**European Journal of Education Studies**
ISSN: 2501 - 1111
ISSN-L: 2501 - 1111
Available on-line at: www.oapub.org/edu

DOI: 10.46827/ejes.v9i4.4263 Volume 9 | Issue 4 | 2022

# A COURSE CONTENT DESIGNED IN ACCORDANCE WITH THE 5E TEACHING MODEL WITHIN THE SCOPE OF STEM LEARNING APPROACH IN ENVIRONMENTAL EDUCATION COURSE: MY SMART GREENHOUSE

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**Abstract:**
The STEM learning approach, which integrates science, technology, engineering, and mathematics disciplines, is increasing its popularity in all countries. Countries are trying to ensure that students develop their cognitive, affective, and scientific process skills by integrating the STEM learning approach into their education systems. In this context, it is considered important to prepare course contents suitable for the STEM learning to approach within the scope of the curriculum, and design-based activities are included. It is thought that the number of guide applications on how teachers can use the STEM learning approach in their lessons to teach their subjects by following per under the STEM learning approach is insufficient. In this study, the literature was searched using the traditional compilation method, and a lesson content suitable for the STEM learning approach was produced by blending my smart greenhouse activity, which was developed for the 7th-grade environmental education lesson outcomes, with the 5E teaching model. It is aimed to increase the diversity of guide resources that teachers can use in their lessons by giving the produced course content together with the application stages.

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**Keywords:** STEM education, 5E learning model, environmental education, 21st century skills

## 1. Introduction

Modern societies are expected to meet the educational needs of individuals trained in education systems so that they can take an active role in both national and international platforms (Steyn, 2018). It is necessary to increase access to future-oriented learning experiences that will result in the creation of knowledge and skills for lasting and to draw alternative ways to achieve this access (Patrick, et al., 2020). In this context, a framework for science education has been created and science teaching standards have been shaped (NRC, 2012). Effective use of technology with the created framework, creative thinking, problem-solving, critical thinking, collaboration, and leadership 21st-century skills, including skills, have emerged. While the living conditions of the 21st-century cause revisions in education systems approaches that focus on producing new, different, effective, and useful products (Yılmaz, 2021). These approaches should serve the purpose of student-centered teaching and learn rather than teacher-centered teaching (Froyd, 2008). Educational institutions should encourage the development of students by providing inquiry and critical thinking skills throughout the country through cooperation in both the teaching and learning process (Ongesa, 2020). STEM learning approach is increasing in popularity day by day in many countries, especially in developed countries from an economic perspective, and it is trying to be integrated into curricula by taking serious steps. STEM learning approach is an approach that expresses the learning and teaching processes in which Science, Technology, Engineering, and Mathematics disciplines are used together (Bybee, 2010; Stohlmann et al., 2012; Hughes, et al., 2019). Creativity is the basis of engineering design processes in STEM applications (Court, 1998). The STEM learning approach draws attention to the products created by the students and focuses on the creativity of the student by evaluating the product as a whole with rubrics (Aquilera & Ortiz-Revilla, 2021).

## 2. Literature Review

### 2.1. STEM Learning Approach

In a changing and developing world, we face global challenges such as climate change, energy efficiency, resource use, sustainable development, and national security (Rischard, 2002; Sachs, 2015). An education system that invests in students from an early age and supports their development; is considered essential to ensure that the United States remains competitive in a changing and evolving world and that all Americans share in the increasing prosperity of the 21st-century (CED, 2020). Following the industrial developments of countries such as China and India, the USA aimed to combine science, mathematics, technology, and engineering disciplines by changing their education systems (Ültay & Aktaş, 2020). For this purpose, it has been stated that most of the knowledge and skills contained in different disciplines can be developed with the STEM learning approach, which includes scientific inquiry, technological innovation, and mathematical calculation (Bybee, 2013). This new learning approach, which emerged in the USA, has increased its popularity day by day. Asian countries with very high-performing education systems, such as China, Japan, and Taiwan, have drawn a broader framework to the STEM learning approach and established national policies around science and technology, university, and industry-oriented research and development (Blackley & Howell, 2015). It is thought that when a context that students may encounter in daily life is integrated into STEM applications, students will gain experience in this context (Kelley & Knowles, 2016). Applications designed by following the STEM learning approach in the education and training process should be culturally inclusive and contain unique contexts related to social life (Johnson, et al., 2015). In educational processes, the problem should be integrated into STEM applications in the form of a context-based on various scenarios and concept cartoons that will arouse the curiosity of the individual, so that the student will be able to do research, produce solutions to solve the problem, make comments by making observations and design products (Köngül & Yıldırım, 2021). With the studies carried out in this framework, it has been concluded that STEM applications designed for secondary school students help students develop their cognitive, affective, and scientific process skills (The Partnership For 21st Century Skills, 2011; MEB, 2016; Gökbayrak & Karışan, 2017; Özkul & Özden, 2020). It is thought that the course contents suitable for the STEM learning approach will have positive effects on the academic success of the students in the science course (Bulut, 2020; Karakaya, et al., 2018).

