A Study On The Evaluation Of The Applicability Of An Environmental Education Modular Curriculum

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ABSTRACT

The purpose of this study was, in line with the views of the students & teacher, to examine Environmental Education Modular Curriculum (EEMC) developed to give environmental education with a specific content. In the study, the case study method was used. The research sample was determined with the purposeful sampling method & made up of 23 7th grade students (12 male & 11 female) attending a secondary school in the city of Gümüşhane. During the application of EEMC in 11 weeks, the data were collected with Semi-Structured Interviews (SSI), Environmental Activities Evaluation Questionnaire (EAEQ), Environmental Education Self-evaluation Form (EESF) & the Constructive Learning Environment Questionnaire (CLEQ). The research data were analyzed with content analysis & frequencies, & the related categories & themes were formed. In the study, it was found that EEMC not only included a content which met the students' needs & which allowed them to produce solutions to environmental problems but also had the quality of a dynamic modular curriculum.

Introduction

Obviously, in line with the influence of a number of changes in nature on human, individuals' lack of knowledge about environmental issues & their lack of necessary education constitute the basis of environmental problems & lead to integration of environmental education in curricula (Erol & Gezer, 2006).

In this respect, curricula have an important role in the training of students regarding environmental issues & in helping them solve environmental problems (Barraza, 2001; Uzun & Sağlam, 2006; Köse, 2010; Özsevgeç & Artun, 2012c). Environmental education is given with an interdisciplinary approach in such countries as Turkey, Holl& & Engl& (Demirkaya,

2006; Erdoğan & Özsoy, 2007; Köse, Gencer, Gezer, Erol & Bilen, 2011; Çalık, 2011; Çalık & Eames, 2012; Alım, 2006; Özdemir, 2007; Tanrıverdi, 2009), while it is given in Belgium, Finl& & Greece within the scope of an independent curriculum (Tanrıverdi, 2009). Many studies point out that environmental education should involve a specific curriculum (Gambro & Harvey, 1999; Davis, 2000; Özdemir, 2007; Merritt, 2008; Tanrıverdi, 2009; Çakıcı & Oğuz, 2010). Studies also demonstrate that students do not take environmental education at the desired level since it is given with an interdisciplinary approach (Atasoy & Ertürk, 2008; Özsevgeç & Artun, 2012a). In other words, environmental education given with an interdisciplinary approach creates problems in training students in a way to make them sensitive to & conscious of environment (Sağır et.al., 2008). This situation also leads to problems in raising students' consciousness of environment (Erol & Gezer, 2006; Özsevgeç & Artun, 2012a).

Analysis of the curriculum of the course of Science & Technology (2005), though partly applied in practice, will clarify the problem. When this curriculum is examined, it is seen that the outcomes related to environmental education are quite limited (Özsevgeç & Artun, 2012c), & a similar situation could also be said to be true for the updated curriculum of the course of Science. Among the 330 outcomes within the scope of the course of Science includes, only 30 of them are directly related to environment & environmental education (Ministry of National Education, 2015). Although environmental outcomes are inserted in information areas, it is seen that students' levels of positive attitudes to & achievement of the outcomes related to environment are not at the desired level due to the fact that these outcomes are generally included in later lesson units & taught as the last outcomes in these lessons (Artun, 2013). In addition, teaching the environment-related outcomes after the lesson subjects of physics, chemistry or biology, which are considered to be more complex & abstract when compared to environment-related subjects, could be said to result in a serious problem in achieving the intended outcomes. In another saying, giving environmental education with an interdisciplinary approach rather than via a specific curriculum is thought to cause problems in environmental education (Özsevgeç & Artun, 2012a).

The course of Science & Technology provides a learning environment in which students can do research in the field of environmental education, solve environmental problems & discuss the related solutions (Taycı & Uysal, 2009). This situation prevents not only learning environment-related subjects based on discussion, research & problem solving but also raising consciousness of environment. Considering the approaches that emphasize the need for a student-centered environmental education, it is necessary to plan learning environments in line with interactive & alternative teaching methods (Sarıkaya, 2006; Akıllı & Yurtcan, 2009). As required by its nature, environmental education has a research-based & student-centered structure & a close relationship with students' problem solving skills (İnel & Balım, 2010; Tatar, Oktay & Tüysüz, 2010). The fact that environmental education is mostly given with traditional methods of teaching, which are not appropriate to the nature of environmental education at all, & that traditional methods of teaching include serious deficiencies in managing these processes & in teaching the related skills will inevitably lead to failure (Ramadoss & Poya-moli, 2011; Manolas & Filho, 2011; Coca, 2013; Taycı & Uysal, 2009; Aydın, 2010; Sadık & Sarı, 2010; Okur et.al., 2011). Eventually, students' academic achievements, changes in their attitudes & their problem solving skills will not be at the desired level (Cutter-Mackenzie, 2009; Mahidin & Maulan, 2010). When the related literature is examined, it is seen that lack of modular curricula or those designed on student-centered basis regarding environmental education supports the related concerns mentioned above. In this respect, there is a need not only for an educational process which includes use of instructional methods appropriate to the nature of environmental education & which focuses on current environmental problems & on related solutions but also for a curriculum that will meet these needs. In line with the views of the students & teacher, the present study examined the effectiveness of the Environmental Education Modular Curriculum (EEMC) developed to provide specific solutions to the problems above.

Literature Review

In related literature, it is seen that studies on environmental education generally focus on research subjects as knowledge of environment (Atasoy & Ertürk, 2008), misconceptions (Okur et.al., 2011), environmental problems (Sadık et.al., 2011; Özgen & Kahyaoğlu, 2011; Tanrıverdi, 2009), Environment education (Veeravatnanond & Singseewo, 2010; Waktola, 2009, Güler, 2009; Özsevgeç & Artun, 2012b), attitudes towards environment (Teyfur, 2008), biological diversity & ecosystem (Ramadoss & Poyya Molı, 2011; Ruiz-Mallen, Barraza, Bodenhorn & Reyes-Gacia, 2009), environmental literacy (Cutter & Smith, 2001) & curricula regarding environment (Than, 2001; Lee, 1997; Eames et.al., 2008; Parlo & Butter, 2007). The research samples in these studies generally include participants from elementary school classes ranging between 4th & 8th grades (Özgen & Kahyaoğlu, 2011; Şimşekli, 2010; Ramadoss & Poyya-molı, 2011; Ruiz-Mallen et.al., 2009), & most of these studies involve elementary school teachers (Waktola, 2009; Parlo & Butter, 2007; Cutter & Smith, 2001; Okur et.al., 2011; Güler, 2009). As data collection tools, questionnaires (Okur et.al., 2011), open-ended questions (Özgen & Kahyaoğlu, 2011; Şimşekli, 2010; Aktepe & Girgin, 2009), semi-structured interviews (Güler, 2009), environmental attitude scale (Teyfur, 2008; Sağır et.al., 2008), surveys & interviews (Ramadoss & Poya-molı, 2011; Duan & Fortner, 2010; Mastrilli, 2005; Sokoli & Doka, 2004; Waktola, 2009) & environmental knowledge & attitude scale (Veeravatnanond & Singseewo, 2010) are used. When the results obtained in these studies are examined, it is seen that students have misconceptions or lack of learning regarding environment (Bozkurt & Koray, 2002); & that students do not have a desired level of environmental knowledge & attitudes towards environment (Atasoy & Ertürk, 2008; Sağır et.al., 2008). In one study, Okur (2011) concluded that the method of "traditional teaching", question & answer, & problem solving" is frequently put into practice in teaching subjects related to biological diversity & science & technology concepts. In another study, Ramadoss & Poya-molı (2011) stated that students have low levels of attitudes towards biological diversity. Ruiz-Mallen & colleagues (2009), in their study, found that students have lack of knowledge about ecology. Sokoli & Doka (2004) point out that the importance given to environmental education at schools has increased in recent years & that despite this increase, there is a need for improvement in environmental curricula. Özsevgeç & Artun (2012b), in their review of the related literature, stated that especially the deficiencies in environmental education in our country make it necessary to design & apply an independent environmental course curriculum. When the literature in national & international scales is examined, it is seen that students have lack of knowledge about environmental education & that they do not have a desired level of attitude towards environment. In addition, students fail to suggest solutions to environmental problems they face & to provide explanations regarding the causes of these problems. As can be seen in related literature, although emphasis is put on the importance of environmental education, the current curricula do not have the capacity to provide solutions to environmental problems, & there is a need for studies within the scope of a modular curriculum. The present study, in line with the views of the students & teacher, examined "Environmental Education Modular Curriculum (EEMC)" developed to give environmental education with its specific content.

