

Sustainable life practice for preschool pupils: Sustainable environmental education program (SEEP) model



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ABSTRACT

Global pollution can only handle with education in early childhood. Especially, the pre-school period is an important time for environmental education. It is seen that current pre-school education programs generally include environmental education but it has missing parts. The aim of the study is to add the built environment elements to the environmental education programs that include only natural elements such as trees, animals, etc. The environment is basically divided into two parts as natural and built (man-made structures). There is no environmental education program in the literature that includes these two basic subjects. The built environment includes architectural elements such as buildings, bridges, and infrastructure systems. All people use these systems and should have knowledge about them. The complete Sustainable Environmental Education Model has been created which is including both natural and built environmental elements for preschool pupils in the study. The LEED criteria were taken as a reference while planning the model. The model was applied to 134 (5 years old) pupils who studying pre-school education for eight months. As a result of the model application, the level of awareness of pupils who have never study any environmental education before, according to the beginning of the program, is from 23.37% to 79.81% in sustainable areas, from 23.87% to 85.32% in "efficient water use", from 13.80% to 91.79% in efficient energy use and from 13.78% to 82.98% in the usage of waste materials. It was determined that it increased. The designed model can be the solution for global pollution.

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1. Introduction

Adopting sustainability principles and living according to these principles are important for the future of the world. The early childhood period and education at this age are very effective for learning these principles (Mahat et al., 2016). This is because learning develops rapidly at an early age (Bulut and Polat, 2019). Within the scope of children's rights, people from all age groups from early ages to adulthood should have a say about the environment they live in. This is the case in democratic societies. Education and awareness of nature are of great importance in order to have a say about the environment (Sebla and Özsoy, 2015). All pupils are the main actors who will give shape their

environment in the future (Arlemalm and Davis, 2014). The population in the cities is increasing. Today, more people prefer to live in big cities rather than in rural areas. For this reason, the number of children living in cities is increasing day by day. According to the data of the United Nations Population Division, by 2025, 6 out of 10 children in developed countries will have to participate in urban life (Özburak et al., 2018). According to Yıldırım et al. (2020) article, people still continue to trust nature despite the increasing urban population today. In order to develop a protective approach against the environment, children should not be detached from nature in the cities they live in and have awareness. In this context, education is a powerful component and an effective tool that can be used in creating a sustainable society (Cars and West, 2015). Preschool education institutions should ensure that children develop an awareness of nature and especially recycling (Klaar and Öhman, 2014). For this reason, the countries should pay more attention to education policies and take environmental education into account (Aikens et al., 2016). Nowadays, many

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institutions and organizations including World Bank, have integrated children into sustainable development plans. It has been realized that children should act in accordance with sustainable principles in matters concerning many disciplines (Ogelman, 2012). The reason for this is that children, who are affected by the actions of their environment and who are in a very open period to learn by taking role models (such as mother, father, brother, teacher, etc.) are seen as an effective tool in solving sustainability problems (Farhana et al., 2017). Human behavior has too many positive or negative effects on the environment (Ikegbu and Nyimba, 2020). Therefore, providing environmental education in schools is one of the global issues that have come to the fore in recent years (Davis and Elliot, 2014). In the past, one of the first nature-based preschool education centers is the New Canaan Nature Center, founded in 1967 in America. Especially after 2000, new schools were added to the schools whose examples increased over the years (Larimore, 2016). According to Vodopivec (2017), it is mentioned that the first environmental education started in Germany in 1960. In addition to these, the school building's sustainability makes the education to be given even more effective (Tasci, 2015). It is known that structures with learning spaces designed according to sustainable principles have an effect on children's educational success, health, and development. The Designing of preschool education institutions according to these principles, which are the starting points of good habits and personality development, will have a positive effect on children. The most important reason for this is that children carry the systems they see and learn in the educational environment into home and community life. Designing a sustainable education structure is important for both the creation of sustainable awareness and the development of education in

accordance with the desired purpose (Tonguç and Özbayraktar, 2017). In recent years, measuring the effectiveness of environmental education given in schools on children is one of the subjects that has been frequently carried out, and that researchers are interested in Ilovan et al. (2019).