In recent years, the STEM learning approach, which has been tried to be integrated into our education system to ensure the active participation of students in the education and training processes in Turkey, has included design-based activities (MEB, 2018; Kahraman & Doğan, 2020). MEB has designed new curricula and started to implement these curricula in secondary schools (Seren & Elşen, 2018). The preparation of course contents suitable for the STEM learning approach within the scope of the curriculum is very important in terms of enriching the education and training processes. Efforts should be made to continuously and systematically develop the contents designed by following per under the STEM learning approach (Kim, et al., 2014; Çavaş, et al., 2020).

### 2.2. Different Perspectives on STEM Learning Approach in Turkey

Different perspectives on STEM learning approach in Turkey There are no widespread consensus on the meaning and applications of the STEM learning approach in the field of education (Shrikoom, et al. 2018). For this reason, the STEM learning approach is tried to be applied by considering it from different perspectives. STEM activities in Turkey; It is generally seen as activities done in science lessons in school environments and robotics applications in out-of-school environments (Herdem & Ünal, 2018). This situation causes the stages of engineering design processes in the STEM learning approach and the way these stages are implemented cannot be determined (Pekbay, et al., 2020). It is thought that the number of guide applications on how teachers can use the STEM learning approach in their lessons to teach their subjects by following per under the STEM learning approach is insufficient (Wang, et al., 2011; Shrikoom, et al. 2018).

### 2.3. The Relationship Between STEM and Creative Thinking Skills

It is revealed that the applications designed by following per under the STEM learning approach increase the motivation of the students in the course (Şanlı & Özerbaş Somuncuoğlu, 2021). In this context, it has been concluded that the 21st-century skills, including creativity, of students who are highly motivated by STEM practices in the classroom, develop positively (Gülhan & Şahin, 2018; Kaya & Ayar, 2020; Gündüz Bahadır & Özay Köse, 2021). The content of our study is aimed to convey the application stages of the activity called "My Smart Greenhouse", which was designed by following per under the 5E teaching model within the scope of the STEM learning approach related to the 7th-grade environmental education course achievements.

## 3. Methods

In our study, the traditional compilation method, which is one of the literature compilation methods, was used. The traditional compilation is defined as revealing a new understanding of the subject by examining previous studies on the subject of the research (Çepni, 2018; Jesson, Matheson & Lacey, 2011). Although there are limited resources on designing course content by following per under the 5E learning model within the scope of the STEM learning approach, there is no clear source on the way it is implemented. For this reason, it is stated that a lesson plan to be prepared according to the 5E model should include the following stages (Bıyıklı & Yağcı, 2014):

- Engage,
- Explore,
- Explain,
- Elaborate,
- Evaluate.

The lesson plan and application method related to the environmental education course gains by blending the STEM learning approach and the 5E learning model are presented below.

### 3.1. 5E Learning Model

This model, which increases the motivation of the students and enables them to use their high-level thinking skills in the educational processes they are involved in, is a learning model developed by Rodger Bybee and contributed by the studies of Jean Piaget and John Dewey (Demir & Kurtuluş, 2019). The 5E learning model provides the creation of permanent learning environments with activities that will attract students' attention and enable them to experience the necessary knowledge and skills. In Table 1, it is stated that a lesson plan to be prepared according to the 5E model should include the following stages. (Goldston, et al., 2010; Fazelian, et al., 2010; Bıyıklı & Yağcı, 2014; Ong, et al., 2021):

