

Modular Curriculum Designed for the Environmental Education of 6th and 7th Grade Students in the North Cyprus

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ABSTRACT

The environment can be defined as the whole system where the history and culture of people who live is constantly utilized while forming them with all natural beings in relation and interaction with each other. The ecosystem has changed with the impact of occasional natural events, and has reached a balance. However, since the first existence of people, they started to increasingly form the natural habitat in the way they desired, which led to a fast deterioration in the natural balance of the ecosystems. In the beginning. Such impacts were very limited; however, they had reached a momentum after the industrial revolution.

Keywords: modular curriculum, environmental education, environment

INTRODUCTION

The balance had started to be on the negative side of nature in the relationship between nature and mankind. Due to the production, methods and mechanisms of mankind, it had become very difficult for nature to protect itself and stay within the tolerance levels through the regeneration opportunities; and it even reached an irrevocable process. Additionally, there are many examples. The seasons are changing, the glaciers are melting, the forests are destroyed wildly, the air that we breathe is loaded with poison and our ears, eyes and brain are being filled with noise, concrete and metal pollution. The basis of environmental education is the protection of nature and natural resources. In addition to providing information, environmental education should influence human behaviour. The main objective of environmental education is to provide positive and permanent behavioural changes and ensure the active participation of individuals in the problem solution. An effective environmental education program is only possible with qualified teachers with positive environmental attitude and who are sensitive to environmental problems. Only such teachers can give knowledge, raise awareness of students about the environment in addition to contributing to the development of values and attitudes of students (Yıldırım, 1996). The students with negative attitudes towards the environment are considered to be less sensitive to environmental problems and even create problems against the environment (Uzun & Sağlam, 2006).

Another reason that leads the students to a negative attitude might be their lack of knowledge on the environment. The students have very little knowledge about the concepts of environmental education; they do not know the meanings of concepts and they do not completely perceive such concepts (Atasoy & Ertürk, 2008). Students learn the correct information from the printed and visual media rather than their families or at schools, which might be another reason for the lack of knowledge among students on the environmental (Darçın, Bozkurt, Hamalosmanoğlu & Köse, 2006).

There are a total number of five scenarios regarding the problem solving skills of students. These include Environmental awareness Ecosystem, Environmental events and Environment and humans. The problem “what is the impact on the problem solving skills of students?” was discussed based on the findings generated from the scenarios in relation to the problem solving skills of students. The high level of total scores among groups indicates the effectiveness of the curriculum since the application of activities was in accordance with the 5E learning model. The students were familiar with the topics via activities and the scenarios and topics were interesting for the students (Balgopal & Wallace, 2009; Gül & Yeşilyurt, 2011; Özsevgeç & Artun, 2012c). The scenarios were interesting, suitable to the levels and related with the everyday life problems. Through the modular curriculum,

Contribution of this paper to the literature

- The developed environmental education modular curriculum would provide more chances to students in the class environment so that they would be more effective, and would facilitate them to think on the environmental problems that they would encounter throughout their lives, generate solutions and lead to solving such problems.
- The modular curriculum would help students to work towards a solution for of the environmental problems around them, and become individuals with environmental literacy through increasing their knowledge of environmental topics.
- The environmental education modular curriculum would provide guidance to teachers with regard to the environmental education with the activities developed suitable for students effective in the learning process of students, economical as well as being easy-to-use, and lead them to appreciate environmental education.

students had the chance to do research within the framework of various projects and ensure the correct description of existing problems, and to reach effective outcomes by following a systematic order such as the options required for solution and selection of the most suitable method.

Such circumstances might cause the development of negative attitudes towards the environmental among students. The abovementioned problem shows that the activities and practices at schools, which would ensure environmental awareness among students, help them to solve environmental problems and develop their problem solving skills, are not sufficient (Özsevgeç & Artun, 2012a; Şimşekli, 2001). At this level, all efforts would not go beyond the identification of environmental problems and transfer of theoretical information about the reasons for such problems to the students. As a natural outcome, the students would not create solutions for the environmental problems, would not form environmental awareness, would not maintain their conceptual learning and attitude change, and hence would not develop their problem solving skills as they would not have active participation in the solution of environmental problems (Taycı & Uysal, 2009). The 5E methods is believed to be useful for these kind of tasks.

The following paragraphs include explanations of both the 5E Learning Cycle phases and the major tasks for the teacher and students in each phase (Bybee & Landes, 1988; Stamp & O'Brien, 2005). As for the 5E methods, it represent five stages of a sequence for teaching and learning: Engage, Explore, Explain, Extend and Evaluate. As The 5E learning cycle leads students through a sequence of learning in which they become engaged in a topic, explore that topic, are given an explanation for their experiences, elaborate on their learning, and are evaluated. (Wilder & Shuttleworth, 2005).

