expanded their information about environment and began to express those views which were the reflections of the functional environmental literacy. Such activities contributed to the affective dimension of their environmental literacy and had positive effects on their interest about and attitudes towards environment. Aslan Efe et. al. (2012) concluded that animation-supported project-based environmental literacy activities had positive effects on the environmental understanding of the students. In the study the activity of our media workshop various animations, documentaries, news stories and cartoons were included and the students expressed positive statements about environment in their diaries. Therefore, the finding of this study is consistent with that of Aslan Efe et. al. (2012).

In the study it was observed that the participants expanded their information about environment and they proceeded from the level of nominal environmental literacy to level of functional environmental literacy. During the last weeks of the implementation the students produced future plans about their actions about environment; following the applied activities they proceeded from the level of functional environmental literacy to level of operational environmental literacy. The participants considered the activities to be fun, exciting, interesting and those which allowed them to take responsibility. They also reported that they became happy to share their products about environment with their family and friends. The importance of neo-utopian slogans such as 'Garden of the Orient', 'Clean and Green Garden City', 'Tropical City' and 'Environmental City' have significance for environmental health and education (Kong, 1993; Savage, 1994 cited in Kwan and Stimpson, 2010). In this study the elementary students organised campaigns about environmental pollution; they wrote slogans everywhere; they prepeared a flower garden which named "4th grade flower garden". They stated about this implementation that "I proud of myself. Beceuse I informed people who live same district with me". In their diaries the participants stated that they became happy to realize their citizenship responsibilities. Şimşekli (2004) found that the level of

environmental information by basic education students was not at the desired level. Therefore, the finding of the study is not consistent with that of Şimşekli (2004).

The findings obtained from the focus group interviews are given as follows: The majority of the participants were aware of the environmental problems and their level of environmental awareness is high; they could propose solutions for the environmental problems they had observed; these solutions focused on reducing environmental pollution and on making the environment beautiful through planting trees and flowers; these solutions were both individual and public. It was also found that for the participant the best activity was one in which they were active participants, learned by doing and had responsibility in solving the environmental problems. Therefore, it can be argued that the activities to improve operational environmental literacy should focus on actions rather than information. In short, the activities designed and implemented to improve the operational environmental literacy of the participants had significant effects on their attitudes towards environment and their responsible acts towards environment. Being an operational environment literate person is one of the prerequisites for being a global citizen. Global citizens are those people who are sensitive to problems in their local, national and international context and actively take part in solving these problems. The participants may gain some qualities of global citizenship in that they reported that they would join non-governmental organizations and they would assume active role in regard to environmental problems. In addition, they also reported that they would attempt to make other people aware of environmental problems. In addition, it is seen that the participants assumed individual responsibility to inform the other people about environment. Activities to improve operational environmental literacy may be designed to allow for students to actively take part in these activities. Quantitative data collection tools may be developed to analyze operational environmental literacy. Student teachers may be informed about operational environmental literacy in the teacher training programs and teachers may be informed about it through in-service training activities. In addition, parents, school community and non-governmental organizations may also participate in the activities about operational environmental literacy.

Disclosure statement

No potential conflict of interest was reported by the authors.

Notes on contributors

Nuray Kurtdede Fidan, holds a PhD in elementary education and now is an assistant professor at Afyon Kocatepe University, Afyonkarahisar, Turkey.

Tuğba Selanik Ay holds a PhD in elementary education and now is an assistant professor at Afyon Kocatepe University, Afyonkarahisar, Turkey.

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