**Table 1:** Stages and Contents of the 5E Teaching Model

| Stage | Stage Content |
|---|---|
| Engage | At this stage, short activities are designed that can attract students' attention and reveal their prior knowledge. The activities to be designed are important in terms of revealing the experiences before the teaching and thus providing permanent learning after the teaching. The teacher should be in the position of a guide guiding the students at this stage. |
| Explore | At this stage, activities are designed that enable students to reconstruct their experiences in a meaningful way, that is, to acquire new conceptual knowledge and restructure existing conceptual knowledge. In this context, these activities can be experimental activities in which students use their experiences to test various questions and predictions. The teacher should be in the position of a guide guiding the students at this stage. |
| Explain | At this stage, teachers can take an active role and transfer a knowledge or skill directly to the students. Teachers' transfer of knowledge and skills in the curriculum to students should lead them to better and more meaningful experiences. |
| Elaborate | At this stage, additional activities are designed to expand the conceptual knowledge framework that students have acquired. In addition, the main purpose at this stage is defined as developing, expanding and reinforcing the experiences of the students in the previous stages. |
| Evaluate | At this stage, the knowledge and skills acquired by the students are evaluated with various assessment tools. In addition, teachers have the chance to evaluate the efficiency of the educational processes while evaluating the achievements of the students. |

### 3.2. Working Group

In this study, the study group was selected by using the purposive sampling method, one of the sampling methods. The selected individuals are not expected to represent the population, but rather they are expected to have the necessary information about the population (Frankel, et al., 2011; Kothari, 2019). In such sample selections, the researched groups are divided into groups homogeneously, provided that they have similar characteristics (Çepni, 2018). In this context, this study group was chosen because secondary school students studying at a state secondary school in the Çeltikçi district of Burdur province and whose family members are engaged in farming are closer to the subject. The study group consists of eleven students, seven male, and four female students.

### 3.3. Data Collection Tool

As a result of the adaptation study of the Scientific Creativity Scale developed by Hu and Adey (2002) by Çeliker and Balım (2012) into Turkish, the Cronbach alpha internal consistency coefficient was calculated as 0.86. As a result of the evaluation of the measurement reliability of the Scientific Creativity Scale, it was found that the difference between the Cronbach's alpha coefficient and the scores of the upper 27% and lower 27% groups was at an acceptable level. An example item regarding the Scientific Creativity Scale is given below.

> *"Please write below in what different ways you might use a piece of glass scientifically. E.g; test tube making."*

To evaluate the prototypes designed by the students at the end of the engineering design processes, a rubric was created using the evaluation criteria of creative thinking skill performance in STEM-based learning created by Chasanah, Kaniawati & Hernani (2017). All of the items that make up the rubric are included in the evaluation phase (Table 2).

### 3.4. Data Analysis

The data obtained were evaluated in SPSS 21, which is one of the package programs. In the Shapiro Wilk test, which was used to determine the normality of the score distributions, the p-value was calculated as 0.12 for the pre-test and 0.49 for the post-test. The fact that the obtained values are greater than 0.05, which is the accepted significance value for the Shapiro Wilk test, reveals the interpretation that the scores are normally distributed (Abu-Bader, 2021; Davis & Pecar, 2021). In this context, a related samples t-test was used to analyze the data.

### 3.5. Planning the Process

The creation and implementation of the lesson plan was carried out within a certain planning. In this context, the diagram regarding the creation and implementation of the lesson plan is given below (Figure 1).

