BURSA İNOVASYON MERKEZİ

STEM ve YAPAY ZEKA TEMA: SÜRDÜRÜLEBİLİR TARIM PROGRAMI

STEM ETKİNLİK PLAN ŞABLONU

Team Name:	Green Roof Ambassadors
Teachers' Names:	Pınar KARABABA, Fevzi ÇETİN, Gökay ORGANCI, Murat KOCAMAN, Osman YÜCEL
Topic Title:	AI-Supported Sustainable Agriculture: Rooftop Farming, Microgreens, Eco-Agriculture
Learning Objectives / Goals:	• Understanding the importance of sustainable agriculture. • Providing opportunities for natural and fresh nutrition. • Learning the role of artificial intelligence and sensor technologies in agriculture. • Designing a system for rooftop farming and measuring environmental parameters. • Developing data-driven decision-making skills. • Thinking globally and first spreading the practice to schools in our country and later to schools worldwide. • Sharing the process with educational stakeholders through technological devices.
Related Learning Outcomes:	Science: • Explaining the effects of environmental factors (humidity, temperature, light, altitude, oxygen level, pH of water) on plant growth. • Discussing the use of sustainable energy resources.
	Information Technologies: • Learning to use microcontrollers (Arduino or Raspberry Pi) to collect and analyze sensor data. • Using software tools (Python, Excel etc.) to process and visualize data.
	Engineering: • Designing a modular system suitable for rooftop farming. • Establishing an IoT-based sensor system.
	Mathematics: • Using statistical methods to analyze collected data and calculating cost and yield per unit area. • Creating graphs from data and making interpretations.
	Developing awareness of producing scientific solutions for sustainable development in agriculture.
Grade Level:	Middle School – 7th Grade
Duration:	40 + 40 Minutes
21st Century Skills:	• Critical thinking • Problem solving • Collaboration • Technology literacy • Artificial intelligence usage
Learning Approach:	Inquiry-Based Learning and Project-Based Learning
Tasks (Teacher and Student Roles):	Teacher: Guiding the process, providing technical support for sensor installation, and mentoring students. Student: Analyzing environmental factors for rooftop farming and optimizing the agricultural system using sensor data.

Materials / Technologies:	• Arduino kit (humidity, temperature, light sensors) • Plant growing equipment (pots, cocopeat, rock wool, heirloom seeds; lettuce, parsley, arugula seeds, etc., including medicinal and aromatic plants) • Software tools (Python, Arduino IDE) • Modular rooftop farming platforms • Solar panel system (electrical panel, battery, regulator) • Solar energy systems (hot water, radial heating system) • Thermal insulation equipment (polycarbonate materials)
LESSON PLAN ACCORDING TO THE 5E LEARNING MODEL	Brainstorming activity is conducted to prepare students for thinking. Students are asked how different objects can be used for purposes other than their original function. Students watch a short video about the decrease of agricultural land and food security in the world. After the video students are asked: "Imagine there is no agricultural land left on Earth and you are fighting global warming and food scarcity. How could sustainable agriculture be applied in a place where everything is covered with buildings?" The concept of rooftop farming is introduced and its importance for sustainability is explained.
	Students are divided into groups and each group receives Arduino kits and sensors (temperature, humidity, light). With teacher guidance, the functioning of sensors is demonstrated and students collect temperature and humidity data. Each group begins observing the collected data and understands the importance of data collection. According to available resources they design possible equipment solutions.
	The teacher explains the engineering design cycle for creating a rooftop farming system (problem identification, research, design, prototype development, testing, evaluation). Students begin designing a model rooftop farming system considering environmental requirements for the plants they selected.
	Each group sets up a rooftop farming system and begins collecting data. Students analyze the data and make suggestions for optimizing the system (for example maintaining specific humidity and light levels). The teacher provides feedback to improve the systems and encourages students to explore opportunities such as selling produced crops and contributing to the school economy.
	A Mentimeter activity is prepared to measure what students learned. Groups present their designs and collected data to classmates. The characteristics of the most effective systems are discussed and students share ideas about which factors are most important for rooftop farming.

	The teacher evaluates each group using a rubric (creativity, data analysis skills, engineering design process).
Related Resources:	• Arduino Student Guide • FAO (Food and Agriculture Organization) Sustainable Agriculture Reports
References:	• 'IoT for Sustainable Agriculture,' Springer Publications • 'Projects with Arduino,' Educational Publications