METHOD

In the study, which was conducted using the case study method, the research sample determined with the purposeful sampling method included a total of 23 7th grade students (12 male & 11 female) attending a secondary school in the city center of Gümüşhane.

EEMC & Its Development Phases

The EEMC developed by researchers is made up of five lesson units. Each unit includes sub-headings like purpose, subject headings, table of specifications, concept map, outcomes & activities. The modular curriculum was developed to reveal a number of thinking skills of students such as doing research on environmental issues, suggesting solutions to environmental problems & establishing connections between events. The constructivist approach, found in the body of "student-centered education", constitutes

the basis of the modular curriculum. Considering this basis, the vision of the curriculum includes not only helping students view environmental issues from an up-to-date perspective but also training them in a way to raise their consciousness of environment & to increase their environmental literacy. In the study, one academician expert in the field of measurement & evaluation, one expert in the field of environmental education, one expert in the field of curriculum development & five science & technology teachers were asked to evaluate the validity of the modular curriculum.

Conducting Needs Analysis

Throughout our country, the needs in relation to the content of environmental education (which has not yet been put into practice in schools belonging to the Ministry of National Education) & to the necessary theoretical sub-structure as well as the needs of teachers, students & the society regarding environmental education should be determined clearly. In order to determine these needs, first of all, environmental curricula applied in several cities & countries in the world (Holl&, Portugal, British Columbia, New Mexico, Engl&, California, New York & Canada), science curricula (2005; 2013 Science & Technology Curriculum) & articles published in relation to environmental education (Ramadoss & Poyya-molı, 2011; Ruiz-Mallen, Barraza, Bodenhorn & Reyes-Gacia, 2009; Veeravatnanond & Singseewo, 2010; Waktola, 2009; Okur et.al., 2011; Sadık et.al., 2011; Özgen & Kahyaoğlu, 2011; Tanrıverdi, 2009; Güler, 2009; Özsevgeç & Artun, 2012a) were examined.

In line with this, semi-structured interviews were held with the students & teacher in our country to determine their needs. As a result of these interviews & the related evaluations, several outcomes covering environmental education were wrote down, transformed into a questionnaire & presented to five science & technology teachers, one expert in the field of measurement & evaluation & one expert in the field of environmental education for their views. Among the outcomes in the questionnaire, the experts were asked to mark the ones appropriate to environmental education, students' levels & to the conditions in our schools & in our country. The outcomes of environmental education were finalized by decreasing them from 120 to 37 in line with the views of academicians from the field of science education & with the views of science & technology teachers. Following this, the common ones were grouped & revised. Lastly, the lesson units regarding the outcomes were named. Table 1 presents the learning area, lesson units & the time allocated to each lesson unit for the environmental education modular curriculum.

Table 1. *Learning area, lesson units, number of outcomes, time/lesson & percentages regarding the EEMC*

Learning Area	Lesson Units	Number of Outcomes	Time/Lesson	%
Living Beings & Environment	1. Environmental Consciousness	5	3*(40'+40')	13.5
	2. Ecosystem	12	5*(40'+40')	32.4
	3. Plants & Animals	7	3*(40'+40')	18.9
	4. Environmental phenomena	8	5*(40'+40')	21.7
	5. Environment & Human	5	3*(40'+40')	13.5
Total		37	19*(40'+40')	100

* refer cross

Development of learning & Teaching Activities

For the learning & teaching activities, the student guidance material & teacher guidance material were developed. After asking experts for their views, the student & teacher guidance materials appropriate to 5E learning model were finalized. The activities

found in the modular curriculum were developed in a way to be student-centered because traditional teaching methods are not efficient to help students underst& environmental subjects or to train them as environmentally literate individuals. Activities found in modular curriculum were developed in a way to allow students to do observations, to collect information via research, to interpret this information & to develop their imagination & creativity. Putting the modular curriculum into practice will prioritize the teaching of the target information, skills, attitudes & habits. Also, since it allows students to be in constant communication with each other & with their teacher & to participate in all the phases of the activities, it will provide students with the opportunity to develop their questioning skills. While developing the activities, the basic structure of the modular curriculum & the outcomes it includes were taken into account. In addition, the activities were appropriate to the intellectual & physical development levels of the students as well as to their individual differences.

Since modular curriculum adopts an underst&ing of student-centered education rather than teacher-centered education, multiple measurement & evaluation methods that consider individual differences & the characteristics of individuals were preferred to traditional measurement & evaluation methods. In this way, application of achievement tests to the students at the end of lesson units allowed not only revealing what they had learned but also determining what they had done in the process using such process evaluation methods in the same curriculum as projects, portfolios, peer evaluation, observations & self-evaluation. In other words, modular curriculum allowed determining students' success as well as evaluating what they had learned or failed to learn in the process.

Data Collection Tools & Analyses

In the study, as the data collection tool, semi-structured interview (SSI), environmental activities evaluation questionnaire (EAEQ), environmental education self-evaluation form (EESF) & constructive learning environment questionnaire (ILEQ) were used.

Analysis of the Findings Obtained via Semi-Structured Interviews

In the study, two different interviews were held. The first one was a semi-structured interview held regarding the concepts to determine the effectiveness of the guidance materials on students' conceptual underst&ing in the lesson units, & the second one was a semi-structured interview held with students & with the teacher (who conducted the application in class) to determine the applicability of the guidance materials developed in the study. For the development of the interview questions, the purpose of the study, current issues on agenda, students' levels of knowledge, concepts, outcomes & the contents of the lesson units found in the EEMC were taken into account. In this process, the sample questions found in the curriculum of Science & Technology in 2005 were examined. The language & comprehensibility of the interview questions were adapted in a way to help students underst& the questions. For this purpose, five science & technology teachers from secondary school in the city center of Gümüşhane, one academician expert in the field of measurement & evaluation & one expert in the field of environmental education were asked for their views for content validity. As a result, the semi-structured interview questions were prepared as follows: eight questions for the lesson unit of "Environmental Consciousness", eight for "Ecosystem", four for "Plants & Animals", six for "Environmental Phenomena", & four for the lesson unit of "Environment & Human". In the study, in order to determine the views of the students & the teacher about the applicability of the guidance materials developed, 11 semi-structured interview questions for the students & six semi-structured interview questions for the teacher were developed.

In the study, pre- & post-interviews were held with the students at the beginning & end of each lesson unit. For the analysis of the semi-structured interviews questions, the responses of the students & the teacher were presented without making any changes. This type of analyses is reported to be beneficial (Yin, 1994; Çepni, 2010). The responses to the

interviews held regarding the students' conceptual underst&ing were categorized as "Fully Underst&s", "Partly Underst&s" & "Fails to Underst&" (Coştu, 2006; Artun, 2009).