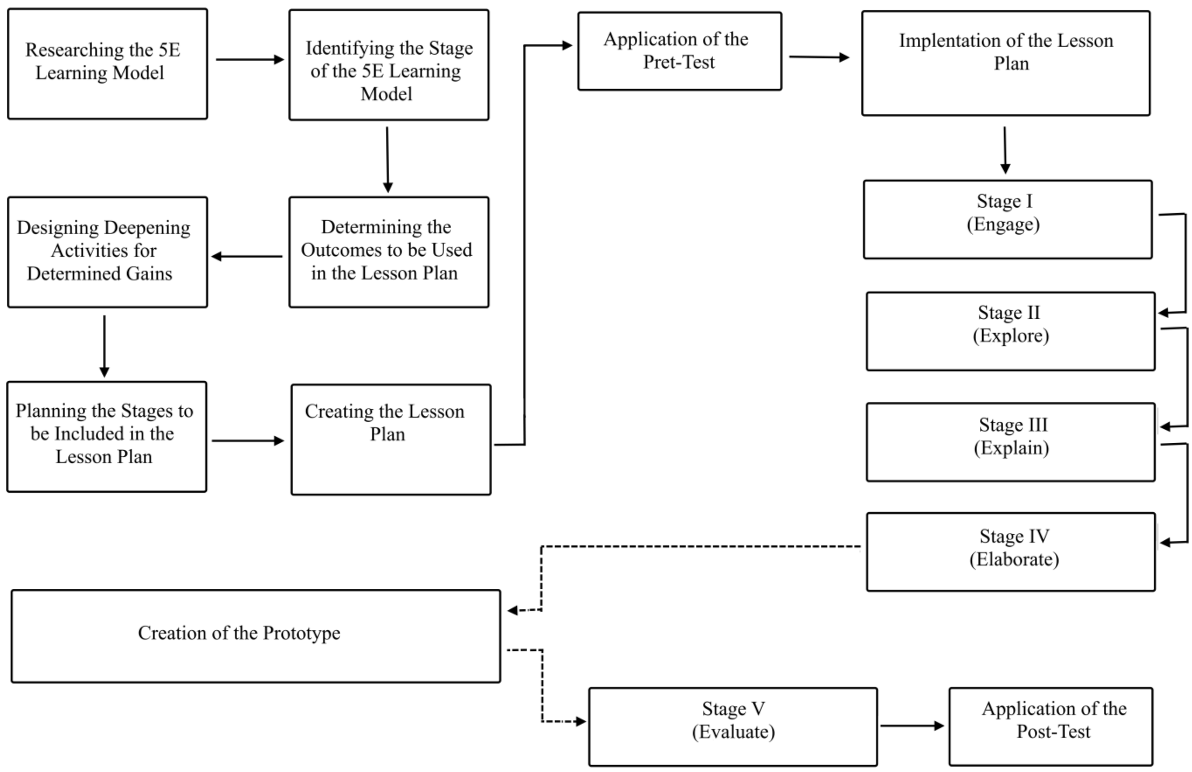


**Figure 1:** Creating and Implementing the Lesson Plan

## 4. Lesson Plan Designed by Following Per Under The 5e Teaching Model: My Smart Greenhouse

| | |
|---|---|
| *Class* | : 7th Grade |
| *Unit Name* | : Limitation of Resources and Ecological Footprint |
| *Learning Area* | : Sustainable Development Implementation |
| *Time of the Lesson Plan* | : 11 Lesson Hours |

The gains given in the lesson plan are the gains in the curriculum that the Ministry of National Education of the Republic of Turkey is still implementing. Since there is no question of making changes in the outcomes, it is given as it is in the curriculum.

*Acquisitions Related to Environmental Education Course:*
• C.E. 3.5. Examines the effect of sustainable natural resource use on sustainable development.
(1)Designs cultivation areas for food production with responsible and environmentally friendly practices based on the concept of organic agriculture.

*Achievements Related to The Mathematics Course:*
• M.7.3.2.1.Explains the side and angle properties of regular polygons.
• M.7.3.2.3.Recognizes rectangle, parallelogram, trapezoid, and rhombus; determines the angle properties.
• M.7.3.2.5. Solves field-related problems.
• M.7.3.4.1.Draws two-dimensional views of three-dimensional objects from different directions.
• M.7.3.4.2. Creates the structures whose drawings are given regarding their views from different directions.

*Acquisitions Related to Technology and Engineering Fields:*
• BT.5.3.2.3. Performs basic research using search engines.
• BT.5.3.2.4. He questions the accuracy of the information he has obtained from different sources.
• BT.5.3.2.5. He organizes the information he has reached by citing the source.
• BT.6.3.2.1. Performs advanced research using search engines.
• BT.6.3.2.2. Distinguish harmful and unnecessary content while accessing information.
• TT. 7. D. 1. 1. Tells the design problem.
• TT. 7. D. 1. 2. Applies the research steps for solving the design problem
• TT. 7. D. 1. 3. Prepares the design plan.
• TT. 7. D. 1. 4. Creates a model or prototype of the design
• TT. 7. D. 1. 5. Evaluate the design according to the determined criteria.
• TT. 7. D. 1. 6. Restructures the designed product according to the evaluation results.
• TT. 7. D. 2. 1. Presents the product or products to be exhibited.

*21st-Century Skills Planned to Be Acquired:*
• Problem-solving
• Critical Thinking
• Creative Thinking
• Communication – Collaboration
• Flexibility – Adaptation
• Productivity

### 4.1. Engage

At this stage, the teacher brings some vegetables to the class, which he thinks will increase the students' interest in the lesson and reveal the students' prior knowledge about the use of natural resources. The teacher allows them to examine the vegetables they bring to the class one by one, as seen in Figure 2. The teacher makes the students watch a documentary about the use of resources and the cultivation of vegetables, as seen in Figure 3.