In addition to the effects on the environment, the environmental education provided in schools has a great effect on children's own individual skills and development. According to the research, knowledge about the environment in the preschool period has many benefits. It has been revealed that children will have a positive impact on their own personal development thanks to their exploratory, investigative, and questioning behaviors while examining nature (Balat and Çiftçi, 2017). According to Erikson, taking programs suitable for their age groups in the right environment improves children's self-confidence, entrepreneurial spirit, and liberal behavior. Therefore, should be given special importance to preschool education according to expert opinions (Erden and Akman, 2014). There are also researches showing that environmental education taken in nature can contribute to the physical development of children and even prevent obesity (Petraiciene et al., 2018). While providing environmental education to children it should be that the child can be active in nature and the education program should be in the natural form (Güven and Yılmaz, 2017). The children do not just want to imagine the knowledge in their mind which they will learn. They want to use their physical and cognitive skills simultaneously while learning. Therefore, experimental programs and active learning methods should be used. In other words, a pre-school education plan should be a focus on students. There are 6 basic elements in Fig. 1 of a good education program.

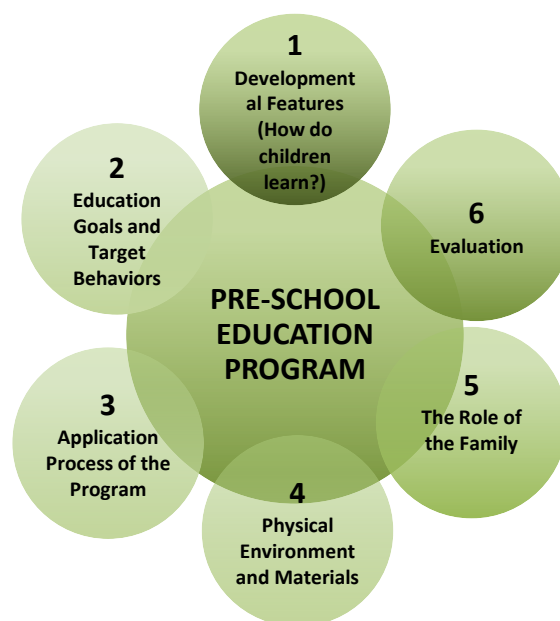


Fig. 1: Basic elements of preschool education programs

The education programs should be given by educators who are experts in their fields and they have knowledgeable and sensitive personality. The equipment of the school building and educators has an important role in the benefit of the program. For

effective environmental education, the triangle of student-educator-school (equipment) in Fig. 2 should be provided completely (Vural and Hamurcu, 2008).

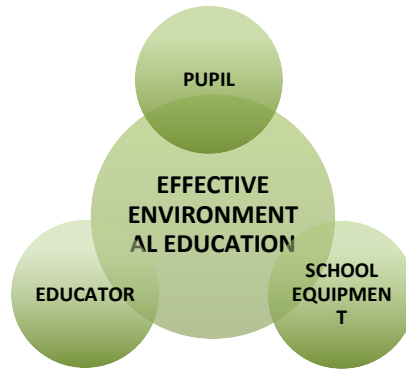


Fig. 2: Effective environmental education diagram in preschool

2. Methodology and research methods

Sustainable Environmental Education Program (SEEP) model was designed for children which is including the natural and built environment together in the study. The model was tested on 134 children for 8 months in a private pre-school in Nicosia. The model was applied 40 minutes, 1 day a week, as a "sustainable environment" course to 8 different classes. In order to measure the effectiveness of the designed model, a "pre-test" was applied by interviewing the children before starting the program. During the interview, 17 open-ended questions were asked to each pupil and their answers were recorded. After the program was finished, the children were interviewed again and a "final test" was applied. The interviews were done with the children one by one in their own classroom. The effect value of the program was determined by comparing the obtained results.