Analysis of Findings Obtained via Environmental Activities Evaluation Questionnaire

The "Environmental Activities Evaluation Questionnaire" was developed to determine the students' views about the activities found in the student guidance material. While developing EAEQ, the group work & discussions, the teacher's attitudes & behaviors, the learning environment, & the learning & measurement-evaluation activities found in the student guidance material were taken into account. The scale was arranged as a five-point Likert-type scale "I Completely Agree", "I Agree", "I am Neutral", "I Agree" & "I Completely Disagree". EAEQ included 22 propositions for the lesson unit of "Environmental Consciousness" & 23 propositions or the other lesson units since the statement of "*The application of the activities in the lesson unit was similar to the one in other lesson units*" was different from the one in the lesson unit of "Environmental Consciousness".

In the study, the students' views about the activities found in the student guidance material were determined with EAEQ. In the study, a total of 22 items for the lesson unit of "Environmental Consciousness" & 23 items for the other lesson units were developed including positive & negative statements & arranged as a five-point Likert-type scale. While numbering the statements in EAEQ, the meanings were taken into account, & the scoring was done from 5 to 1. The totals & the mean scores for the students' responses to the items were calculated.

Analysis of the Findings Obtained via Environmental Education Self-Evaluation Form

Self-evaluation refers to forms used to allow students to evaluate themselves & to write down their views & thoughts about themselves so that students who are aware of the learning process, who can control this process & who can learn on their own can be trained (Ministry of National Education, 2006; Arslan & Şahiner, 2010). The EESF used in the study was developed by the researcher considering the self-evaluation form developed by the Ministry of National Education (2006). Self-evaluation form was developed to determine students' views about the subjects taught on weekly basis during the application & to allow the students evaluate themselves. The form was made up of 10 open-ended statements. The students were asked to use these open-ended statements to fill out the blanks left below the questions. The 10 open-ended statements found in the form were written down by the students 17 times at the end of each lesson.

EESF was applied on weekly basis, & the findings obtained were categorized as "Achieved the Outcome", "Partly Achieved the Outcome" & "Failed to Achieve the Outcome" considering what the students had written down on the form. In order to help the reader underst& it better, quotations were made from the students coded as S_1 & S_2.

Analysis of the Findings Obtained via the Integrative Learning Environment

In the study, in order to evaluate the learning environment, CLEQ developed by Keser (2003) was used. CLEQ included a total of 50 items, 10 for each phase. Each statement in the questionnaire was rated & assigned scores as "Failed to Achieve = 0", "Partly Achieved = 1", "Average = 2", "Good = 3" & "Fully Achieved = 4". In the study, there were 11 activities, & each activity was observed by the researcher & a secondary researcher. Following this, the mean observation scores for the items were calculated & presented in a Table. The scores with a mean of three or higher demonstrated that the related item or phase was achieved at the desired level.

Within the scope of the study, the findings obtained via the observations noted down in the open-ended parts of CLEQ applied to 11 activities appropriate to the 5E learning model found in the guidance materials developed in the study were analyzed. In the study, since the 5E learning model was used for 11 weeks, the analyses were conducted for these weeks. The qualitative data were read several times for the purpose of revealing the students & teacher's evaluations regarding the applicability of the curriculum. As a result,

codes related to each phase of the 5E learning model were determined. The coding was done by two researchers from the field of science education, & the codes fitting one another were used in the study. Matrices demonstrating the distribution of the codes according to the weeks of application of CLEQ were formed, & the frequencies of these codes were presented as Tables.

Validity & Reliability Studies for the Data Collection Tools

The data collection tools were piloted with 29 7th grade students attending a secondary school in the city center of Gümüşhane. For the content validity of the data collection tools, an academician expert in the field of measurement & evaluation, an expert from the field of environmental education & five science & technology teachers were asked for their views. As a result, the data collection tools were found to be valid for use in the present study. In the phase of the application of the modular curriculum, interviews were held. In line with the experts' views, the interview questions were found to be valid for use in this study. Special attention was paid to the fact that the interview questions would be clear enough for students to underst& & would avoid any misunderst&ing. Detailed information was provided about how the interview data were collected, recorded & analyzed. In addition, the audio & video records & the guidance materials for the students were kept & stored attentively for the reliability of the data. During the interviews, the teacher & the students were informed that they would not be exposed to any harm due to the study, & for this purpose, symbols were used instead of their names. In addition, for the analysis of the interview data, codes & themes were formed by two researchers from the field of science education & used in the study in agreement. For the reliability of the interview data, two researchers examined the fit between the codings. Cohen's Kappa Fit Coefficient for the data collected was calculated as 0.65. As a result of pilot application of EAEQ, Cronbach alpha reliability coefficient was calculated as .78. This reliability coefficient could be said to be at a good level for use in the present study (Sözbilir, 2010). Since EESF included open-ended statements, the related reliability analyses were not conducted. The reliability & validity studies for the observation form were carried out by Keser (2003). Therefore, following the pilot study, no reliability & validity study was conducted again for the observation form. The percentages of consistency between the data gathered by the researcher & the observation data collected by the secondary researcher were found to range between 80% & 88%, & the average consistency percentage was calculated as 82%. Depending on these results, the observations were thought to be reliable.

FINDINGS

The findings obtained in the study were as follows:

Findings Obtained via the Interview Questions

The findings obtained following the interviews held are presented below separately as the teacher interviews & student interviews. First, the findings obtained via the semi-structured interviews held regarding the students' evaluation of the application are presented. Next, the findings obtained via the semi-structured interviews held regarding the teacher's evaluation of the application are presented.

The findings obtained via the interviews held with the students at the end of each lesson unit to evaluate the application & the modular curriculum are presented under three headings: 1) Overall evaluation of the lesson units 2) Evaluation of the activities & 3) Evaluation of the subjects.

The students' responses to the interview questions directed at the end of each lesson unit in relation to the question of *"How do you evaluate the lesson unit in general?"* were coded, & the findings related to the overall evaluation of the lesson units were obtained as can be seen in Table 2 below.

Table 2. Views about the overall evaluation of the lesson units

Question	Codes	Environmental Consciousness	Ecosystem	Plants & Animals	Environmental Phenomena	Environment & Human	f
		Lesson Units					
	Being entertaining	x	x	x	x	x	5
	Raising Consciousness	x	x		x		3
How do you evaluate the lesson unit in general?	Learning new information	x	x		x	x	4
	Achieving changes in attitudes	x	x	x	x		4
	Increasing interest	x	x		x	x	4
	Applying to daily life	x	x	x	x		4
	F	6	6	3	6	3	24 / 24

According to Table 2, the students' responses to the interview questions revealed such codes as "being entertaining", "achieving changes in attitudes", "increasing interest" & "applying to daily life". Among these codes, the code of "being entertaining" was valid for five lesson units; "achieving changes in attitudes" for four units; "increasing interest" for four units; & the code of "applying to daily life" was valid for four lesson units. Of all the students, $S_{Ü2}$ & S_{A1} reported their views in relation to the codes of "achieving changes in attitudes" & "applying to daily life" as follows:

> $S_{Ü2}$: …I used to throw garbage into waste bins, but now, as I have understood the importance of recycling, I throw it into recycling bins.

> S_{A1}: I've become more conscious. I throw both the bottle of the water I have drunk & its blue cap into recycling bin. I have also made a recycling bin at home. My mom throws waste paper into that bin if any…

The students' responses to the interview questions directed at the end of each lesson unit were coded, & the findings regarding the evaluation of the activities were obtained. The questions related to the activities were grouped under six sub-groups as follows: 1) Overall evaluation of the activities, 2) Influence of the activities on attitudes towards environment, 3) Influence of activities on group work, 4) Influence of activities on underst&ing the environmental problems, 5) Influence of activities on efficacy in solving environmental problems, & 6) students' views about the evaluation questions in the activities. Table 3 presents the findings obtained.

