

Teaching Script

1. Title

Building a robot with sensor technology

2. Keywords

Robotics, Sensors, Programming, Building Robots, Technology, Mission, Robots, Educational Kits, Testing and Evaluation

3. Basic information

STEAM Subject: TECHNOLOGY

Typical interaction time with the instructional scenario in teaching hours for in-school work: 2 hours

General description of the scenario:

<u>Phases</u>	<u>Stage</u>	<u>Time</u>
Introduction to Robot Technology	Preparatory Stage	25 minutes
Construction of the Robot	Implementation Stage	40 minutes
Programming and Testing	Implementation Stage	40 minutes
Presentation and Evaluation	Evaluation Stage	15 minutes

Age group: 10-12 years old

Estimated difficulty level:

Very Easy	Easy	Moderate	Challenging	Very Challenging
			X	

Teaching resources

Materials:

- Ready-made educational robotics kits (eg LEGO Mindstorms, VEX Robotics or other similar kits)
- Computers or tablets for programming
- Sensors (e.g. distance sensors, touch sensors)
- Batteries and cables
- Papers, pencils, and basic crafting tools

School infrastructure:

- Computers or Tablets. To program the robots, students need access to computers or tablets with the necessary programming software.
- Robotics or Technology Lab. Ideally, the course will be held in a lab with space to build and test the robots. Alternatively, a large room that can be temporarily equipped with the necessary equipment.
- Source of Electricity. In order to connect and operate the robots and sensors, a power source will need to be available.
- Laboratory Equipment. Tools and materials for construction, such as cables, batteries, and other small materials, must be available.

Additional material from external sources/online tools:

- Scratch (programming language) (<https://scratch.mit.edu/>)
Usage: Simple programming language that allows students to create programs for robots and other projects.
- Tinkercad (design and programming) (<https://www.tinkercad.com/>)
URL: Tinkercad
Usage: Free 3D design tool that can be used to design robot parts and programmed sensor setup.
- Blockly (programming with blocks) (<https://blockly.games/>)
URL: Blockly
Usage: Block programming tool that helps students understand basic programming concepts without writing code.

Differentiated instruction for students with different abilities and learning styles in the same class:

Assign different roles within the team (eg, designer, developer, maker) to tap into each student's strengths and encourage collaboration.

Developed by: Development Center of Thessaly

4. Educational Problem

This scenario addresses the problem of students' limited exposure to basic concepts of technology and robotics. Through building and programming a robot, students gain hands-on experience in sensor technology and develop problem-solving, collaboration, and creativity skills. The scenario integrates theoretical knowledge with practical application, enhancing the understanding of technological concepts and the ability to apply them in real-world situations.

5. Learning Objective (-s)

1. Understanding Technology Concepts: Students will understand the function of sensors and robots and how they are used to perform specific missions.
2. Building and Programming Skills: Students will develop practical skills in building and programming robots, using educational kits and software.
3. Problem Solving: Students will learn to identify and solve problems that arise during robot construction and programming.
4. Collaboration and Communication: Through group work, students will enhance their collaboration and communication skills by sharing ideas and solutions with their peers.
5. Critical Thinking and Evaluation: Students will develop critical thinking through evaluating the operation of the robot and discussing how to improve its performance.

6. Phases of the Scenario

Phase 1

Title: Introduction to Robot Technology

Indoor	Outdoor	Mixed
X		

Phase duration in minutes: 25 minutes

Detailed description of the scenario phase: In the first phase of the scenario, "Introduction to Robot Technology," students are introduced to the basics of robotics and sensors. The instructor begins with a presentation that explains the basic concepts of robotics, showing how robots and their sensors work. A demonstration of a ready-made robot follows, with an emphasis on the operation of the sensors and their application in various missions. Students have the opportunity to observe and examine the robot up close, while being given basic information on the use and importance of the technological components they will use in their construction. This phase is intended to spark students' interest, familiarize them with technology concepts, and prepare the ground for the hands-on work in the next phase.