Engagement phase (E1): The teacher assesses students' prior knowledge and engages students in learning a new concept. The teacher also helps students make connections between prior and present knowledge, and helps to organize students' thoughts about the learning outcomes of present activities.

Exploration phase (E2): The teacher provides students with a common base of activities reflective of present concepts and skills. Students complete activities by using their prior knowledge to generate new ideas, to explore questions and possibilities, and to execute a preliminary investigation.

Explanation phase (E3): The teacher focuses students' attention on a specific aspect of their "engagement" and "exploration" experiences, and provides opportunities for students to demonstrate their understanding or skills. The teacher can also use direct instruction and guide the students toward a deeper understanding of a concept.

Elaboration phase (E4): The teacher challenges and extends students' conceptual understanding and skills. Students learn to develop broader and deeper understanding and skills, through the above three phases.

Evaluation phase (E5): The teacher evaluates students' progress toward achieving the instructional goals. Students learn to assess their understanding and abilities.

A modular curriculum organises multi-dimensional activities covering plant and animals. The modular curriculum allows the 6th and 7th grade students to observe the features of plants and animals around them just like a scientist, to take notes and share those notes in the classroom, all of which contribute to the understanding of such concepts. Another significant component of the designed curriculum is that during the learning process, students are always active, namely students actively participate to the activities, observations and in-class discussions. Within the framework of the designed curriculum, the achievement tests were utilised to identify the products of students while projects and self-assessment were used to reflect the performances of students, as the aim is to demonstrate to the students all aspects and allow them to assess themselves. Hence, the curriculum might have allowed the students to constantly review themselves to identify their deficiencies (Özsevgeç, 2007) and improve themselves. Such a feature of the modular curriculum might have improved their conceptual understanding. It is easy to interpret this as the more suitable education strategies are, the better it is for students.

Table 1. Sample Size and Applications of Research

Process	Activities
	Identification of research problem
Design of Environmental Education Modular Curriculum	Literature review
	Identification of acquisitions
	Description of chapters
	Development of data collection tools
	Preliminary and final tests of achievement tests
	Preliminary and final tests of environmental education attitude scale
Pilot Study	Final test of environmental education self-assessment form
	Validity analysis of data collection tools
	Reliability and validity analyses of data
	Preliminary and final tests of environmental education attitude scale
Original Study	Pilot applications based on the problem solving skills
	Final test of environmental education self-assessment form
	Final test of integrated learning environment survey

With that feature, the utilisation of methods and techniques like group work, brainstorming and discussion during the same lesson might have improved the conceptual understanding of students (Coca, 2013).

Despite of the fact that there is no significant difference between the environmental attitudes of students, the provision of an interactive education process opportunity to the students via the designed curriculum (Sarıay, 2008; Taş & Seçken, 2009) and application of students oriented practice together with various features might cause a change in the attitudes of students. The outcome of the designed curriculum supports such studies; and the use of different methods and techniques in the application might have increased the attitudes of students (Ergin & Okutmuş, 2007). The lack of supplementary education tools cause a major deficiency in environmental education, as such tools cover the relevant benefits/topics, support the environmental education concepts with enriched activities and facilitate the students to generate solutions to environmental problems.

Therefore, the aim of the environmental education modular curriculum designed in the study is to identify the impact on the conceptual understanding and academic success of 6th and 7th grade students in North Cyprus.

MATERIAL AND METHODS

Data Collection Tool

The data collection tools of this research are “Achievement Test Based on Chapters”, “Environmental Education Attitude Scale”, and “Environmental Activities Assessment Survey” based on the sub-problems.

“The Integrated Multiple Case” pattern, which reviews all data as a whole, is a part of a specific case suitable for the nature of the study, and is used in the five different chapters under the modular curriculum designed for this study had formed multiple variable. Each chapter is analysed separately to understand the internal changes and process, and then to understand the efficiency of the implementation process (Cohen & Manion, 1989; Çepni, 2010).

Research Sample

During the pilot and original implementation of the research, it was ensured that the researcher would perform the research much easier; the researcher would be enthusiastic and voluntary during the application; the students would show similar characteristics from every aspect and the physical facilities of school would be suitable for the research. The sample of the study comprised of a 30-person sample group from two schools selected using the random sampling method. The sample size and implementation of the study are given in **Table 1**.