Data analysis: The data obtained from the pre-test were evaluated according to the four criteria of the LEED Green Building Certificate System. The data obtained about "sustainable built environment" from open-ended unstructured questions were processed

in 3 different ways as awareness motion (positive action)/unawareness motion (negative action) and undecided (unideaed). While the data were recorded in the tables, the number of students (n) and success percentages (%) were specified.

3. SEEP modeling process

Hedefalk et al. (2015) compared articles published in many journals and prepared a review. When this study is examined, it can be clearly seen that environmental education includes only "natural environment" elements and that the built environment has not yet entered the curriculums. Environment courses have started to be included in the curriculum in contemporary education programs but are generally organized to include "natural environment" elements. This idea is incomplete. The environment is divided into two-part as "natural" and "built". It is actually the "built environment" that causes nature to be damage. In the study, the complete environmental education program was designed in four stages in Fig. 3.



Fig. 3: Formation process of preschool sustainable environmental education program

STEP 1: The missing part in preschool environmental education has been identified.

STEP 2: The LEED Green Building Certificate System was examined and selected the systems that can be taught to pupils.

STEP 3: 15-week environmental education program designed for pupils.

STEP 4: The program was tested with 134 pupils in a private pre-school in Nicosia.

3.1. STEP 1: The missing part in preschool environmental education has been identified

In the researches, it has been concluded that the basic content components of ideal sustainable environmental education are natural and built environmental elements. The education program is organized on these two basic factors. The complete (optimum) sustainable environmental education program components were seen which are designed for pupils in Fig. 4.

An interdisciplinary effort is required to develop a completely sustainable environment program. The common consensus of different occupational groups is important. The common work of child development specialists, preschool educators, and architects are necessary for environmental education programs. The program to be created should be developed in accordance with the age group, emotional/physical development, community life, and culture of the children (Acer, 2016).

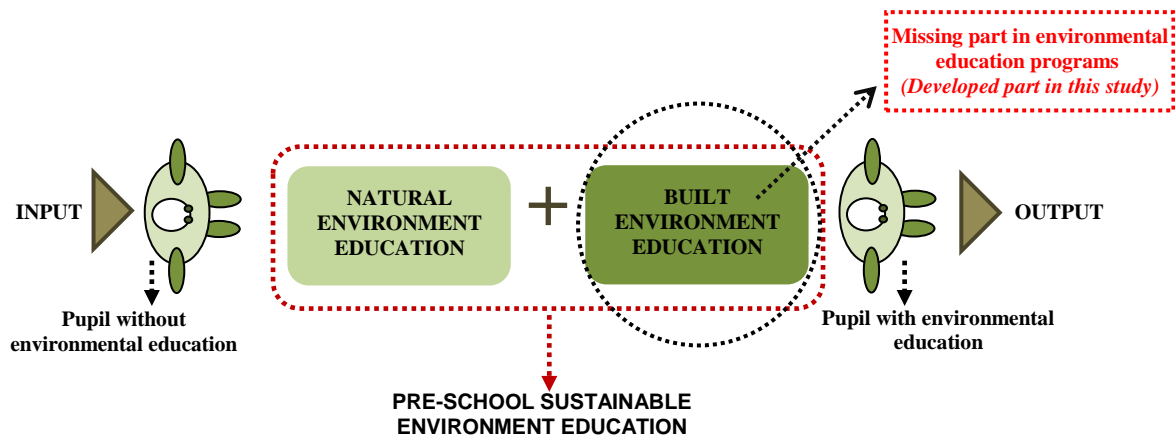


Fig. 4: Preschool sustainable environmental education program components and the detected missing part

3.2. STEP 2: The LEED green building certification system examined and selected the systems that can be taught to pupils

In order to provide education that will create environmental awareness in children, first, they have to take education in an environment where they can see, try and experience sustainable systems. The

education building is the proper material for this. In the suggested model, it has been prepared by considering the four basic criteria of the LEED Green Building Certificate System as in Table 1. A sustainable activity area that includes these criteria has been designed in the school garden for pupils.