Table 3. Views regarding the overall evaluation of the activities

Dimensions of Evaluation of Activities	Codes	Lesson Units					
		Environmental consciousness	Ecosystem	Pants & Animals	Environmental Phenomena	Environment & Human	F
Overall Evaluation	Being relevant to the subject	x	x	x	x	x	5
	Giving information about environmental subjects	x	x	x	x	x	5
	Being entertaining	x	x	x	x	x	5
Influence on attitudes towards environment	Changes in attitudes	x	x	x	x	x	5
	Changes in behaviors	x		x			2
	Raising consciousness	x	x	x	x	x	5
Influence on group work	Helping learn the subjects	x		x	x		3
	Presenting objective information		x				1
	Being deductive		x		x	x	3
	Sharing ideas	x	x	x	x	x	5
	Providing support	x		x		x	3
	Distribution of duties		x			x	2
	increasing one's knowledge	x			x	x	3
	Establishing relationships with peers		x	x		x	3
	Producing ideas	x	x	x	x	x	5
Influence on underst&ing environmental problems	Learning what happened	x	x	x	x	x	5
	Learning how learning happens	x	x	x	x	x	5
	Learning the damages	x	x	x	x	x	5
	Increasing one's knowledge	x	x	x	x		3
	Changes in attitudes	x		x	x		3
	Raising consciousness	x	x	x	x	x	5
Influence on solving environmental problems	Putting forward solutions	x	x	x	x	x	5
	Raising consciousness	x	x	x	x	x	5
	Changes in attitudes	x	x	x	x		4
Evaluation questions	Helping teach the subjects	x	x	x	x	x	5
	Reinforcing subjects	x	x		x		3
	Providing self-check	x				x	2
	F	23	21	21	21	20	110

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According to Table 3, the students' responses during the interviews revealed that the codes of "appropriate to the subject", "changes in attitudes", "raising consciousness", "producing ideas" & "sharing ideas" were obtained for five lesson units; the code of "increasing one's knowledge" for three units; & the code of "providing self-check" was obtained for two lesson units. Among the students, S_{A2} & S_{A1} reported their views regarding the codes of "producing ideas" & "changes in attitudes" as follows:

S_{A2}: *When I lacked something, I learned them via the discussions I made with my friends. & I produced ideas accordingly.*

S_{A1}: *I don't give much importance to recycling. Recycling was a big problem for environment. I used to thrown garbage into waste bins, but now I throw it into recycling bins.*

The students' responses to the interview questions directed at the end of each lesson unit were coded, & the subjects of the lesson units were evaluated under two headings: 1) which subjects students love more & are interested in, & 2) Students' views about the influence of these subjects on their interest in the course of environment education.

Table 4 presents the findings regarding the lesson subjects the students loved more & the reasons why they were more interested in these subjects.

Table 4. Students' views about the subjects they loved & were interested in

Lesson Units	Subjects	Students						
		$S_{Ü1}$	$S_{Ü2}$	S_{O1}	S_{O2}	S_{A1}	S_{A2}	F
Consciousness of Environment	Environmental Pollution & Protection of the Environment	x		x	x	x	x	5
	Environmental Wastes, Prevention & Recycling of Wastes	x	x	x	x	x	x	6
	Healthy Environment			x	x	x	x	4
Ecosystem	Species, Population, Habitat & Ecosystem	x		x				2
	Nutrition Network					x	x	2
	Importance of Habitat							0
	Competition & Cooperation				x			1
	Human Factors Influential on Ecosystem							0
	Biological Diversity		x					1
Plants & Animals	Plants & Animals		x	x	x	x	x	5
	Extinction of Plants & Animals			x	x	x	x	4
	Water & Air, importance of clean environment,			x	x	x	x	4

	Love & protect plants & animals	x		x	x	x	x	5
	Greenhouse effect	x	x	x	x	x	x	6
	Global warming & climate change	x	x	x	x	x	x	6
Environmental Phenomena	Radiation, CO_2 & chemical drugs	x	x	x	x	x	x	6
	Human health	x	x	x	x	x	x	6
	Technological devices	x	x	x	x	x	x	6
	Renewable & non-renewable energy sources	x	x	x	x	x	x	6
	People & their influence on environment	x	x	x	x	x	x	6
	Environmental pollution & human health	x	x	x	x	x	x	6
Environment & Human	Effects of the increasing population	x	x	x	x	x	x	6
	Importance given by Atatürk to the environment	x	x	x	x	x	x	6
	f	14	13	18	18	18	18	99 99

According to Table 4, the students' responses to the interview questions revealed that six students were interested in the subjects of "environmental wastes, prevention & recycling of wastes", "Global warming & climate change" & "renewable & non-renewable energy sources"; that two students were interested in the subject of "Nutrition network"; & that five students were interested in the subject of "Plants & animals". Among the students, S_{A1} & S_{O1} reported their views about the subjects of "recycling" & "food chain" as follows:

> S_{A1}: *I was quite interested in the subject of recycling because recycling is more important than the others. To me, it is the most important factor to increase the quality of our life. I can say it is fairly important to protect the nature & to increase the quality of life.*
>
> S_{O1}: *Nutrition chain is more important than the others. It influences all the animals & plants. Extinction of any of them could have bad influence on another. Nutrition chain covers plants & animals. Even a tiny degeneration influences all.*

Table 5 presents the codes regarding the influence of the lesson subjects on their love of environmental education.

Table 5. Students' views about their love of environmental education thanks to environmental subjects in the curriculum

Codes	Lesson Units

	Consciousness of Environment	Ecosystem	Plants & Animals	Environmental Phenomena	Environment & Human	F
Raising awareness	X	x	X	X		4
Increasing the interest	X			X	x	3
Arousing curiosity			X	X	x	3
Modelling	X	x		X		3
Learning concepts	X	x	X	X	x	5
						18
F	4	3	3	5	3	18

According to Table 5, the students' responses to the interview questions revealed that the code of "raising awareness" was valid for four lesson units; the codes of "increasing the interest" & "arousing curiosity" for three lesson units; & the code of "learning concepts" was valid for five lesson units. Among the students, $S_{Öo1}$ & $S_{Öo2}$ reported their views about the codes of "learning concepts" & "raising awareness" as follows:

$S_{Öo1}$: *I exchanged ideas with friends regarding environmental education. Learning new information about the phenomena in the environment helped me love the environment & environmental education.*

$S_{Öo2}$: *Learning about recycling allowed me to recognize that our country spends less money. Petrol is used to produce plastic materials. There is already too little petrol. When you recycle plastic wastes, we spend less money & avoid importing such products.*

The interview questions directed to the teacher at the end of the application regarding the applicability of the curriculum to evaluate the instructional process, the application & environmental education modular curriculum are presented under three headings: 1) Activities, 2) Outcomes & 3) Suggestions regarding the curriculum. Table 6 demonstrates the codes obtained via the teacher's views about the applicability of the curriculum.

Table 6. Teacher's views about applicability of the curriculum

Theme	Codes
Views about the activities	Being appropriate to students' level
	Having positive influence on the student
	Being beneficial for the teaching of environmental subjects
	Activities' not lacking anything
	Being efficient for underst&ing environmental subjects
	Experiencing no problem in practice
Views about the outcomes	Being related to environmental education
	Impressing students
	Making knowledgeable about environmental education
	Being influential on raising consciousness of environment
Suggestions regarding the curriculum	Putting the curriculum into practice as a separate course

As can be seen in Table 6, the application teacher mentioned the codes of "being appropriate to students' level", "Experiencing no problem in practice", "Impressing students" & "putting the curriculum into practice as a separate course".