Prior to the performance of the pilot study, the teacher, who would help the in the implementation was discussed with in relation to the guide materials and assessment tools and provided with the information on the guide materials, assessment tolls and period of administration. Information exchange was also conducted with the teacher that would help in the administration prior to and after the lesson about what would be done. As the pilot and original study were both conducted by the same teacher, the related teacher was observed to be more experienced during the original study. It is known that the teacher had knowledge on the 5E learning method and was giving consideration to apply such a model in his classes and conducting activities accordingly.

The willingness of the assistant teacher in such activities contributed to bringing the guide materials and data collection tools to the final shape as the teacher adopted the pilot and original study, was helpful as much as possible and in providing information about the status of the students.

Validity and Reliability

The reliability and validity of data collection tools of this study are crucial. Therefore, the reliability and validity of data collection tools must be conducted. The data collection tools were tested through a pilot study on the 6th and 7th grade students of Atleks Sanverler and Turk Maarif Koleji located in North Cyprus.

In consideration of the evaluation of collected data, the data collection tools were found to be valid and could be used in the study. Under the modular curriculum, there are achievement tests for five different chapters. As a result of the pilot study, the Cronbach's alpha reliability coefficients of tests were .791 for the "Environmental Awareness Chapter", .743 for the "Ecosystem Chapter", .891 for the "Plants and Animals Chapter", .816 for the "Environmental Events Chapter" and .823 for the "Environment and Human Chapter" respectively. Such reliability coefficients can be considered as good and suitable for the study (Büyükoztürk et al., 2017). The Cronbach's alpha reliability coefficient of the environmental education attitude scale was calculated as .892, which could be considered as at a good level (Çepni, 2010). The Cronbach's alpha reliability coefficient of the environmental activities assessment survey was calculated as .761.

Data Analysis

The research data were collected through the environmental education attitude scale, environmental activities which included assessment surveys, scenarios on problem solving skills and achievement test. In order to identify the variance in the environmental attitudes of students, t-test, frequency of answers in the environmental activities assessment and daily notes of researcher for the observations were analysed.

The SPSS 20 program was utilised to statistically analyse the findings from the environmental attitude scale and achievement tests. The achievement tests, which would be used as preliminary and final tests of chapters, were conducted to measure the change aspect of knowledge levels of students for each chapter. T-test analysis was conducted for the identification of whether or not there is any significant relation between the final test scores of the five chapters in the modular curriculum. The views of students regarding the activities of student guide materials were identified through the environmental activities assessment survey. Pilot activities were performed for the guide materials developed in the study and an assessment was undertaken accordingly. Evaluation of the pilot study results, the guide materials and assessment tools prepared for the original study were administered on the last 2 hours of lessons during the 5 weeks as the complete 2nd semester of 2016-2017 academic year was the original study period. Firstly the research problem was determined for the application of the environmental education modular curriculum. A literature review was conducted. Chapters were described as; environmental awareness, ecosystem, plants and animals, environmental events, environment and humans. Guide materials were developed and environmental education attitude scale, scenarios on the problem solving skills and an achievement test were administered. The preliminary and final tests were conducted and then finally the results were reported.

Data Collection Tools

The achievement test developed for the five chapters of the research "Environmental Awareness", "Ecosystem", "Plants and Animals", "Environmental Events" and "Environment and Humans" were used in the analysis. For each of the chapters, the analysis results of the achievement test results were identified. After the evaluation of the preliminary and final test results of the achievement tests were administered to the sample group, a t-test was performed to identify whether or not the difference between the preliminary and final tests were statistically significant. The related results are given in [Table 2](#).

FINDINGS

As seen in [Table 2](#), there is a statistical significant difference in favour of the final test For the Environmental Awareness Chapter, $p = .000$, $p < 0.05$), for the Ecosystem Chapter, $p = .003$, $p < 0.05$); for the Plants and Animals Chapter, $p = .005$, $p < 0.05$); for the Environmental Events Chapter, $p = .001$, $p < 0.05$); and for the Environment and Humans Chapter, $p = .003$, $p < 0.05$.