Table 1: Selected LEED criteria for teaching to pupils

Leed criteria list selected to teach preschool children		
1	Sustainable Sites	2 activities
2	Water Efficiency	1 activity
3	Energy Efficiency	4 activities
4	Waste Materials	1 activity
	Common Activities (include all criteria)	7 activities
	Total	15 activities

In the project, the school building was not sustainable. The "Sustainable Activity Area (Mini Farm)" has been designed and built in the school garden for pupils. As in Fig. 5, this farm included sustainable site systems, water efficiency systems, energy efficiency systems, and waste material systems. The children spent time here and experience sustainability.

3.3. STEP 3: 15-week environmental education program created for pupils

While preparing the education program, first of all, a meeting was done with the school administration. It is important to cooperate with school administrators and teachers in programs related to pupils. Permission was obtained first from

the pre-school deputy principal and then from the school principal for the SEEP model application. The administrators interviewed said that environmental education in their school was missing. They have mentioned that such a study is always on their education planning but they have never been able to implement it.

The meetings were repeated four or five times and making brainstorm together for developing the education program. After the meetings were completed, the "applicable program" permission was obtained by the school administration for the draft SEEP model. After that, the study was detailed by weeks and interviewed with the pre-school education coordinator.

When the project was approved by the coordinator, the deputy principal organized a meeting with all 5-year-old pupils' teachers. Before

the application, the program was explained to all teachers. All of them gave strong support while an application to the SEEP model. At the same time, the SEEP model was announced by the university and

the other press to all people in the country. All processes of the SEEP model fieldwork are shown Fig. 6.