The teacher responded to the question of *"What do you think about the appropriateness of the activities to students' level?"* saying that the activities were appropriate to the students' levels; that the activities had positive influence on the students; & that the activities were beneficial for the teaching of a number of new subjects related to environmental education. The teacher reported his/her related views as follows:

> T: *The activities were appropriate to the students' levels. In addition, I can say there were no activities that the students would have difficulty doing. The students managed to carry out most of the activities. During the activities, they didn't get bored; in contrast, they enjoyed them. The activities allowed raising the students' consciousness of environmental education.*

As a response to the question of *"What do you suggest regarding the activities?"*, the teacher stated that the activities did not lack anything at all & that the activities were efficient enough to help the students underst& the environmental subjects. In relation to this question, the teacher reported his/her views as follows:

> T: *The activities were appropriate. For example, some of the activities included in the course book of science & technology were missing, but here, because there was no activity that the students failed to carry out or underst& or had difficulty doing so, I can say there was no deficiency. With these activities, environmental education was given to the students quite well. I think the activities were efficient enough to raise the students' consciousness of environment.*

As a response to the question of *"To what extent do you think the in-class activities fit the modular curriculum developed? Please, give examples.",* the teacher stated that there was no problem with the application of the activities for the course within the scope of the curriculum & that the activities were effective in terms of the students. In relation to this question, the teacher reported his/her views as follows:

> T: *It was appropriate. To illustrate, the projects, activities & applications we carried out were consistent with the information to be given. They learn the concepts better by doing & applying these concepts together with the activities within the scope of the course. The examples of global warming, the activities carried out & the nutrition pyramid were all more influential since they allowed the students to see & illustrate them directly. For example, you define the species & population, & you have students write down these definitions. However, this will not be so much effective, but it will be more permanent as the students carried out the activities themselves. We did this in class. The students themselves cut & glued, & they saw what concepts are. They developed models regarding global warming & produced recycling bins. They did all these on their own, & I think they thus learned better.*

As a response to the question of *"What do you think about the outcomes for environmental education? Are there anything you want to add to these outcomes?",* the teacher stated that the outcomes were generally related to environmental education & that the outcomes impressed the students & helped them become knowledgeable about environment. In relation to this question, the teacher reported his/her views as follows:

> T: *When we consider the outcomes, I can say that there were activities for discussion in some of the outcomes. For example, regarding the question of "If you were an administrator, what would you do to prevent environmental pollution?", the students expressed themselves saying their thoughts. They told their own views about environment. Thereby, we can say that the students achieved that outcome, & I can say we did our job...On the other h&,*

I can also see the traces of that course in the related lesson unit of the course of science & technology. That's, the students were influenced by that course… the outcomes in the course of science & technology were mentioned, but, were you able to achieve these outcomes? Which ones did you achieve? This is important, but we focused on each outcome in the course of environmental education, & activities were carried out for better learning.

As a response to the question of *"To what extent do you think these lesson units & outcomes were influential on raising your students' consciousness of environment? Could you please explain it briefly?"*, the teacher stated that the lesson units & outcomes had positive influence on students' consciousness of environment. In relation to this question, the teacher reported his/her views as follows:

T: We didn't have any time-related problem in the course of environmental education. We did all the activities one by one. Thus, the students raised their environmental consciousness. Thanks to such activities, students can find the necessary information on their own. They do not get the information directly from the teacher. They learn by doing or discussing the activities. The teacher just provides guidance, & the students find it themselves. Thus, the course is appropriate to constructivism…The students reached the information on their own via the activities, & they don't forget it easily... Therefore, the lesson units & the outcomes were quite good. Also, I think they also helped students gain environmental consciousness & develop sensitivity to the environment.

As a response to the question of *"Should environmental education be given as a separate course?"*, the teacher believed that giving environmental education as a separate course would be more beneficial for students. In relation to this question, the teacher reported his/her views as follows:

T: This course should certainly be taught. I said so too while doing the pilot application. The course of environmental education must be taught urgently… Our environment is devastated so badly that we can easily witness it. This devastation does not happen slowly. It occurs quite fast… Thus, the environment is damaged severely, but there is no specific curriculum to raise our students' consciousness of this issue. Therefore, urgent precautions should be taken. Among these precautions, the most important one is raising individuals' consciousness… we should do it not just for our own future but for the future of our children as well, not for just a few questions. In addition, I believe it should be a main course, not optional. I think the course of environmental education is as much as physical education & mathematics. Don't you think the course of environmental education has as much importance as the course of technology design, or mathematics, or as the course of science & technology. To me, it is much more important than all. If you ruin your accommodation place, pollute the air there, then you will not even be able to learn math, science or Turkish Language. What's more, there will be no one to learn such things. Well, it must be taught urgently as an obligatory course.

Findings Obtained via EAEQ

The students' views about the activities found in the student guidance material were determined with EAEQ. The students' responses to the items were scored, & the mean score for each item was calculated. Table 7 presents the mean scores for the data obtained via EAEQ.

Table 7. Mean scores for EAEQ

	Items	Environmental Consciousness	Ecosystem	Plants & Animals	Environmental phenomena	Environment & Human
1	The activities we carried out as a group made me more sensitive to the environment.	4.34	4.56	4.69	4.65	4.65
2	I failed to learn the subject in cases of activities which required group work.	4.13	4.73	4.21	4.26	4.39
3	A good study environment was formed for the group work activities.	4.56	4.52	4.47	4.47	4.52
4	I enjoyed the activities found in the lesson units.	4.82	4.78	4.65	4.73	4.43
5	I understood the causes of environmental problems better thanks to the activities.	4.73	4.86	4.73	4.78	4.60
6	The questions in the activities regarding environment did not draw my attention.	4.30	4.21	4.69	4.78	4.82
7	Thanks to the activities, my belief in the solution to environmental problems increased.	4.69	4.56	4.65	4.65	4.65
8	Thanks to the discussions in the activities, my ideas regarding the solution to environmental problems increased.	4.78	4.56	4.69	4.86	4.86
9	I didn't underst& much about the activities.	4.43	4.78	4.65	4.60	4.73
10	Thanks to the activities, I had the chance to establish better communication with my teacher.	4.43	4.78	4.47	4.60	4.60
11	I found the discussions in the activities boring.	4.43	4.56	4.78	4.65	4.60
12	Teaching of the activities in the lesson unit was similar to teaching of those in other lesson units.	-	4.52	4.34	4.56	4.52
13	The evaluations in the activities were good.	4.73	4.65	4.65	4.73	4.60
14	The subjects we learned in this lesson unit allowed me to love the course of environmental education more.	4.78	4.82	4.78	4.73	4.65
15	I did not use the information at all I learned about environment in my daily life.	4.39	4.34	4.39	4.43	4.43
16	These activities made environmental education more boring.	4.60	4.56	4.47	4.47	4.52
17	I want the course of environmental education to be taught all the time in that way.	4.78	4.65	4.78	4.78	4.69
18	I can join discussions regarding environmental problems thanks to the	4.26	4.56	4.47	4.43	4.69

	information I learned during the lesson.				
19	Thanks to the activities during the lesson, I found the class environment more entertaining.	4.47	4.60	4.52	4.43	4.43
20	Thanks to the course of environmental education, I get along better with my friends.	4.43	4.56	4.69	4.69	4.69
21	What I learned in the course of environmental education helped me overcome the uncertainties in my mind.	4.69	4.47	4.69	4.69	4.52
22	I understood that the protection of nature with the help of the course of environmental education is fairly important.	4.82	4.82	4.65	4.65	4.52
23	I learned that the nature protects itself against human thanks to the course of environmental education.	4.04	4.30	4.34	4.30	4.39

As can be seen in Table 7, among the mean scores obtained via EAEQ, the mean for the lesson unit of "Environmental Consciousness" ranged between 4.04 (Item 22) & 4.82 (Item 4); the mean for "Ecosystem" between 4.21 (Item 6) & 4.82 (Item 14); the mean for "Plants & Animals" between 4.21 (Item 2) & 4.78 (Items 11, 14 & 17); the mean for "Environmental Phenomena" between 4.26 (Item 2) & 4.86 (Item 8); & the mean for "Environment & Human" ranged between 4.39 (Items 2 & 23) & 4.86 (Item 8).