Table 2. T-Test results on the achievement test

Chapters	Group	N	Standard Deviation	t	p
1. Environmental Awareness Chapter	Preliminary test	30	6.23	7.22	.000
	Final test				
2. Ecosystem Chapter	Preliminary test	30	6.79	6.51	.003
	Final test				
3. Plants and Animals Chapter	Preliminary test	30	3.47	6.13	.005
	Final test				
4. Environmental Events Chapter	Preliminary test	30	8.29	7.39	.001
	Final test				
5.Environment and Humans Chapter	Preliminary test	30	10.69	4.63	.003
	Final test				

Table 3. T-test results on the environmental attitude scale

Group	N	Arithmetic Average	Standard Deviation	t	p
Preliminary test	30	126.75	19.25	9.23	.007
Final test					

The problem of study was “Is there a significant effect of the designed environmental education modular curriculum on the environmental attitudes of 6th and 7th grade students from the schools in North Cyprus?” The objective in using such assessment tools is to reflect the changes in the environmental attitudes of students in detail. After the evaluation of the preliminary and final test results of achievement tests administered to the sample group, a t-test was performed to identify whether or not the difference between the preliminary and final tests are statistically significant. The related results are given in **Table 3**.

As seen in **Table 3**, there is no statistical significant difference in favour of final test among the preliminary and final test results of students ($p = .007$, $p > 0.05$).

The problem of the study was identified as “What is the effect of the designed environmental education modular curriculum on the problem solving skills of 6th and 7th grade students from the schools in North Cyprus?” There were a total number of 5 scenarios regarding the problem solving skills of students in the “Environmental Awareness Chapter”, the “Ecosystem Chapter”, the “Environmental Events Chapter” and the “Environment and Humans Chapter”. The findings with regard to the application of scenarios on the 6th and 7th grade student groups in the North Cyprus are given in **Table 4**.

During the application of this skill, we used five steps. The first step was “determine the problem”, second step was “collection of information”, third step was “investigation of probing solutions”, fourth step was “determination of solutions”, and the final step was “problem solving.”

Table 4. Total scores from the application of "Scenarios In Relation With The problem Solving Skills" on the student groups

Chapters	Name of Groups	I. Step: Identification of Problem	II. Step: Information Collection	III. Step: Searching for Problem Solving	IV. Step: Identification of Solution	V. Step: Problem Solving	Total Score
"Environmental Awareness" Chapter	ÇB1	6	5	3	5	5	24
	ÇB2	3	3	3	4	4	20
	ÇB3	5	5	4	6	3	23
	ÇB4	4	3	4	5	5	21
	ÇB5	4	5	5	6	6	26
"Ecosystem" Chapter	EK1	5	3	3	5	4	21
	EK2	3	4	5	3	5	20
	EK3	4	2	2	3	5	16
	EK4	3	2	6	2	4	17
	EK5	3	5	5	4	2	19
"Plants and Animals" Chapter	BH1	3	2	4	5	3	17
	BH2	5	3	4	4	6	22
	BH3	6	2	4	3	3	18
	BH4	3	4	4	3	3	17
	BH5	5	5	6	2	5	23
"Environmental Events" Chapter	ÇO1	5	5	3	3	4	20
	ÇO2	2	3	2	5	3	15
	ÇO3	6	2	5	4	5	17
	ÇO4	3	6	5	3	4	21
	ÇO5	5	4	6	5	3	23
"Environment and Humans" Chapter	Çİ1	4	4	5	6	4	23
	Çİ2	5	2	4	5	5	21
	Çİ3	5	2	6	3	2	18
	Çİ4	3	5	3	4	4	19
	Çİ5	4	3	6	2	5	20

Students can only get 7 points as the lowest and 27 points as the highest

As seen from **Table 4**, the ÇB group got 114 points in total, the EK group 93 points, the BH group 97 points, the ÇO group 96 points and the Çİ group 101 points.

The environmental activities assessment survey was conducted to identify the views of 6th and 7th grade students from the schools in North Cyprus about the activities in the student guide material. The survey has a total of 22 items and is in the form of a 5-point likert scale as ranging from "Strongly Agree", "Agree", "Neutral", "Strongly Disagree" and "Disagree". The complete arithmetic averages of data generated from the environmental activities assessment survey are given in **Table 5**.