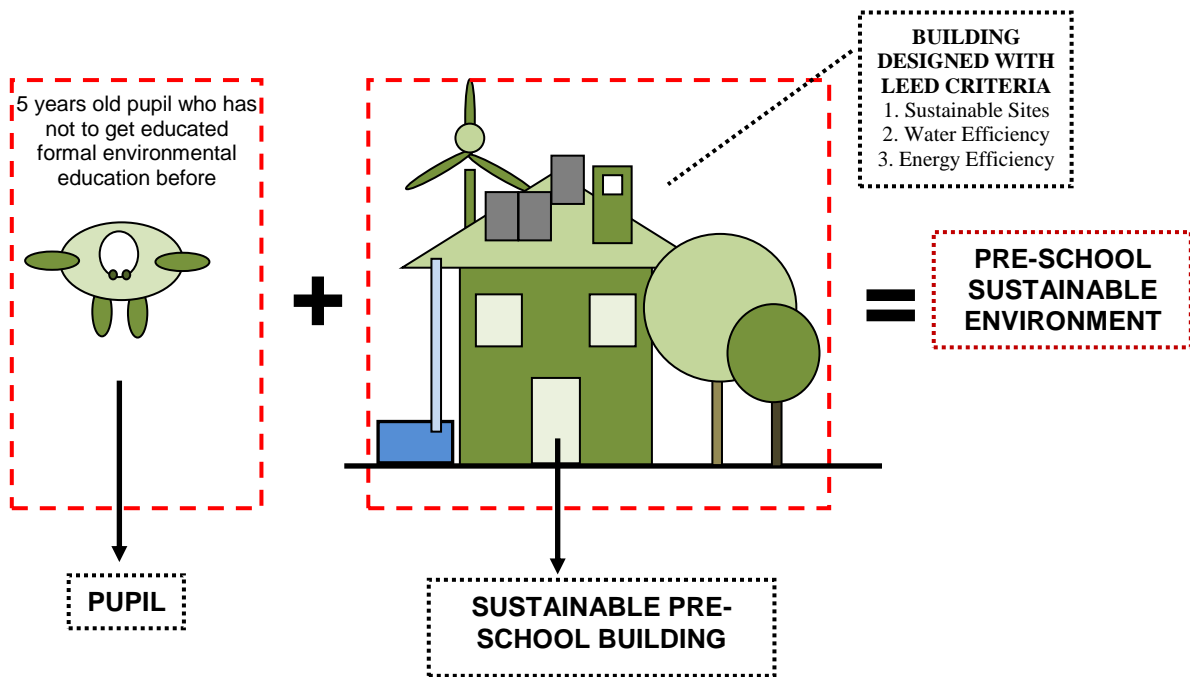


Fig. 5: Suggestion model elements; sustainable pre-school building (included sustainable systems) and relationship with the pupils

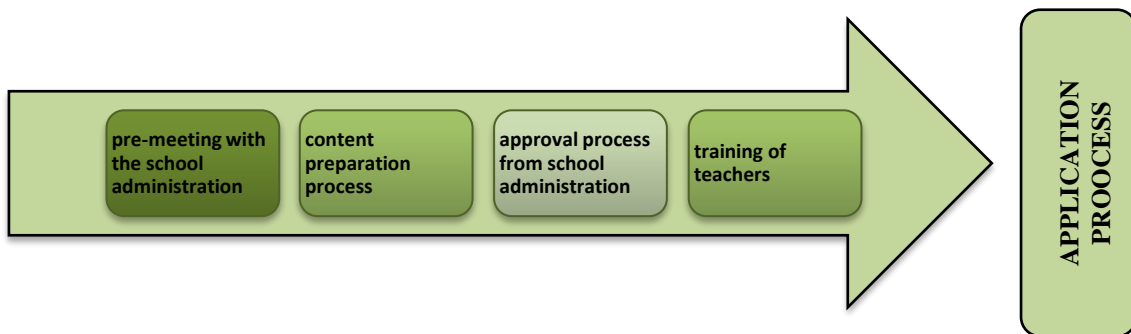


Fig. 6: SEEP model fieldwork development process

The SEEP model is planned for 15 weeks as 1 course (40 minutes) per week. The program is

designed in three parts: Awareness measurement, indoor activities, and outdoor activities in Table 2.

Table 2: Sustainable environment education program activity plan

1A. MEASURING	WEEK 1	Pre-test process
	WEEK 2	
	WEEK 3	"Let's get to know our school's environment"
	WEEK 4	"NEU-Sustainable Farm for 5 ages"
	WEEK 5	"We are designing our building"
2. INDOOR ACTIVITIES (CLASS STUDIES)	WEEK 6	"We are designing birdhouse"
	WEEK 7	"We are learning "Wind Energy"
	WEEK 8	We are learning "Solar Energy"
	WEEK 9	Activity with parents (Parents Week)
	WEEK 10	"We are planting our school"
	WEEK 11	"Wind turbine in our school"
3. OUTDOOR ACTIVITIES (APPLICATION FIELD STUDIES)	WEEK 12	"Our solar house in our garden"
	WEEK 13	"We harvesting water"
	WEEK 14	
	WEEK 15	
1B. MEASURING	WEEK 16	Final-test process

• 1A - 1B MEASURING, refers to the pre and post-tests performed to measure the pupils' awareness level of the environment.

• 2. INDOOR ACTIVITIES (CLASS STUDIES), refers to the activities in the school building, especially in the classroom.

- 3. OUTDOOR ACTIVITIES (APPLICATION FIELD STUDIES), refers to the activities in the "Sustainable Activity Area" (mini Farm) designed and built in the school garden.