Activity Sheets:

Activity Sheet: Introduction to Robot Technology

Name: _____

Date: _____

1. Robot Observation:

A. He observed the robot that the teacher presented. Write down the main parts of the robot and what they do.

Part of Robot	Function Description
_____	_____
_____	_____
_____	_____

2. Comprehension Questions:

A. What is a sensor and how does it help the robot carry out its missions?

B. What are the basic functions of a robot that uses sensors?

3. Robot Design:

Design the robot you would like to build. Use the area below to design and note which sensors you would use.

4. Brief Summary:

Write two things you liked most about the robot presentation and why.

1. _____
2. _____

Instructions for Use:

- Complete the activity sheet during or immediately after the presentation.
- Record your answers in as much detail as possible.
- Use the design space to express your own robot ideas.

Phase 2		
Title: Construction of the Robot		
Indoor	Outdoor	Mixed
X		
Phase duration in minutes: 40 minutes		
<p>Detailed description of the scenario phase: In the second phase of the scenario, "Building the Robot", students enter into the practical application of the concepts learned in the first phase. Starting with assembling the robot, students use robotics training kits that include various parts such as motors, sensors, and cables. Here are step-by-step instructions for mounting and connecting the components. During construction, students apply their knowledge of how sensors work and connect them to the robot programmer. The instructor provides guidance and support for any problems that arise, while students work in groups to complete the assembly of their robot. This phase enhances students' practical skills and prepares them for the robot programming process in the next phase.</p>		
Activity Sheets: N/A		
Phase 3		
Title: Programming and Testing		
Indoor	Outdoor	Mixed
X		
Phase duration in minutes: 40 minutes		
<p>Detailed description of the scenario phase: In the third phase of the scenario, "Programming and Testing," students focus on programming the robot they have built. Using programming software appropriate for their robot's platform, such as Scratch or Blockly, students create programs that determine the robot's actions based on the sensors they have installed. Students write code to perform specific actions, such as moving the robot or detecting objects. After completing the program, they perform tests to check that the robot works as expected and performs the programmed actions correctly. They record test results and identify any errors or problems that require corrections. This phase allows students to combine theoretical knowledge with practical application, developing programming and problem-solving skills.</p>		

Activity Sheets:

Activity Sheet: Robot Programming and Testing

Name: _____

Date: _____

1. Program Objectives:

A. Describe in one sentence the goal of your robot program.

2. Robot Test:

A. Is the robot performing the actions correctly? (Yes/No)

B. Mark one improvement needed:

3. Troubleshooting:

A. What is the main problem you have identified?

B. What solution do you propose?

Instructions for Use:

- Complete the sheet during the robot test.
- Use your answers to improve the program.

Phase 4

Title: Presentation and Evaluation

Indoor	Outdoor	Mixed
X		

Phase duration in minutes: 15 minutes

Detailed description of the scenario phase: In the fourth phase of the scenario, "Presentation and Evaluation," students present the results of their robot construction and programming to the class. Each team gets a chance to show how their robot works, explain the program they've created, and point out any challenges they encountered in the process. A discussion follows in which students exchange comments and suggestions for improvement based on the other groups' presentations. The instructor provides feedback and highlights strengths and areas for improvement. This phase encourages students' self-esteem, critical thinking and communication skills, enhancing their understanding of the process and the technology they used.

Activity Sheets: N/A

7. Evaluation Methodology

Assessment of the scenario is carried out through a combined approach that includes student self-assessment, peer assessment and teacher assessment. Students' complete activity sheets during each phase, highlighting their understanding and skills in building, programming and testing the robot. In the final phase, presentation and peer feedback reinforce critical thinking and provide opportunities for further improvement. The teacher evaluates student performance based on criteria such as completion of activities, functionality of the robot, and communication and presentation skills. Feedback from the teacher and peers helps to enhance learning outcomes and improve student skills.

8. Additional Resources for the teacher

N/A