Table 5. Arithmetic Averages of Environmental Activities Assessment Survey

No	Items	Chapter (ÇB)	Chapter (EK)	Chapter (BH)	Chapter (ÇO)	Chapter (Çİ)
1	The group activities have made us more environmentally conscious.	3.21	3.36	3.65	3.56	3.43
2	I couldn't understand the topic in the activities requiring group work.	3.17	3.65	3.41	3.21	3.46
3	The environment was good in group work activities	3.21	3.54	3.18	3.45	3.65
4	I enjoyed the activities of the chapter.	3.63	3.21	3.56	3.23	3.49
5	I understand the environmental problems more with the activity.	3.17	3.47	3.27	3.65	3.57
6	I am not interested in the environmental problems given in the activities.	3.24	3.52	3.34	3.54	3.45
7	I have more faith in the environmental problems with the activities.	3.66	3.82	3.29	3.43	3.65
8	I have more opinions on the solution of environmental problems based on the discussions at of the activities.	3.14	3.41	3.37	3.61	3.22
9	I couldn't understand a lot from the activities.	3.66	3.54	3.28	3.17	3.42
10	I had a better chance to communicate with our teacher about the activities.	3.29	3.25	3.66	3.49	3.55
11	I found the discussions during the activities boring.	3.17	3.47	3.56	3.43	3.56
12	The activities in the chapter are taught in a similar way to the other chapters.	3.56	3.24	3.41	3.29	3.66
13	The evaluations in the activities were good.	3.22	3.49	3.66	3.19	3.49
14	The topics that I saw in this chapter made me like the environmental education lesson more.	3.42	3.49	3.26	3.33	3.51
15	I haven't used the information about the environment in my daily life that much.	3.53	3.42	3.19	3.34	3.47
16	Such activities made the environmental education lesson quite boring.	3.22	3.37	3.51	3.49	3.66
17	I want the environmental education lesson to be always taught like this.	3.23	3.41	3.34	3.54	3.55
18	I can use the information that I learnt in the lesson to discuss such matters.	3.19	3.14	3.25	3.51	3.43
19	The activities during the lesson made the class environment more enjoyable.	3.43	3.21	3.31	3.58	3.66
20	I started to get along with my friends better through the activities in the environmental education lesson.	3.56	3.29	3.17	3.26	3.51
21	What I learnt from the environmental education lesson eliminated the unclear points for me.	3.17	3.47	3.63	3.33	3.39
22	With the environmental education lesson, I learnt that nature protects itself against humans.	3.21	3.33	3.55	3.29	3.55

According to **Table 5** showing the arithmetic average of environmental activities assessment surveys, the average of the ÇB chapter is between 3.17 and 3.66, that of the EK chapter between 3.21 and 3.82; that of the BH chapter between 3.17 and 3.66, that of the ÇO chapter between 3.17 and 3.65 and lastly that of the Çİ chapter between 3.22 and 3.66.

DISCUSSION AND CONCLUSION

After the evaluation of the preliminary and final test results of the achievement tests administered to the sample group, a t-test was performed to identify whether or not the difference between the preliminary and final tests were statistically significant. There was a statistical significant difference between the preliminary and final test scores of the 6th and 7th grade students in favour of final test: Environmental Awareness Chapter, $p = .000$, $p < 0.05$), Ecosystem, $p = .003$, $p < 0.05$); Plants and Animals, $p = .005$, $p < 0.05$); Environmental Events, $p = .001$, $p < 0.05$); Environment and Humans, $p = .003$, $p < 0.05$.

Following the assessment of the preliminary and final tests in relation with the achievement test applied on the students for the "Environmental Awareness Chapter", the statistically significant difference between the preliminary and final test scores of students in favour of the final test indicated that the modular curriculum leads to an increase in the academic success of students and the clarity of related outcomes of the modular curriculum for the students

contributed to the learning process of concepts and enhancement of academic success. The designed curriculum created a discussion environment for students and led them to organize discussion activities on the concepts. This discussion can be considered as a contribution of the students to discuss the current issues and help them to reach solutions. Therefore, the modular curriculum enabled the effective learning environment given in the literature and thus would improve in the future. The environment, environmental pollution, waste and prevention of environmental pollution are the topics on the agenda. The modular curriculum emphasizes the issues of recycling and waste; gives sufficient time to learn such concepts and leads to a positive change in the conceptual understanding and academic success of students by constituting unique outcomes in relation with recycling. Such a situation can be interpreted as a separate environmental education lesson that is effective in improving success in terms of conceptual understanding and academic success (Akyol & Kahyaoğlu, 2012). Since the activities are in compliance with the 5E learning model, the students are able to recycle paper and understand the concept of recycling in addition to facilitating better understanding of concepts conducted under “*the problem solving*” step (Özsevgeç & Artun, 2012b; Şahin, 2010).