3.4. STEP 4: The program was tested with 134 pupils in a private school in Nicosia

The program was applied to 134 children with two preschool teachers in each class. An online meeting network was established with 5-year-old teachers and discussions were held about the materials to be used, the activities to be done, and

the time before each lesson. In the activities that require preparation, the necessary arrangement was made in advance by communicating in this way and the lesson time was used effectively. Each environmental lesson was determined according to the program in the school curriculum that week. The LEED criterion (SUBJECT) planned to be taught was selected according to the curriculum and transferred to the student with a reinforcing activity (ACTIVITY) with the appropriate material selection (MATERIAL) using the game method (METHODOLOGY) in Fig. 7.

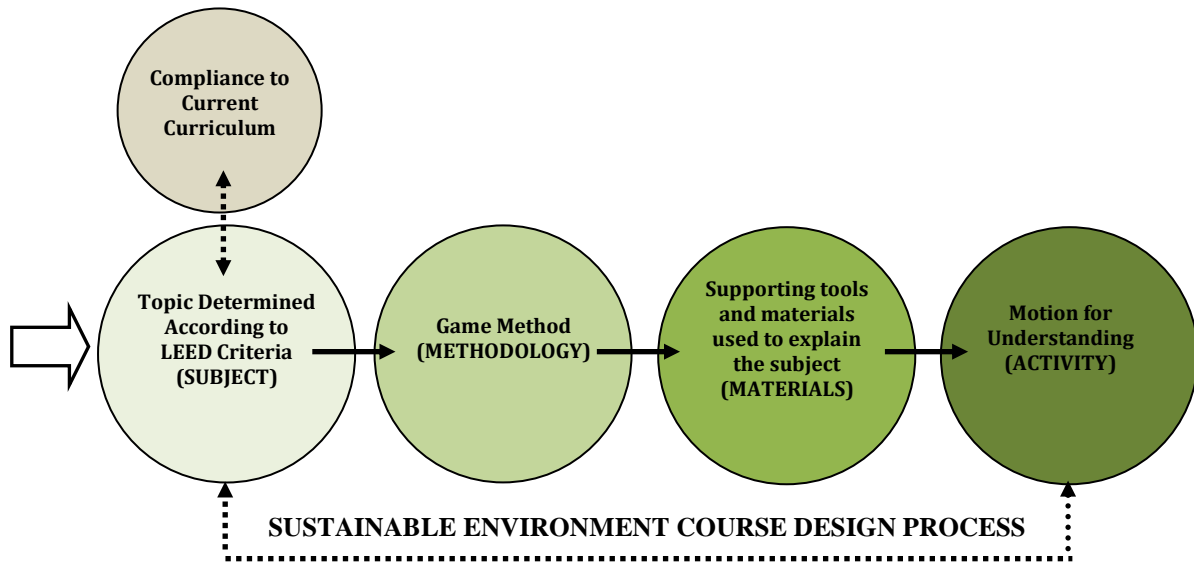


Fig. 7: Sustainable environment course design process for each activity

4. Findings

The 15-activity "Sustainable Environmental Education Program (SEEP)" prepared for children was implemented once a week for 8 months. It is important to measure the success effect of the program in order to evaluate the content of the study. In this context, a "measurement test" was applied at the beginning and end of the program in order to measure the effects of the activities on the environmental awareness level. The data obtained from measurement tests can be seen in Table 3.

According to the model program pre and final test results, it is seen that success can be achieved when activities that include sustainable built environmental components are designed, which children learn by practicing and experiencing.

- Sustainable areas; In the activities performed with this criterion, the rate of "awareness motion" was measured as 23.37% in the pre-test, while this rate increased to 79.81% in the final test. The difference of 56.44% indicates that there is a 2.41 times difference at the end of the program compared to the first awareness rate in this criterion.