**Figure 2:** The Students Examine Vegetables

**Figure 3:** The Students are Watching a Documentary

The teacher asks students to write down their views on the use of resources and the cultivation of vegetables and fruits. Ask students to share their opinions with their friends. The teacher creates three groups of four people as seen in Figure 4. Based on the visuals and some vegetables and fruits that the teacher brought with her, the teacher distributes the questions given below to each student in groups of four with one question for each student and asks the students to research the question given to them. The teacher also states that students can benefit from technological tools (computer, tablet, phone…) during the research process.

*Note:* The introductory phase is planned as 2-course hours.

*Questions:*
(1) What does it mean to you that some fruits and vegetables have worms?
(2) What could be the reason why the same kind of vegetables or fruits differs from each other in size?
(3) What can be innovative applications in vegetable and fruit growing?
(4) What should be the characteristics of the areas where vegetables and fruits will be grown?

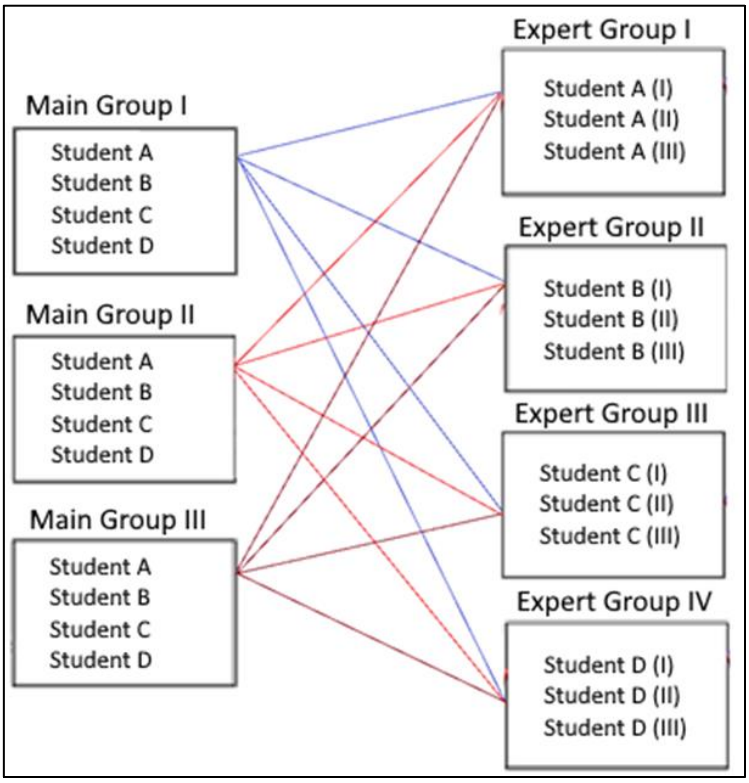

**Figure 4:** The Groups Created

## 4.2. Explore

Students who are in the main groups created by the teacher for the application of the jigsaw technique and research the same question gather in expert groups (Figure 5). These gathered groups are called expert groups for each question. Research results related to each question are shared and discussed in expert groups (Figure 5). Students who have mastered each question return to their original groups for in-depth discussion and learn about the answers to the questions (Figure 5). After the evaluation process is completed in the discussion environment, the following activity is done by going out to the school garden with the students.

**Figure 5:** Main Group and Expert Group

*Activity: I'm Watering My Flowers*

Materials:

| | | |
|---|---|---|
| (1) Pipette | (2) Connecting Pieces | (3) Plastic Pipe |
| (4) Casting Foot | (5) Dissecting Needle | (6) Metal Rods of Different Sizes |

*Experimental Procedure:*

Experimental materials are prepared as much as the number of groups. Materials are distributed to students. Students are asked to share tasks with their friends in their groups. Metal rods are mounted to each other with the cast feet. Water is filled into the pipette. It is fixed to metal rods with pipette connectors.

**Figure 6:** The Irrigation System Established by the Students

As seen in Figure 6, the plastic pipe combined with the tip of the straw is positioned over the point where the plant meets the soil. It is ensured that the plant in the soil is watered at regular intervals.
*Note:* The exploration phase is planned as 2 lesson hours.

### 4.3. Explain

In this section, the teacher makes explanations regarding the main achievement within the scope of the Ministry of National Education 7th Grade Environmental Education Curriculum (Figure 7).

**Figure 7:** Applied Area Calculation Activity of Students

*Note:* The explanation phase is planned as 1 lesson hour.

### 4.4. Elaborate

*Mathematics Integration:*
According to the Ministry of National Education's 7th Grade Mathematics Curriculum, the teacher explains the learning outcomes and does the following activity with the students in the classroom. As a result of the activity carried out by the teacher with the students in the classroom, it is aimed to gain the achievements about geometric shapes and will be used in the design of the product to be created with the integration of engineering.