Findings Obtained via EESF

The achievement levels of the outcomes for each lesson unit are presented in categories. Table 8 demonstrates the findings obtained.

Table 8. Levels of outcomes achieved for EESF

Lesson Units	Outcomes	Achieved	Partly Achieved	Failed	Total	Sample Statements
		f	f	f	N	
Environmental Consciousness	1.1 1.2	21	2	-	23	*Achieved: At the end of this course, I now think that we have to protect our environment, & failure to prevent environmental pollution will bear bad results (S_8).*
	1.3 1.4	19	4	-	23	*Achieved: I learned what waste materials & recycling are. I also learned the influence of recycling on environment, & we have to throw waste materials into recycling bins. (S_1). Partly achieved: I've learned what waste materials in our environment are (S_17).*

	1.5 1.6 1.7	23	-	-	23	*In this course, I learned the characteristics of a healthy environment & the importance Atatürk gave to environment (S21).*
Ecosystem	2.1	23	-	-	23	*Achieved: Previously, I heard the concepts of species, population, habitat & ecosystem, but now I learned them (S10).*
	2.2 2.3	21	2	-	23	*Achieved: I learned about nutrition network & its place in ecosystem. Also, I learned what the living & non-living factors in ecosystem are (S16).* *Partly achieved: In this course, What I understood best is the relationship between living & non-living beings (S23).*
	2.4 2.5	23	-	-	23	*I enjoyed the subject of Habitat a lot. It was interesting for me to learn that habitats have limited numbers of plants & animals (S18).*
	2.6 2.7	23	-	-	23	*I learned about ecosystem, competition & cooperation. I didn't know the relationship between them, but I learned it thanks to the activities we carried out. I learned these subjects (S7).*
	2.8	23	-	-	23	*I learned the human & natural factors influential on ecosystem. I understood what to do to avoid damaging the ecosystem. I think these are very entertaining & beneficial subjects (S9).*
	2.9 2.10 2.11	22	1	-	23	*Achieved: I learned about biological diversity & the concepts I didn't know. I understood the relationship between biological diversity & natural sources. The activities we carried out were quite good (S3).* *Partly achieved: I was not aware of the natural sources in my environment, but I learned them at the end of this course (S22).*
Plants & Animals	3.1 3.2 3.3	23	-	-	23	*I learned about the human & natural factors harmful for plants & animals. It was a very entertaining course (S14).*
	3.4 3.5	23	-	-	23	*I learned that plants & animals need love. I also learned that we have to protect plants & animals & I also learned that just like the human, plants & animals have the right to live (S11).*
						Achieved: I learned about global warming & greenhouse effect. It

Environmental Phenomena	4.1 4.2	22	1	-	23	*was a very nice subject. As I always encounter with these in my environment, it is an important subject for me, & I got conscious thanks to this course (S2). Partly achieved: I learned about the bad effects of global warming on environment (S21)*
	4.3 4.4	23	-	-	23	*I learned about the human factors influential on climate changes & about how to prevent global warming. It was an entertaining course & instructive as well (S23).*
	4.5 4.6	20	3	-	23	*Achieved: I learned the good & bad effects of technological devices on our environment. Also, I learned the influence of air, water & soil pollution on human health. The activities we carried out & the discussions we made helped me underst& the subject better (S4).*
	4.7 4.8	23	-	-	23	*I didn't know anything about renewable & non-renewable energy sources or their effects on environment, but now, I know them thanks to this course (S15).*
Environment & Human	5.1 5.2	23	-	-	23	*I learned the influence of human on environment. In fact, I had general knowledge about this, but now, I know it better. It was quite an entertaining course for me (S13).*
	5.3 5.4 5.5	23	-	-	23	*I learned the bad effects of population growth on environment. I also learned that our world is polluted as the population increases. I learned about the effects of population growth on environment. I also learned about Atatürk's love of environment. I didn't know much about Atatürk's thoughts about this subject, but now I know it (S6).*

According to Table 8, it is seen that 19 students 'achieved' & four students "partly achieved" the outcomes of 1.3 & 1.4 for the lesson unit of "Environmental Consciousness"; that all the students "achieved" the outcome of 2.1, & 21 students "achieved" & two students "partly achieved" the outcomes of 2.2 & 2.3 for "Ecosystem"; that all the students "achieved" the outcomes for "Plants & Animals"; that 22 students "achieved" & one student "partly achieved" the outcomes of 4.1 & 4.2, & all the students "achieved" the outcomes of 4.3 & 4.4 for "Environmental Phenomena"; & that the students "achieved" all the outcomes for the lesson unit of "Environment & Human".

Findings Obtained via CLEQ

The findings obtained via CLEQ will be presented under two headings: Quantitative findings & qualitative findings obtained via the application of CLEQ.

Quantitative Findings Obtained via CLEQ

Each activity, 11 in total, was observed by the researcher & by an independent observer, & the mean score for each item was calculated. Following this, the mean score for each step was calculated. The data obtained are presented in Tables below under the headings of lesson units (The lesson unit of "Environment & Human" was excluded since it did not include any activity according to the 5E learning model). Table 9 demonstrates all the mean scores for the data collected via CLEQ.

Table 9. Mean scores for the data collected via CLEQ

Units / Phases	Environmental Consciousness	Ecosystem	Plants & Animals	Environmental Phenomena
Engagement	3.60	3.25	3.42	3.46
Exploration	3.07	3.47	3.30	3.36
Explanation	2.97	3.20	3.45	3.37
Elaboration	3.50	3.22	3.40	3.21
Evaluation	3.35	3.05	3.20	3.47
Mean Score	3.29	3.23	3.35	3.37

According to Table 9, the highest mean score obtained via CLEQ was 3.37 belonging to the lesson unit of "Environmental Phenomena", & the lowest was 3.23 belonging to the lesson unit of "Ecosystem".

Qualitative Findings Obtained via CLEQ

In relation to the 11 activities appropriate to 5E learning model in the guidance materials developed within the scope of the study, the findings obtained via the open-ended parts of CLEQ are presented below. Each activity was observed by the researcher considering the phases of 5E learning model, & the observations for each phase are presented in Tables below.

Table 10 presents the findings obtained via the researcher's observation of the phase of engagement for the activity.