Table 3: Sustainable environmental education program evaluation table

CRITERION	TEST	MOTIONS (%)			EVALUATION
		unawareness motion	awareness motion	undecided	
1. SUSTAINABLE SITES	pre-test	70.75	23.37	5.88	In this criterion, which mostly includes natural environmental elements, a difference of 56.44% was observed in conscious movements. This reveals the inadequacy of environmental programs for children or nature issues integrated into other courses.
	final-test	19.70	79.81	0.49	
2. WATER EFFICIENCY	pre-test	71.88	23.87	4.25	Children's awareness about water has increased by 61.45%. The difference is that the desired consciousness cannot be formed due to the fact that the subjects in the curriculum on water use and water saving are almost non-existent.
	final-test	13.93	85.32	0.75	
3. ENERGY EFFICIENCY	pre-test	84.88	13.80	1.32	There are very few energy subjects in the curriculums, education on this subject has a 77.99% effect on children's knowledge level. It can be mentioned as the most beneficial criterion for children.
	final-test	3.35	91.79	4.86	
4. WASTE MATERIALS	pre-test	78.05	13.78	8.17	It has been observed that the issue of waste in schools cannot go beyond making artworks with the materials that children bring from their homes. In this context, it has been measured that the education given has an effect of 69.20% on the children.
	final-test	13.72	82.98	3.30	

- Water efficiency; In the activities performed with this criterion, the rate of "awareness motion" was measured as 23.87% in the pre-test, while this rate increased to 85.32% in the final test. The difference of 61.45% indicates that there is a 2.57 times difference in this criterion compared to the first awareness rate at the end of the program.
- Energy efficiency; In this criterion, the rate of "awareness motion" in the activities were measured as 13.80% in the pre-test, while this rate increased to 91.79% in the final test. The difference of 77.99% indicates that there is a difference of 5.65 times in the program compared to the first consciousness rate in this criterion.
- Waste materials; In the activities performed in this criterion, the rate of "awareness motion" was measured as 13.78% in the pre-test, while this rate increased to 82.98% in the final test. The difference of 69.20% indicates that there is a 5.02 times difference in this criterion compared to the first awareness rate at the end of the program.

5. Conclusion and recommendation

In the study, According to the pre-test and post-test values, it is seen that the education program prepared with LEED Criteria provides the children with the most awareness about "efficient energy usage". This is followed by the evaluation of waste materials, efficient usage of water, and sustainable sites. In Table 4, the awareness effect rates of the "Sustainable Environment Education Program (SEEP)" created in children about the built environmental education can be seen according to the LEED criteria

Table 4: The built environment awareness effect rates in children according to LEED criteria

SUCCESS ROW	SUCCESS RATE	LEED CRITERIA
1	5.65	Efficient Use of Energy
2	5.02	Evaluation of Waste Materials
3	2.57	Efficient Use of Water
4	2.41	Sustainable Sites

The needs of "Architecture" are changing and developing day by day as in every field. The pre-test and post-test data show that in the context of protecting the environment, it has become important to include the "Sustainable Architecture Culture" in the field of education and education programs. The model can also be a support for future studies. In the designed and tested model, according to the observations during the practice, the things to be done in order for "Sustainable Built Systems" to enter the curriculum immediately are as follows:

- It should not be forgotten that children will become adults in the future and have an idea in urban planning, and sections of education that will create appropriate environmental awareness in the early period should be designed.
- Environmental education should be designed in two parts as "natural" and "built".

- Environmental components in the education curriculum should be reviewed according to the model.
- It should not be forgotten that the "school building" can be an example in early childhood education and should be used as educational material if possible (it should not be forgotten that children learn by seeing, experimenting, and exploring).
- Early education should be given importance in order for individuals living in cities, towns, or rural areas to develop a sense of belonging and prefer built environments that respect other individuals and nature.
- Since all individuals are users of the built environment, sustainable built environmental education should be included in the curriculum compulsorily not on an optional basis.
- Sustainable built environmental education programs should be prepared in cooperation with architects, pedagogues, and preschool teachers.

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Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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