*Activity: How many people are we in which field?*

*Materials:*
• Wall Strip

*Making the Activity:*
13 strips of 1 m length are cut from the wall strip. Different geometric shapes are created by sticking the obtained strips to the floor (Square - Hexagon - Triangle). Students enter the shapes created on the floor with only their shoulders touching. The number of students who enter each geometric shape, in turn, is determined. As seen in Figure 8, a

relationship is established by comparing the numbers of students entering the geometric shapes.

**Figure 8:** Applied Area Calculation Activity of Students

Area calculations are made by establishing a discussion environment about the comparison data obtained by the students. It is tried to reach a consensus by comparing the theoretical area calculations with the data obtained as a result of the application.
*Note:* Mathematics integration is planned as 1 lesson hour.

*Engineering and Design Integration*
At this stage, a problem that they may encounter in daily life is given to the students by scenario.

*Problem Status:*

With the acceleration of agricultural technologies in recent years, there is a radical transformation in plant production practices. However, the field where the breath of future agriculture is felt most closely is undoubtedly greenhouse cultivation. Thanks to the greenhouse areas where very different technologies can be used at the same time and controlled production can be made, many products have begun to conquer brand new areas where they were not grown before. Smart greenhouses, which put heat and humidity levels under the control of the manufacturer, are at the center of this transformation. In Turkey, where the number of greenhouses with geothermal energy is increasing, greenhouse cultivation is spreading to a wider area. It is now possible to encounter vegetable production in many regions and climates, in which the coastal areas, especially the Mediterranean, predominate.
Source: https://www.tarlasera.com/haber-11905-akilli-sera-salataliklari-buyuksehir-tezgahlarinda

*Problem Statement:*

Teacher: "*My dear students, based on a newspaper report in case of a problem, different environmentally-friendly greenhouse models are designed and built. Considering the greenhouse industry in our country, producers can reach max. If you were to design a greenhouse where it can produce a large number of products, what kind of greenhouse model would you design*?"

*Aim:*

With the completion of this activity, it is aimed to increase the awareness of the students about the design of a greenhouse and environmentally friendly practices in food production to be made in the greenhouse.

*Sub-Aims:*

• The max. using area max. obtaining product
• The greenhouse can be designed and built structurally
• The methods that can be used in food production in the greenhouse have environmentally friendly practices
• The greenhouse has a sustainable structure in food production

*Concepts to Know:*

(1) Smart Greenhouse (2) Sustainability (3) Resource Utilization

*Stages to be followed:*

(1) Examination of sample greenhouse models
(2) Thanks to the environmentally friendly greenhouse models with different geometric shapes, max. making area calculations to reach production
(3) Deciding on the most ideal greenhouse model
(4) Beginning the creation of the model

(5) Creating the model and finalizing the model

*Necessary materials:*

| | | | |
|---|---|---|---|
| (1) Cardboard | (2) Straws | (3) Ruler | (4) Stretch Film |
| (5) Silicone gun | (6) Paper cups | (7) Silicone pen | (8) Wooden skewers |

Realization of the Activity:

