BURSA İNOVASYON MERKEZİ

STEM ve YAPAY ZEKA TEMA: SÜRDÜRÜLEBİLİR TARIM PROGRAMI

STEM ETKİNLİK PLAN ŞABLONU

Team Name:	BAP
Teachers' Names:	Berna Kılıç Ayça Adıyaman Pembe Turan
Topic Title:	Detecting Crop Damage While Protecting Biodiversity in Sustainable Agriculture (STEM + 5E Model)
Learning Objectives / Goals:	• To help students understand the importance of sustainable agriculture. • To develop problem-solving skills by integrating STEM disciplines (Science, Technology, Engineering and Mathematics). • To increase students' abilities to collect and analyze data by creating a simple model for damage detection. • To raise awareness about producing technological solutions to problems encountered in agriculture.
Related Learning Outcomes:	Science: Students predict factors threatening biodiversity based on research data.
	Information Technologies: Students learn to recognize the interface and features of spreadsheet programs and create appropriate tables. They collect data and classify them according to their types. They develop an algorithm to solve a problem and test the algorithm they created.
	Engineering: Problem identification, research, proposing solutions, design, testing and evaluation. Throughout this activity students experience all stages of the engineering design process. Students gain insight into what engineers do and adopt an engineering mindset while developing 21st-century skills such as problem solving, creativity, critical thinking, communication and collaboration.
	Mathematics: Data collection, representation and interpretation. Students present plant disease and pest data using tables and graphs and draw conclusions from these data. Students display data belonging to two groups using a double frequency table and column graph.
	Other: Real-life problems: Students can develop projects to solve problems related to agricultural areas in their own environment. This activity also improves interdisciplinary thinking by combining knowledge from science, mathematics, technology and design to solve a problem.

	Additionally, it contributes to students' ability to understand and express scientific texts in Turkish lessons and relate environmental problems and sustainability concepts learned in Social Studies. In summary, the activity combines many disciplines in the 6th-grade curriculum and helps students both improve academic skills and become environmentally conscious individuals regarding sustainable agriculture.
Grade Level:	6th Grade
Duration:	3 Class Hours
21st Century Skills:	Critical Thinking and Problem Solving • Data Analysis: Students analyze collected data and make decisions accordingly. • Problem Identification: Students detect plant diseases and face a real problem requiring solutions. • Solution Orientation: Students generate different solutions and develop creative thinking. Communication and Collaboration • Presentation: Students present their work effectively to classmates. • Group Work: Students collaborate with peers to complete projects. Creativity and Innovation • Different Perspectives: Students approach problems from different angles. • Design: Students demonstrate creativity by developing their own designs. Information and Technology Use • Database: Students organize collected data to create a database. • Technological Tools: Students analyze data using software or applications. Learning and Adaptation • Learning New Information: Students gain knowledge about plant diseases and agriculture. • Adaptation to Changing Situations: Students develop the ability to produce solutions depending on conditions.
Learning Approach:	Collaborative Learning Discovery Learning Problem Solving Project-Based Learning Learning by Exploration Inquiry-Based Learning Critical Thinking Observation Technique Question-Answer Method
Tasks (Teacher and Student	Teacher Roles: • Arousing interest and curiosity

Roles):	• Asking inquiry-based and exploratory questions • Guiding group work • Explaining concepts such as STEM and sustainability • Conducting continuous assessment and providing feedback • Encouraging creativity Student Roles: • Conducting exploration and research • Active participation and collaboration • Thinking about biodiversity and sustainable agriculture • Presenting and sharing knowledge • Developing problem-solving skills • Self-assessment and receiving feedback
Materials / Technologies:	Technological Tools and Simulations Drone simulation software that simulates aerial observation of agricultural areas to detect crop damage (e.g., SimScale, Google Earth). Sensors: • Moisture sensors • Temperature sensors • Light sensors • pH sensors • Motion and presence sensors to detect pests or animals Data Collection Tools: • Tablets or smartphones for collecting and analyzing sensor data • Cameras for documenting agricultural areas and detecting pests Software and Applications: • Data analysis software such as Excel or Google Sheets • Farm management applications such as FarmLogs or AgriWebb • Image processing tools such as ImageJ or Photoshop Physical Materials: • Paper and pencils for recording observations • Drawing papers and markers for designs and solution maps Educational Visuals: • Biodiversity posters and graphics • Cards describing pests and plant diseases • Videos explaining ecosystems and biodiversity in agriculture
LESSON PLAN ACCORDING TO THE 5E LEARNING MODEL	Purpose: To capture students' attention and connect with prior knowledge. Activity: Question prompts such as: • "What role do you think protecting biodiversity plays in agriculture?" • "What environmental consequences might occur when crops are damaged on a farm?"

	Case study presentation: Students watch a short video or visual presentation about crop damage caused by pests, diseases or weather conditions. Goal statement: “Today we will explore how technologies can be used to detect crop damage in agriculture and understand the importance of protecting biodiversity.”
	Purpose: Encourage students to collect data and conduct investigations. Students observe a virtual agricultural area using basic sensors (moisture, light, etc.) or drone simulations. Students work in small groups and analyze datasets representing different types of crop damage or environmental factors such as climate changes. Students record observations and identify which factors affect biodiversity.
	Purpose: Help students understand concepts related to the collected data. Students combine and analyze the data in groups and discuss how technology can be used to protect biodiversity. Teacher explanations support students’ observations and introduce scientific explanations about biodiversity conservation in agriculture. Students learn about technologies used in sustainable agriculture such as biological pest control and AI-based damage detection.
	Purpose: Enable students to apply their knowledge to real-world situations. Students design a solution that protects biodiversity while detecting crop damage. Example: Using drone images and sensors to monitor farmland and detect pests sustainably. Students also simulate crop damage under different environmental conditions and visualize how plants are affected under various climate conditions.
	Students evaluate the learning process. Group presentations: Each group presents its solution and explains how it works, its contribution to biodiversity and how crop damage is detected.

	Peer evaluation: Students evaluate each other's projects and discuss which solutions are more sustainable. Short quiz or survey: A short quiz or survey is conducted to measure students' understanding of biodiversity, crop damage detection and sustainable agriculture.
Related Resources:	• Educational videos about drone simulations or agricultural sensors • Sensor kits (moisture, temperature etc.) or virtual simulation software • Biodiversity graphs and infographics • Drawing papers and markers for recording designs
References:	ChatGPT, 6th Grade Science Curriculum, 6th Grade Mathematics Curriculum, 6th Grade Information Technologies Curriculum, Gemini, Microsoft Copilot, Eduaide.AI