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Eco-Interactions: Simulation of food webs with Micro:bit and Artec

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Objectives and Tasks

Learning Objectives

1. Build physical representations of plants, herbivores, and predators using Artec pieces.
2. Program Micro:bit with different types of reactions depending on the type and proximity of another living being.
3. Place the elements in a simulated environment (habitat).
4. Observe, analyze, and explain the trophic interactions that occur.
5. Formulate hypotheses about changes in the ecosystem balance.

Didactic Tasks

1. Program the movements of the Otto robot to simulate the path of geometric shapes on the ground.
2. Count and convert the robot's steps to centimeters or meters.
3. Calculate the perimeter by adding the sides measured by Otto.
4. Apply the corresponding formulas to find the area of the traversed shape.
5. Present the results in groups and share the code used.

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Interdisciplinary Connections

Related Subjects

1. Technology: Block programming and use of radio for communication between Micro:bits.
2. Artistic Education: Design and physical construction of living beings with Artec.
3. Spanish Language: Oral and written description of observed interactions.
4. Values Education: Awareness about sustainability and ecosystem conservation.

Practical Applications

1. Active understanding of how a food web works.
2. Observation of causes and consequences within an ecological system.
3. Identification of environmental problems and formulation of solutions.

Resources and Materials Needed

Physical Resources

1. Micro:bit boards (one per group).
2. Artec pieces to build physical representations of living beings.
3. Tape to delimit ecosystem areas in the classroom or on the floor.
4. Posters or cards with the assigned role for each group (plant, herbivore, or predator).

Digital Resources

1. Computers with internet access.
2. Possibility to project the code or show simulations.

Session Structure

Introduction

1. Explanation of Solar System movements: rotation, revolution, and the relationship between distance from the Sun and orbital speed.
2. Presentation of the challenge: program Otto to follow the orbit a planet would have around the Sun.

Development

1. Each group decorates their Otto as the planet assigned to their team.

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2. They recognize what the orbit of their planet would be in the scenario.
3. They program the robot to move in a circle.
4. They adjust the speed or waiting times between steps to simulate the relative speed of the planet.

Closure

- Each group explains the characteristics of their planet.
- Guided reflection: Which planet moved the fastest? Why are there differences in orbital speeds?

Expected Results

Key Learnings

1. Understanding of the heliocentric model of the Solar System.
2. Relationship between distance from the Sun and orbit duration.
3. Ability to program simple sequences for educational purposes.
4. Development of scientific thinking, active observation, and oral expression.

Final Products

1. HP Otto robot programmed and decorated as a planet.
2. Group simulation of the Solar System in the classroom or playground.
3. Oral presentation by each group.

Additional Notes

Suggestions

- The simulation can be recorded on video for review or sharing.
- Integrate sound effects or customized LED icons depending on the species.
- Repeat the activity changing roles between groups to understand different perspectives.

Possible Extensions

- Simulate phenomena such as deforestation, drought, or introduction of invasive species.
- Add sensors (temperature or light) to simulate real environmental conditions.
- Expand the number of programmed interactions to create a more complex ecological network.

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Programming Example