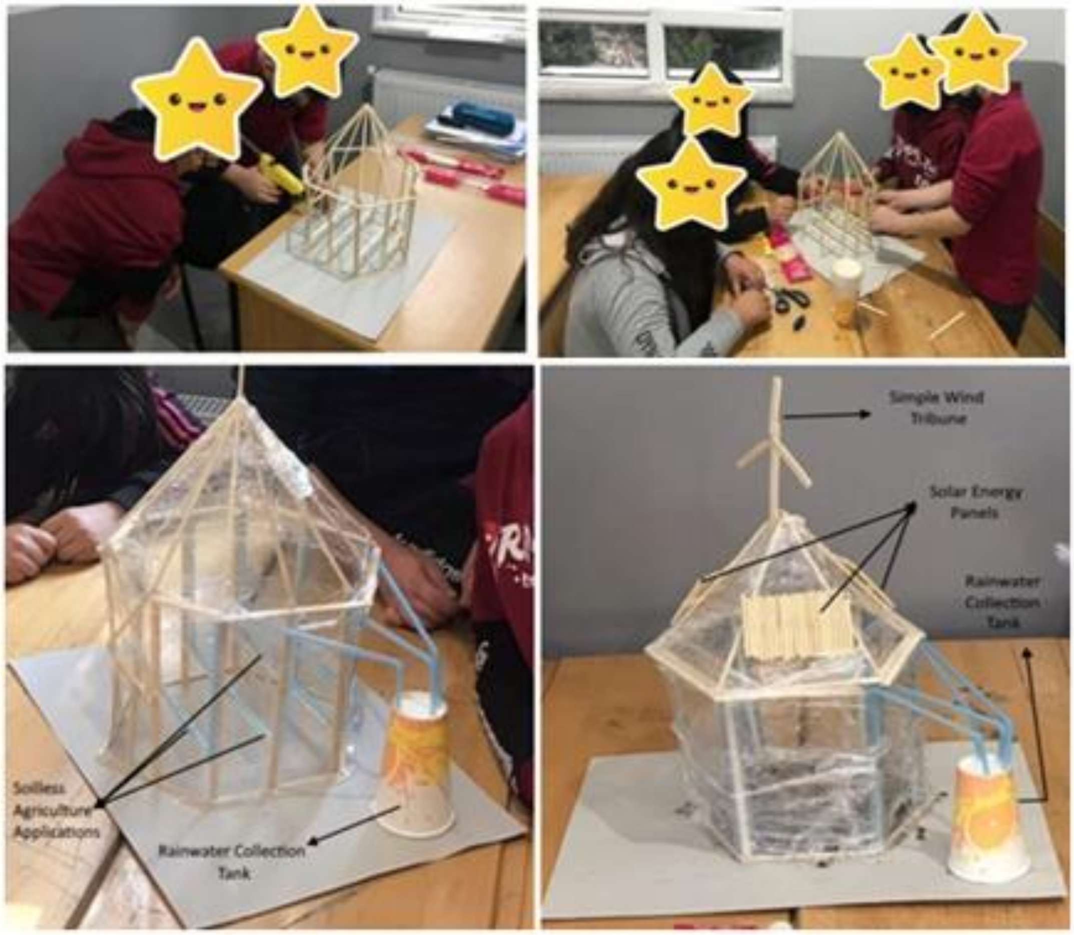


**Figure 9:** Creating and Finalizing the Model

*Note:* Engineering and design integration is planned as 4-course hours.

### 4.5. Evaluate

The evaluation criteria of creative thinking skill performances in STEM-based learning developed by Chasanah, Kaniawati & Hernani (2017) that the teacher can use at this stage are presented in Table 2. Product evaluation is at the teacher's discretion and different product evaluation methods or tools can be used.

Eagles group scored 34 points, the Canaries group 33 points, and the Lions group 31 points in total. In this context, according to the criteria in Table 2, the prototype

designed by the Eagles group received the highest score. The scores obtained by the groups according to the criteria are given in Table 2.
*Note:* The evaluation phase is planned as 1 lesson hour.

**Table 2:** Evaluation Criteria of Creative Thinking Skills Performance

| Creative Thinking Skills Criteria | Engineering Design Process Steps | Criteria | Group of Lions Points | | | | | Group of Eagles Points | | | | | Group of Canaries Points | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| Flexibility | Identifying Problems | The student finds the problems of the displayed events. | | | | | x | | | | | x | | | | | x |
| | Discussion | Students come up with and develop many ideas. | | | | | x | | | | | x | | | | | x |
| | Uncovering Solutions | Students offer many ideas, answers, and problem solutions. | | | | | x | | | | | x | | | | | x |
| Originality | Design | Students design a product with a new look that is not the same as their friends. | | | x | | | | | | x | | | | x | | |
| Fluency | Building | Students are skilled and quick at making products. | | | x | | | | | | x | | | | x | | |
| Detailing | Discussion | Students can develop and enrich their friends' ideas. | | | | x | | | | | x | | | | | | x |
| | Evaluation Test | Students test the product to find out its weaknesses. | | | x | | | | | | x | | | | | x | |
| | Redesign | Students make additions to the product to correct their weaknesses. | | | x | | | | | x | | | | | x | | |

## 5. Results

It was observed that the students could not quickly integrate the solution proposals they put forward into their designs, and they were highly influenced by each other while designing the appearances of their prototypes. Although the students are influenced by each other in terms of prototype appearances, different agricultural practices in the prototypes are considered very important in terms of richness of ideas. As a result of the evaluations made in terms of the functionality of the prototypes, new agricultural applications added to the prototypes serve to the extent that the prototypes can be built in real life. Although there was no statistically significant difference in creativity skills as a result of the analysis of the pre-test and post-test scores obtained using the scientific creativity scale with the SPSS program, it was determined that there was an increase in creativity skills as a result of the comparison of the total scores of the pre-test and post-test (Figure 10).