Table 10. Student & teacher behaviors in the phase of engagement

Application Weeks of CLEQ	Outcomes	By student			By teacher		
		Participation in lessons	Asking questions	Drawing attention	Asking questions	Guidance	Motivating
Week 1	1.1 1.2	x	x	x	x		x
Week 2	1.3 1.4	x	x	x	x	x	x

Week 4	2.1	x	x	x	x		x
Week 5	2.2	x	x	x	x	x	
	2.3						
	2.4						
Week 7	2.8	x	x	x	x	x	x
Week 8	2.9	x	x	x	x		
	2.10						
	2.11						
Week 10	3.2	x	x	x	x	x	
	3.3						
Week 11	3.4	x	x	x	x	x	
Week 12	4.1	x	x	x	x		
Week 13	4.2	x	x	x	x	x	x
	4.3						
Week 15	4.7	x	x	x	x		x
F	19	11	11	11	11	6	6

According to Table 10, the codes of "participation in lessons", "asking questions" & "drawing attention" & the codes of "guidance" & "motivating" were observed 11 times for the phase of engagement. The researcher's statements regarding the codes of "participation in lessons", "drawing attention" & "guidance" obtained via the observations were as follows:

> R: Following the demonstrations, the teacher directed questions to the students regarding the subject, & most of the students were observed to raise their h&s to respond, & they gave different answers to the question.
>
> R: The teacher started the lesson by bringing slights in class that demonstrated the polluted environment & a video related to "Environmental Pollution-1".
>
> R: Some of the students responded to the teacher's question saying "lion", & the teacher replied "Does it live in our environment?" to have the student re-think about his/her response.

Table 11 presents the findings obtained via the researcher's observation of the exploration phase of the activity.

Table 11. Student & teacher behaviors in the phase of exploration

Application Weeks of CLEQ	Outcomes	By Student		By Teacher		
		Doing Group work	Student Willingness	Guidance	Motivating	Asking Students for Their Ideas
Week 1	1.1	x	x	x	x	x
	1.2					
Week 2	1.3	x	x	x	x	x
	1.4					
Week 4	2.1	x	x	x		x
Week 5	2.2	x	x			x
	2.3					
	2.4					

Week 7	2.8	x	x			x
Week 8	2.9 2.10 2.11	x	x		x	
Week 10	3.2 3.3	x	x			x
Week 11	3.4	x	x	x		
Week 12	4.1	x	x	x	x	x
Week 13	4.2 4.3	x	x	x		x
Week 15	4.7	x	x	x	x	x
F	19	11	11	7	5	9

According to Table 11, in the exploration phase of the observations, the codes of "doing group work" & "student willingness" were observed 11 times; the code of "guidance" was observed seven times; & the code of "asking students for their ideas" was observed nine times. The researcher's statements regarding the codes of "doing group work" & "asking students for their ideas" were as follows:

R: The teacher asked the students to do group work by allocating a certain period of time so that they could find an answer to the question of "How do industrial wastes, forest fires & environmental pollution damage ecosystem?".

R: Next, the teacher asked the group spokesman of each group about their views regarding what they had done in their groups.

Table 12 presents the findings obtained via the researcher's observation of the explanation phase of the activity.

Table 12. Student & teacher behaviors in the phase of explanation

Application Weeks of CLEQ	Outcomes	By Student		By Teacher	
		Using Previous Learnings	Giving Examples	Guidance	Making Explanations
Week 1	1.1 1.2	x	x	x	x
Week 2	1.3 1.4		x		x
Week 4	2.1		x	x	x
Week 5	2.2 2.3 2.4			x	x
Week 7	2.8				x
Week 8	2.9 2.10 2.11		x		x
Week 10	3.2 3.3				x
Week 11	3.4	x			x

Week 12	4.1	x	x	x	x
Week 13	4.2 4.3	x		x	x
Week 15	4.7		x		x
f	19	4	6	5	11

According to Table 12, regarding the explanation phase of the observations, the code of "giving examples" was observed six times; the code of "guidance" was observed five times; & the code of "making explanations" was observed 11 times. The researcher's statements regarding the codes of "giving examples" & "making explanations" were as follows:

> R: In this phase, the students were observed to give direct examples from their environment in relation to recycling & wastes.

> R: In this phase, the teacher was observed to provide their students with the most appropriate scientific information & to help them underst& the subject better.

Table 13 presents the findings obtained via the researcher's observation of the elaboration phase of the activity.

Table 13. Student & teacher behaviors in the phase of elaboration

Application Weeks of CLEQ	Outcomes	By Student				By Teacher			
		Defending one's thoughts	Class Discussion	Sharing Ideas	Doing Group Work	Elaborating the Subject	Guidance	Asking Questions	Encouraging
Week 1	1.1 1.2	x		x		x	x	x	x
Week 2	1.3 1.4		x		x	x	x	x	
Week 4	2.1	x				x		x	
Week 5	2.2 2.3 2.4		x	x		x	x	x	
Week 7	2.8				x			x	x
Week 8	2.9 2.10 2.11		x			x		x	
Week 10	3.2 3.3		x	x		x	x	x	
Week 11	3.4					x		x	
Week 12	4.1	x		x		x		x	
Week 13	4.2 4.3		x			x		x	
Week 15	4.7		x	x		x		x	
f	19	3	6	5	2	10	4	11	2

According to Table 13, regarding the elaboration phase of the observations, the code of "class discussion" was observed six times; the code of "sharing ideas" was observed five

times; the code of "elaborating the subject" was observed 10 times; & the code of "asking questions" was observed 11 times. The researcher's statements regarding the codes of "class discussion", "elaborating the subject" & "asking questions" were as follows:

> R: After watching the videos related to "Biological Diversity" & "Our Natural Sources", the students were guided to make in-class discussions regarding the concepts in question.

> R: By having the students watch the videos related to "Recycling of Rubber Tires", "How to do Recycling" & "Recycling & Environment", the subject was elaborated.

> R: After watching the videos, the teacher was observed to direct attention-grabbing related to the subject.

Table 14 presents the findings obtained via the researcher's observation of the evaluation phase of the activity.

Table 14. Student & teacher behaviors in the phase of evaluation

Application Weeks of CLEQ	Outcomes	By Student			By Teacher	
		Summary of Learnings	Active Participation	Discussing the Questions	Motivating	Guidance
Week 1	1.1 1.2	x	x		x	x
Week 2	1.3 1.4	x	x	x		x
Week 4	2.1		x			x
Week 5	2.2 2.3 2.4	x	x		x	
Week 7	2.8	x	x			x
Week 8	2.9 2.10 2.11	x	x			x
Week 10	3.2 3.3		x	x		x
Week 11	3.4	x	x	x		
Week 12	4.1		x	x		x
Week 13	4.2 4.3	x	x			x
Week 15	4.7	x	x			x
f	19	8	11	4	2	9

According to Table 14, regarding the evaluation phase of the observations, the code of "summary of learnings" was observed eight times & the codes of "active participation" & "guidance" were observed nine times. The researcher's statements regarding the codes of "summary of learnings" & "guidance" were as follows:

> R: Depending on what the students learned in class, the teacher asked them to do the activity of "Yesterday-Today-Tomorrow".

R: The students were observed to write down their responses in the wrong place due to misunderst&ing, but then, the teacher's guidance allowed them to write down their responses in the correct place.

DISCUSSION

In the present study, taking the views of the students & the teacher into account, evaluated the environmental education modular curriculum developed to provide secondary school students with environmental education with a content specific to it. The initial findings obtained in the study demonstrated that the students found the lesson units in the modular curriculum entertaining & that the lesson units developed could be put into practice in terms of their contents. In addition, the fact that the students were able to put their learnings thanks to the lesson units into practice in their daily lives could be said to indicate that the modular curriculum has become a part of our daily life. Based on the findings obtained, it could also be stated that the curriculum designed has brought about changes not only in students' knowledge but also in their daily lives. The fact that the students' families used the recycling bins that the students produced as a product of the "Recycling Bin Project" during the application of the modular curriculum demonstrates the good impact of the curriculum designed. The fact that the students wanted to use the information they have learned to solve the environmental problems in their environment also shows that the application was influential both in the short term & in the long term. Based on this situation, it could also be stated that students better learn & internalize new things they find entertaining (Ağgül-Yalçın & Bayrakçeken, 2010; Sarıay, 2008).