Following the assessment of the preliminary and final tests in relation to the achievement test administered to the students for the “*Ecosystem Chapter*”, the statistically significant difference between the preliminary and final test scores of students in favour of the final test indicated that the modular curriculum leads an increase in the academic success of students using the modular curriculum. The modular curriculum and studies of Ramadoss and Poyyamoli (2011) and Lindemann-Matthies, P. (2002) regarding the importance of bio-diversity and its provision within a curriculum have similarities. The designed curriculum provides bio-diversity under a curriculum together with the outcomes and activities, which might find solutions for the deficiencies of related studies and improve the conceptual understanding of students. Since the modular curriculum allows students to merge different activities and correlate the concepts, it is considered as contributing to the realization of learning by bringing the mental functions of students to the high levels. The efficient use of the 5E learning model can be interpreted as improving the conceptual understanding (Artun & Coştu, 2013; Gül & Yeşilyurt, 2001). On the other hand, another feature of the designed curriculum is that the activities are suitable for students and they are able to understand the concepts themselves. The modular curriculum enables the use of alternative teaching methods and techniques that are more efficient in environmental education rather than the traditional teaching methods (Coca, 2013; Lindemann-Matthies, 2002; Manolas & Leal Filho, 2011; Ramadoss & Poyyamoli, 2011). The longer and more comprehensive learning environment provided to the students through the modular curriculum allows students to improve their critical thinking skills and contributes in finding solutions to the problems. Therefore, a good learning environment of students have a major place in learning concepts (Bukova-Güzel, 2008; Tafrova-Grigороva, Boiadjieva, Emilov, & Kirova, 2012).

Following the assessment of preliminary and final tests in relation with the achievement test administered to the students for the “*Environmental Events Chapter*”, the statistically significant difference between the preliminary and final test scores of students in favour of the final test indicated that the modular curriculum leads an increase in the academic success of students in terms of the Environmental Events Chapter. The study of Thornber, Stanisstreet, and Boyes (1999) stated that the knowledge of students in relation to air pollution and damages caused by air pollution, and such a concept must have a major place in the curriculum. The modular curriculum widely covers the outcomes of air pollutions while correlating the events of air pollutions and elaborating the main reasons of air pollution, which allows students to understand the air pollution concepts better. Additionally, the designed curriculum provides information about the other types of pollution in addition to air pollution that might be a reason of for improvement in the conceptual understanding as concepts complement each other and ensure correlation. This can be interpreted that the modular curriculum is significant for learning about the concept of air pollution. The activities of the modular curriculum led to group discussions and changes in the perspective of students towards environmental events. Such circumstance can be interpreted as allowing questioning concepts and improving critical thinking. The modular curriculum allowed students to see the environmental events in more concrete ways through its activities and materials (Dağ & Kırıkaya, 2012).

Following the assessment of the preliminary and final tests in relation to the achievement test that was administered to the students for the “*Plants and Animals Chapter*”, there was a statistically significant difference between the preliminary and final test scores in favour of the final test. In consideration of the answers given by the students at the last interview, the majority were mainly about the solution to problems in relation to plants and animals and taking measures, which were both covered in a limited number of references in the literature (Atasoy & Ertürk, 2008; Seçgin, Yalvaç, & Çetin, 2010).

Following the assessment of the preliminary and final tests in relation with to the achievement test that was administered to the students for the “*Environment and Humans Chapter*”, the statistically significant difference between the preliminary and final test scores of students in favour of the final test indicated that the modular curriculum leads to an increase in the academic success of students. The relation between the environment and humans is the least known subjects of environmental education. While there are almost no studies on this matter

in the literature, the level of conceptual understanding is also not clearly known in terms of the relation between the environment and humans. The designed curriculum covers studies regarding such concepts and eliminates any deficiencies. It can be explicitly noted that the students must know such topics, yet they don't have sufficient knowledge. Due to the nature of the designed curriculum, it covers the relation between the environment and humans, which is not included in other curricula. It also supports the problem solving process to the problems such as people causing environmental deterioration and allows the implementation of solutions through the use of knowledge.

Lastly, the results reflected that there was a positive change in the conceptual understanding and academic success among students. The students started to understand the concepts related with environmental education more easily and much more clearly. The students now gave more consideration to environmental problems. The modular curriculum allowed students to learn much detailed information about the concepts of environmental education and improved their critical thinking skills through the provision of group activities allowing the discussion of environmental education concepts, which were taught in the modular curriculum.

The outcomes of the modular curriculum was that students liked environmental education and that the curriculum implemented student oriented practices, which positively changed the environmental attitudes of students, provided sufficient time for the improvement of positive environmental attitudes, contributed to the improvement of environmental attitudes through providing a multi learning environment with reading texts and posters related with environmental education that improved the environmental awareness of students and positively changed their environmental attitudes. Similarly, Akkor and Gündüz (2017) offers to be focusing rather than on the concern of the students with regard to future environmental problems. The importance of the individual studies should be pointed out for the resolution of the environmental problems, and the students should be encouraged in this direction.

