



BURSA İNOVASYON MERKEZİ

STEM ve YAPAY ZEKA TEMA: SÜRDÜRÜLEBİLİR TARIM PROGRAMI

STEM ETKİNLİK PLAN ŞABLONU

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| Team Name: | SMN Innovative Agriculture |
| Teachers' Names: | Salim KELLEÇİ, Mithat KARA, Nihal KUZU |
| Topic Title: | Dissemination of Sustainable Agriculture in Schools |
| Learning Objectives / Goals: | Teaching students sustainable agriculture methods and helping them understand the importance of these methods. Encouraging students to interact more with nature and increasing environmental awareness. |
| Related Learning Outcomes: | Science: <ul style="list-style-type: none">• Learning plant life cycles.• Understanding photosynthesis and plant growth.• Learning about ecosystems and ecological cycles.• Understanding soil structure and components.• Distinguishing organic and inorganic matter. |

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| | <ul style="list-style-type: none"> • Observing chemical change processes through composting. • Understanding how plants use solar energy. • Developing environmental awareness through sustainable agriculture. • Understanding the importance of protecting natural resources. • Developing scientific process skills such as observation, experimentation, data recording, hypothesis formation and evaluation. |
| | <p>Information Technologies:</p> <ul style="list-style-type: none"> • Collecting and analyzing data obtained during agricultural activities. • Presenting data using graphs and tables with software tools. • Designing automated systems such as irrigation systems using simple programming. • Integrating technology into agriculture with microcontrollers such as Arduino and Raspberry Pi. • Conducting internet research and sharing information digitally. • Developing digital content such as blogs or simple websites. • Improving collaboration and project management skills using online tools. • Developing problem solving and critical thinking skills using technological solutions. • Encouraging creative thinking and innovation for sustainable agriculture. |
| | <p>Engineering:</p> <ul style="list-style-type: none"> • Producing engineering solutions for problems encountered in agricultural activities. • Developing innovative projects using design thinking methods. • Modeling agricultural processes and irrigation systems mathematically. • Designing automatic irrigation systems using microcontrollers. • Analyzing system performance. • Planning and managing engineering projects. • Selecting appropriate materials for agricultural projects. • Collecting and analyzing agricultural data. • Producing creative and innovative engineering solutions. |
| | <p>Mathematics:</p> <ul style="list-style-type: none"> • Learning statistical concepts by collecting and analyzing agricultural data. • Visualizing data with graphs, tables and diagrams. • Measuring plant growth and agricultural areas to calculate area, volume and perimeter. • Applying ratio and proportion in irrigation and fertilizer calculations. • Solving real world problems using mathematical thinking. • Designing agricultural areas using geometric concepts. • Modeling plant growth and predicting productivity. • Learning financial mathematics including cost analysis, budgeting, profit and loss calculations. |
| | <p>These outcomes help students apply theoretical knowledge from science, information technology, engineering and mathematics courses to real world problems.</p> |
| Grade Level: | Middle School Grades 5–8 and High School Grades 9–10 |
| Duration: | 10 Hours |
| 21st Century Skills: | <ul style="list-style-type: none"> • Critical Thinking and Problem Solving • Creativity and Innovation |

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| | <ul style="list-style-type: none"> • Communication Skills • Collaboration and Teamwork • Digital Literacy • Learning to Learn • Entrepreneurship • Cultural and Environmental Awareness |
| Learning Approach: | Project-Based Learning (PBL). Students work on real world problems related to sustainable agriculture, conduct research, collaborate in teams, produce innovative solutions and evaluate their own learning process. |
| Tasks (Teacher and Student Roles): | <p>Teacher Roles: Guiding students, providing resources and theoretical knowledge, motivating students, evaluating work, encouraging collaboration, solving problems and managing project resources.</p> <p>Student Roles: Project leader, researcher, data analyst, gardener, technology specialist, communication officer, designer, financial manager, educator, and evaluation specialist.</p> |
| Materials / Technologies: | <p>Materials:</p> <ul style="list-style-type: none"> • Garden tools (shovel, rake, hoe, watering can) • Seeds and seedlings • Organic soil, fertilizers and compost • Irrigation systems and water storage tanks • Natural plant protection products • Compost bins • Plant labels and markers • Recycling bins <p>Technologies:</p> <ul style="list-style-type: none"> • Microcontrollers such as Arduino or Raspberry Pi • Agricultural sensors (soil moisture, temperature, light) • Data analysis software (Excel, Google Sheets) • Online learning platforms (Google Classroom, Microsoft Teams) • 3D printers for prototypes • Mobile applications |
| LESSON PLAN ACCORDING TO THE 5E LEARNING MODEL | <p>Objective: To attract students' attention and stimulate curiosity.</p> <p>Activity: Students watch a documentary or short video about the importance of sustainable agriculture.</p> <p>Discussion Questions:</p> <ul style="list-style-type: none"> • What is sustainable agriculture? • How is it different from traditional agriculture? • Why is sustainable agriculture important? <p>Students form small groups and research different sustainable agriculture techniques such as composting, water harvesting or organic fertilizers using computers and internet resources.</p> <p>Each group presents their research results using presentations, posters or brochures. Students discuss their findings and answer questions.</p> <p>Students conduct practical agricultural activities in the school garden. They apply selected sustainable agriculture techniques and start growing plants.</p> <p>Students evaluate the project process and results. They record</p> |

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| | plant growth and share results with classmates. Students prepare a report explaining what they learned and how it can be applied in real life. |
| Related Resources: | Books, research articles, online resources, agricultural applications, local farmers and environmental NGOs. |
| References: | <p>Books:</p> <p>Altieri, M. A. (1995). <i>Agroecology: The Science of Sustainable Agriculture</i>.</p> <p>Gliessman, S. R. (2007). <i>Agroecology: The Ecology of Sustainable Food Systems</i>.</p> <p>Lovins, A. B. (1999). <i>Natural Capitalism</i>.</p> <p>Articles and Reports:</p> <p>FAO – Climate Smart Agriculture.</p> <p>Journal of Sustainable Agriculture.</p> <p>Online Resources:</p> <p>Coursera, edX, WWF, Greenpeace, TED-Ed, Khan Academy.</p> |