The below statements made by the teacher & by the students who found the activities in the modular curriculum entertaining & beneficial for the teaching of the subjects in environmental education demonstrate that the students raised their consciousness of the environment thanks to the activities.

S_{A1}: In the past, I didn't give much importance to recycling. Recycling was an important problem for the environment, & we had to do it. I used to throw garbage into waste bins, but now I throw them into recycling bins.

T: The activities were appropriate to the students' levels. Also, I can say there was no activity exceeding the students' levels in terms of difficulty. Thus, the students were able to do most of the activities. They did not get bored while doing the activities. They enjoyed them. The activities were all beneficial for raising the students' consciousness of environment.

The fact that the teacher & the students gave similar answers during the interviews & had similar views demonstrates that the application was beneficial for both sides; that it did not lead to any misunderst&ing; & that it supported interaction between the students & the teacher. In other words, the fact that the course objectives were parallel to the students' needs demonstrates that the modular curriculum developed served the purpose & was applicable & consistent. This shows that the method used in the modular curriculum, the up-to-datedness of the subjects & appropriateness to the students' levels made environmental subjects & concepts more attractive & grabbed their attention. In brief, the subjects & concepts included in the curriculum developed could be said to be applicable both for the teacher & for the students.

It could also be stated that the curriculum developed supported group work to allow interactive learning for students. The students could be said to learn better via group work depending on one student's statement: "*S_{O1}: I exchanged ideas with my friends regarding the environmental subjects. Learning new information about the phenomena in my environment allowed me to love the environment & environmental education*". Also, the findings obtained via EAEQ support the fact that activities involving group work were more beneficial & helpful for learning environmental subjects. The higher mean scores obtained via EAEQ demonstrate that the activities had positive influence on group work. In other words, the modular curriculum developed could be said to be appropriate to interactive group work (Ünlü & Aydıntan, 2011; Sezer & Tokcan, 2003; Coca, 2013; Doymuş et.al., 2010; Manolas & Filho, 2011).

We increasingly experience environmental problems in our environment. Considering the fact that it is important for students to learn about current environmental problems & to suggest solutions to these problems (Sarıay, 2008; Özsevgeç & Artun, 2012c; Balgopal & Wallace, 2009), the modular curriculum could be said to help students both underst& environmental problems & produce solutions to these problems. This is obvious in the statement of a student coded as $S_{A1,}$ who reported that *"…In other courses, teachers always teach something, & this is somewhat boring... Today, we learned via the discussion report that the effects of population constitute an environmental problem. In order to prevent its effects on environment, we tried to suggest solutions…"* in the statement of another student coded as S_{10} in his/her self-evaluation form who noted that *"I learned that global warming & climate changes are all regarded as environmental problems. I learned the human factors causing these problems. I also learned how to prevent global warming & environmental pollution"*. Depending on this, the fact that the modular curriculum could not only help students become knowledgeable about certain environmental problems such as environmental, air, water & soil pollutions, global warming & greenhouse but also provide students with the opportunity to suggest solutions to these problems demonstrates applicability of the curriculum.

The fact that the outcomes of the modular curriculum are applicable & that the modular curriculum inform students about environmental subjects is obvious in one statement of the teacher, who reported that *"T:... The lesson units & the outcomes were efficiently good. I also think that they helped the students raise their consciousness of environment & become more sensitive to the environment"*. The teacher's view that *"…The students were asked to write down slogans related to environment in the course of Turkish Language, & they wrote down the slogans they produced in the course of environmental education…"* demonstrates that the modular curriculum provided the students with the opportunity to transfer what they had learned into other disciplines; that the curriculum had positive influence on the students; & that the applications were successful. Depending on this, the outcomes in the modular curriculum could be said to be applicable. Similarly, the teacher's view that there was no problem with the application of the activities in the modular curriculum & that the activities were effective in terms of the students was another indicator of the applicability of the curriculum. The justifications put forward by the teacher are also consistent with the results of studies which point out that environmental education should be given as a separate course (Köse et.al., 2011; Çalık, 2011; Özsevgeç & Artun, 2012a; Çalık & Eames, 2012).

Since the constructivist learning approach was taken as basis while designing the modular curriculum for environmental education, multiple measurement & evaluation techniques were used for the evaluation of the students. The fact that the questions in the modular curriculum were applicable & that the questions were deductive & appropriate to the subjects is obvious in the statement made by $S_{Ü2,}$ who reported that *"…they were entertaining questions. I didn't find them difficult because I had learned the subjects well"*. Multiple measurement & evaluation cover the process & produce development. The questions in the curriculum demonstrate that they functioned well in the process & that they are thus applicable. The modular curriculum supports the product besides the process. The curriculum developed could also be said to be applicable depending not only on its outcomes, the learning environment & instructional materials but also on its dimension of measurement & evaluation. To sum up, in the light of the findings mentioned above, the modular curriculum could be said to be applicable not only in terms of the subjects, outcomes & activities but also with respect to measurement & evaluation.

CONCLUSIONS

1. The fact that the activities in the modular curriculum developed were appropriate to the outcomes of the lesson units; that the activities were consistent with the outcomes; & that the outcomes helped teach the subjects & concepts demonstrated the applicability of the curriculum.
2. The fact that the students used what they had learned via the modular curriculum in writing "Slogans" related to environment in different courses or in other activities

showed that the modular curriculum had good effects on the students in terms of environmental education & that it was a curriculum supporting other courses.

3. Depending on the fact that the students reached the necessary information on their own within the scope of the modular curriculum; that they learned by doing & discussing the activities; & that the teacher provided guidance, the application process could be said to be a curriculum appropriate to constructivism.

4. The fact that the subjects included in the modular curriculum were general, or specific; that the subjects met the students' needs; & that the contents of the subjects allowed finding solutions to environmental problems in today's conditions demonstrated that it was an up-to-date curriculum appropriate to environmental education.

5. Based on the fact that the modular curriculum, with the awareness it raised & with its applications put into action, helped students not only underst& better the damages given by people to the environment but also produce solutions to problems they encountered, it could be stated that the applicability of the curriculum was fairly applicability.

6. The fact that the students observed the environmental phenomena in their environment like scientists, took related notes & shared them in class & that the outcomes in the modular curriculum helped develop such skills of students as research, investigation, problem solving as well as their scientific process skills demonstrated that the modular curriculum was applicable.

7. The fact that the students acquired such skills as critical thinking & questioning the concepts related to environmental education in different ways demonstrated that the modular curriculum not only led to fundamental changes in the students' views points regarding environmental phenomena they encountered in their daily lives but also raised their awareness of environment.

8. Depending on the fact that the activities included in the modular curriculum drew the students' attention & encouraged to make more efforts to learn the concepts related to environmental education, it could be stated that the modular curriculum was appropriate to the students' levels.

9. The fact that the students learned environmental concepts & associated them with their daily lives following the application of the modular curriculum demonstrated that the students put the modular curriculum into practice in their daily lives.

SUGGESTIONS

1. Decreasing the damage given to environment, protection of natural balance & prevention of environmental pollution require students to have permanent knowledge about environment. In order to provide permanent related solutions, to find solutions to environmental problems & to take precautions regarding future probable environmental problems, the modular curriculum developed in the study should be put into practice prevalently & effectively.

2. By observing the students for a period of year to whom the modular curriculum developed have been applied, the students' attitudes towards environmental education, their levels of knwoledge & the longitudinal influence of the modular curriuclum could be investigated.

3. In order to apply the modular curriculum more effectively & to allow students to find the opportunity to study at schools, class environments could be organized in a way appropriate to environmental education.

Disclosure statement

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