The Robotic Spirograph – Robotics Meets the Great Painters

Connection to eTwinning Project: European Palette: Discovering Great Artists

Goal: Students attempt to combine the art of painting with robotics.

Activity Title: Creating a Spirograph with LEGO WeDo 2.0

Duration: 4 Teaching Hours

Educational Fields (STEM/STEAM): Engineering, Technology, Mathematics, Art

Link: https://padlet.com/panpavelis/codeweek-z4mza4gmz3qoah74

https://codeweek.eu/view/1303283/construction-of-a-spirograph

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Teaching Objectives

Cognitive Objectives

- Understanding the concept of **circular motion** and **motion transmission (gears)**.
- Familiarization with the basic parts of the **WeDo 2.0 kit** (SmartHub, Motor, bricks).
- Learning **visual programming** (setting motor direction/speed, rotation time/degrees).
- Connecting with **Mathematics concepts** (shapes, symmetry, perimeter/radius).

21st Century Skills & Computational Thinking

- Application of the **Engineering Design Process**.
- Development of **Computational Thinking** and **Algorithmic Approach**.
- Cultivation of **Collaboration** and **Problem Solving (Troubleshooting)**.
- Development of **Creativity** and **Imagination (Art)**.

Required Equipment

- Two **LEGO Education WeDo 2.0** sets.
- **Paper** (large size, ideally) and **markers / pencils** (one per drawing arm).
- **Supporting Material:** Construction plan for a basic spirograph (internet search).

Stages of the Teaching Scenario

1. Introduction & Exploration

Duration: 20 minutes

Activities & Teacher's Role:

- Shows a video or images of a **traditional spirograph** or **Spirograph Art**.
- Poses the question: **"How can we build a robotic spirograph using LEGO WeDo 2.0?"**
- Students discuss the basic principles of the spirograph's operation (rotation, fixed center, drawing movement).

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2. Construction

Duration: 90 minutes

Teacher: Provides basic construction instructions (either pre-made or by guiding them) for a model that has a **motor rotating an arm or a disk** (this disk will hold the pencil/marker).

Students: Collaborate to build the robotic model, focusing on **stability** and how the motion will be transmitted to the drawing arm. (Application of Engineering).

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3. Programming

Duration: 30 minutes

Teacher: Guides students to connect the **SmartHub** and write the initial code in WeDo 2.0. The basic algorithm includes: **Start → Motor On (specific direction) → Wait/Duration → Motor Off.**

Students: Experiment with the **parameters** (speed, duration, or degrees of rotation) to see how the drawing is affected. (Application of Technology/Computational Thinking).

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4. Testing & Improvement

Duration: 15 minutes

Teacher: Encourages teams to make **changes to their model** (e.g., larger/smaller arm, changing the marker's position, using gears to alter speed/torque) and the **code** (e.g., alternating rotation direction, pauses) to create different patterns.

Students: Redesign and **debug** to produce the most impressive or complex shapes (Connection to Art and Mathematics).

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5. Presentation & Evaluation

Duration: 25 minutes

Teacher: Asks students to **present their model**, explain its operating principles, and show the best drawing they created.

Students: Present their work, explain what they learned about **engineering and programming**, and comment on the results.

Discussion about the shapes: Are they symmetrical? How does the speed relate to the density of the pattern?