The aim of this study was to identify "Is there any significant effect of the designed environmental education modular curriculum on the environmental attitudes of 6th and 7th grade students from the schools in the North Cyprus?" The environmental education attitude scale was used in the study. The objective in using such assessment tools was to reflect the changes in the environmental attitudes of students in detail. After the evaluation of the preliminary and final test results of the environmental education attitude scale a t-test was performed to identify whether or not the difference between the preliminary and final tests were statistically significant. There is no statistically significant difference ($p = .007$, $p > 0.05$) between the preliminary and final test scores of students in favour of final test.

In consideration of the high total scores from the scenarios in relation to the problem solving skills of students, the designed modular curriculum created a positive contribution on the improvement of problem solving skills of students. Since the activities of the curriculum were in accordance with the 5E learning model and to allow the improvement of research skills among students; hence it is not effective for the students to understand the existing environmental problems around them and to attract as well as lead the students in problem solving through the developed scenarios.

REFERENCES

- Akkor, Ö., & Gündüz, Ş. (2017). The study of university students' awareness and attitude towards environmental education in Northern Cyprus. *Eurasia Journal of Mathematics, Science and Technology Education*, 14(3), 1057-1062. <https://doi.org/10.12973/ejmste/81366>
- Akyol, B., & Kahyaoğlu, H. (2012). İlköğretim ikinci kademe öğrencilerinin çevre bilgi düzeyleri üzerine bir çalışma: Niğde örneği. *X. Ulusal Fen Bilimleri ve Matematik Eğitimi Kongresi*, 27-30 June, Niğde.
- Artun, H., & Coştu, B. (2013). Effect of the 5E model on prospective teachers' conceptual understanding of diffusion and osmosis: A mixed method approach. *Journal of Science Education and Technology*, 22(1), 1-10. <https://doi.org/10.1007/s10956-012-9371-2>
- Atasoy, E., & Ertürk, H. (2008). İlköğretim öğrencilerinin çevresel tutum ve çevre bilgisi üzerine bir alan araştırması. *Erzincan Eğitim Fakültesi Dergisi*, 10(1), 105-122.
- Balgopal, M. M., & Wallace, A. M. (2009). Decisions and dilemmas: Using writing to learn activities to increase ecological literacy. *The Journal of Environmental Education*, 40(3), 13-26. <https://doi.org/10.3200/JOEE.40.3.13-26>
- Bukova-Güzel, E. (2008). Yapılandırmacı öğrenme yaklaşımının matematik öğretmen adaylarının matematiksel düşünme süreçlerine olan etkisi. *e-Journal of New World Sciences Academy*, 3(4), 678-688.
- Büyükoztürk, Ş., Çakmak, E. K., Akgün, Ö. E., Karadeniz, Ş., & Demirel, F. (2017). Bilimsel araştırma yöntemleri. *Pegem Atf İndeksi*, 1-360. <https://doi.org/10.14527/9789944919289>

