EASE
EuropeAn network of steam Educators

LESSON PLAN

TITLE:
Exploring Mechanics and Coding with Strawbees and Micro:bit

GRADE LEVEL: 6TH, 7TH AND 8TH GRADE

STEAM AREAS: TECHNOLOGY, SCIENCE, ENGINEERING

MATERIALS NEEDED:

- Strawbees building kits;
- Micro:bit kits;
- Servo motors;
- Computers with internet access
- Micro:bit simulator (MakeCode interface);
- Projector and screen for demonstrations.

OBJECTIVES:
- Understand basic mechanical principles through building a model crane.
- Learn introductory coding skills using the Micro:bit platform.
- Apply problem-solving skills to integrate mechanical components with coding.
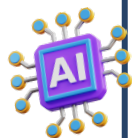- Explore the concept of input/output through real-world simulations and coding.

PROCEDURE:

Introduction (15 minutes):
- Begin the session by introducing the Micro:bit and Strawbees. Demonstrate their respective abilities and some basic projects built using these tools;
- Discuss the concepts of servo motors and how they can be controlled using code written in MakeCode;
- Distribute the materials and ensure every group (3-4 students) has access to a computer or tablet with MakeCode opened and a Micro:bit and Strawbees kit.

Building the Crane (30 minutes):
- Instruct students to use the Strawbees to construct the frame of a crane, including a moveable arm where a servo motor will be attached. Guide them through the construction process using step-by-step instructions available on the Strawbees classroom site if needed;
- Discuss the importance of sound engineering principles such as balance and support.

PROCEDURE:

Coding the Crane (30 minutes):
- Show students how to access the MakeCode website and start a new project;
- Guide students through the process of setting up their project by adding the Strawbees extension to the MakeCode library;
- Demonstrate how to code simple commands like moving the servo motor up and down. The basic code block to control a servo will be something like, `set servo A to 0 degrees` and `set servo A to 180 degrees`;
- Explain the concept of loops and conditions using button A and B for controlling the crane manually.

Mathematical Application (15 minutes):
- Let students change the application to respond to temperature input, where they use the Micro:bit's onboard temperature sensor;
- Guide them to code the Micro:bit to take four different temperature readings and calculate the average. Discuss variables, storage, and simple mathematical operations like addition and division.

Discussion and Troubleshooting (15 minutes):
- Allow students to test their cranes and fix any bugs in their code or issues in their Strawbees construction;
- Encourage students to explain what each part of their code does, fostering an understanding and mastery of their project.

Cleanup (5 minutes):
- Ensure students account for all components and neatly pack away their kits.

Ensure all safety guidelines are followed while handling electronics.
Encourage creativity as there is no single 'right' design or solution.
Adjust the complexity based on the students' understanding and grade level.

ASSESSMENT:
- Monitor student engagement and offer troubleshooting help during the building and coding phases;
- At the end of the class, have a brief Q&A session where students can explain how their crane works and what each segment of code does.
- Evaluate their final product and their ability to calculate the average temperature data successfully.

REFERENCES:
- Micro:bit official website: https://microbit.org/
- - Strawbees official website: https://www.strawbees.com/
- - MakeCode programming environment: https://makecode.microbit.org/
- https://www.youtube.com/watch?v=Eny65svuLhA

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