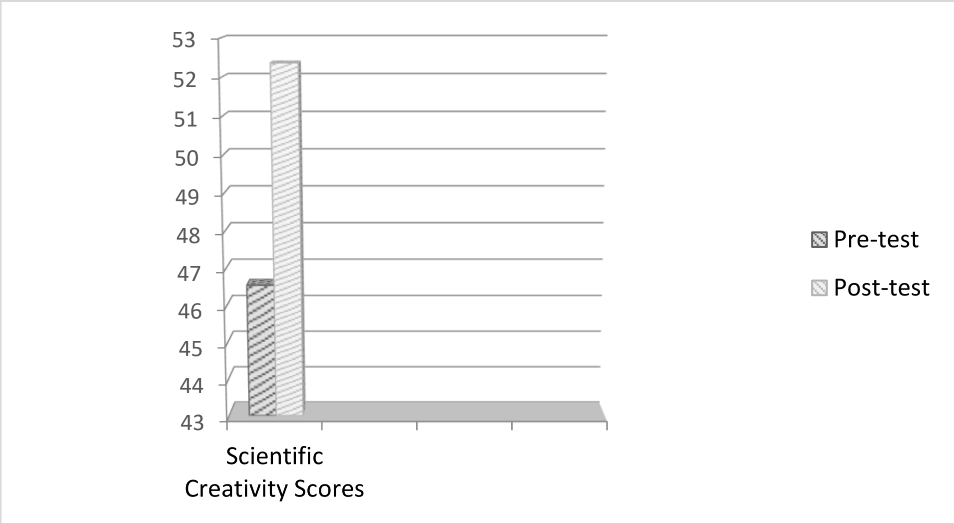


**Figure 10:** Scientific Creativity Total Scores

**Table 3:** Pre-Test and Post-Test Mean Scores

| Measurement | N | Mean | S | sd | t | p |
|---|---|---|---|---|---|---|
| Pre-test | 11 | 46,55 | 16,45 | 10 | 1,92 | .083 |
| Post-test | 11 | 52,36 | 13,66 | | | |

When Table 3 is examined, the pre-test and post-test mean scores of students regarding scientific creativity do not differ statistically significantly from each other [t (10) =1.92, p>.01].

## 6. Discussion, Conclusions and Recommendations

It is stated that thanks to the designed STEM activities, learning and teaching processes can be transformed into processes that increase the usability of the transferred information rather than just transferring information to students (Pehlivan & Uluyol, 2018). It is thought that by increasing the usability of information, students' interest and attitudes towards the disciplines that make up STEM will increase positively, and they will be more successful by experiencing less anxiety in the assessment exams they will enter (Knezek, et al., 2013; Luo, et al., 2020). In addition, with the course contents created, it can be ensured that students are raised as individuals who solve problems better, have advanced logical thinking skills, and have innovative ideas, thanks to their experiences

(Morrison, 2006). As a result of the evaluation of the data obtained from the literature review, it is predicted that the teachers will be able to use the course content designed in the study in the scientific applications and environmental education courses, especially the science course. In addition, it is thought that it will be a guided study for the new course contents that teachers will design. When the prototypes designed at the end of the implementation process of the course content were evaluated according to Table 2, it was determined that the students generally identified the problem in the given problem situation, created a discussion environment by consulting about the problem situation, and offered solutions for the problem situation.

Within the scope of the secondary school 7$^{th}$-grade elective environmental education course, a lesson plan designed using the 5E learning method related to the STEM learning approach was implemented and the scientific creativity skills of the students were measured. The results of the analysis revealed that students' scientific creativity skills are positively affected. In addition, when the evaluation criteria of creative thinking skill performances were examined, it was observed that the students were influenced by each other in the greenhouse design processes, they had difficulties in the processes related to the evaluation and redesign of the greenhouse models they designed, and they were not sufficiently skilled and fast in the design processes. When other criteria are examined, it is evaluated that they are more successful than the observations mentioned.

With this result obtained from the study, both the application skills of the teachers and the scientific creativity of the students can be developed by using this lesson plan within the scope of the elective environmental education course. The study was carried out with a single group and data were collected using the scientific creativity test. In future studies, qualitative data collection methods can be used by selecting experimental and control groups. In this way, different results can be obtained and different applications can be developed on the subject.

**Acknowledgement**
The schematic images used in the study were created by the researchers; the pictures were taken by the researchers during the implementation of the lesson plan.

**Conflict of Interest Statement**
The authors declare no conflicts of interest.

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