- Bybee, J. W., & Landes, N. M. (1988). The biological sciences curriculum study (BSCS). *Science and Children*, 25(8), 36-37.
- Çepni, S. (2010). *Araştırma ve Proje Çalışmalarına Giriş*. Genişletilmiş 5. Baskı, Üçyol Kültür Merkezi, Trabzon.
- Coca, D. M. (2013). The influence of teaching methodologies in the learning of thermodynamics in secondary education. *Journal of Baltic Science Education*, 12(1), 59-72.
- Cohen, L., & Manion, L. (1989). *Research methods in education* (3rd Ed.), New York, NY: Routledge Publication, New York.
- Dağ, F., & Kırıkkaya, E.B. (2012). 8. sınıf doğal süreçler ünitesi için web tabanlı öğretim materyali hazırlığı: Farklı alan uzmanlarının materyal hakkındaki görüşleri. *e-Journal of New World Sciences Academy*, 7(1), 212-229.
- Darçın, E. S., Bozkurt, O., Hamalosmanoğlu, M., & Köse, S. (2006). Determination of elementary students' level of knowledge and misconceptions about greenhouse effect. *International Journal of Environmental and Science Education*, 1(2), 104-115.
- Ekiz, D. (2003). *Eğitimde araştırma yöntem ve metodlarına giriş: Nitel, nicel ve eleştirel kuram metodolojileri*. Anı Yayıncılık.
- Ergin, H., & Okutmuş, E. (2007). Çevre Muhasebesi: Çevre Maliyetleri ve Çevre Raporlaması. *Yönetim Bilimleri Dergisi*, 5(1), 33-45.
- Ergin, H., & Okutmuş, E. (2007). Çevre Muhasebesi: Çevre Maliyetleri ve Çevre Raporlaması. *Yönetim Bilimleri Dergisi*, 5(1), 33-45.
- Gül, Ş., & Yeşilyurt, S. (2011). Yapılandırmacı Öğrenme Yaklaşımına Dayalı Bir Ders Yazılımının Hazırlanması ve Değerlendirilmesi. *Cukurova University Faculty of Education Journal*, 40(1), 19-36.
- Lindemann-Matthies, P. (2002). The influence of an educational program on children's perception of biodiversity. *The Journal of Environmental Education*, 33(2), 22-31. <https://doi.org/10.1080/00958960209600805>
- Manolas, E., & Leal Filho, W. (2011). The use of cooperative learning in dispelling student misconceptions on climate change. *Journal of Baltic Science Education*, 10(3), 168-182.
- Özsevgeç, T. (2007). *Determining effectiveness of guided materials about force and motion unit based on the 5E model for elementary students* (Unpublished PhD Thesis). Karadeniz Technical University.
- Özsevgeç, T., & Artun, H. (2012). İnsan Ve Çevre Ünitesinin" öğretiminde fen ve teknoloji öğretmenlerinin karşılaştıkları zorluklar. X. *Ulusal Fen Bilimleri ve Matematik Eğitimi Kongresi*, 27-30 June, Niğde.
- Ramadoss, A., & Poyyamoli, G. (2010). Biodiversity conservation through environmental education for sustainable development-a case study from Puducherry. *International Electronic Journal of Environmental Education*, 1(2), 97-111.
- Şahin, Ç. (2010). *İlköğretim 8. sınıf "kuvvet ve hareket" ünitesinde "zenginleştirilmiş 5e öğretim modeli"ne göre rehber materyaller tasarlanması, uygulanması ve değerlendirilmesi* (Doctoral Thesis), KTÜ, Fen Bilimleri Enstitüsü, Trabzon.
- Sarıay, M. (2008). *Ortaöğretim fizik dersi itme ve momentum konusu öğretim programını geliştirme üzerine bir çalışma* (Masters Thesis).
- Seçgin, F., Yalvaç, G., & Çetin, T. (2010). İlköğretim 8. sınıf öğrencilerinin karikatürler aracılığıyla çevre sorunlarına ilişkin algıları. *In International Conference on New Trends in Education and Their Implications*, 11(13), 391-398.
- Şimşekli, Y. (2001). Bursa'da "uygulamalı çevre eğitimi" projesine seçilen okullarda yapılan etkinliklerin okul yöneticisi ve görevli öğretmenlerin katkısı yönünden değerlendirilmesi. *Uludağ Üniversitesi Eğitim Fakültesi Dergisi*, 14(1), 73-84.
- Stamp, N., & O'Brien, T. (2005). GK-12 Partnership: A model to advance change in science education. *BioScience*, 55(1), 70-77. [https://doi.org/10.1641/0006-3568\(2005\)055\[0070:GPAMTA\]2.0.CO;2](https://doi.org/10.1641/0006-3568(2005)055[0070:GPAMTA]2.0.CO;2)
- Tafrova-Grigorova, A., Boiadjeva, E., Emilov, I., & Kirova, M. (2012). Science teachers' attitudes towards constructivist environment: A Bulgarian case. *Journal of Baltic Science Education*, 11(2), 184-193.
- Tas, G., & Seçken, N. (2009). İlköğretimde "Maddenin İçyapısına Yolculuk" Konusunun Öğretiminde Yapılandırmacı Yaklaşımın Etkisi. *Education Sciences*, 4(2), 520-533.
- Taycı, F., & Uysal, F. (2009). Çorlu'da birinci ve ikinci kademe ilköğretim öğrencilerine çevre eğitimi konusunda uygulanan anket çalışması. *Fen, sosyal ve çevre eğitiminde son gelişmeler sempozyumu*, 18-20.
- Thorner, J., Stanisstreet, M., & Boyes, E. (1999). School students' ideas about air pollution: Hindrance or help for learning? *Journal of Science Education and Technology*, 8(1), 67-73. <https://doi.org/10.1023/A:1009481521719>
- Uzun, N., & Sağlam, N. (2006). Orta öğretim öğrencileri için çevresel tutum ölçeği geliştirme ve geçerliliği. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 30(30).

- Wilder, M., & Shuttleworth, P. (2005). Cell inquiry: A 5E learning cycle lesson. *Science Activities: Classroom Projects and Curriculum Ideas*, 41(4), 37-43. <https://doi.org/10.3200/SATS.41.4.37-43>
- Yıldırım, A. (1996). Disiplinlerarası öğretim kavramı ve programlar açısından doğurduğu sonuçlar. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 12(12).

<http://www.ejmste.com>