EARLY Teaching Scenario

Topic: Light waves and sound waves

Learning outcome: Students think and practice technical solutions.

-think about the difference between a light wave and sound wave
- must find appropriate technical parts for the experiment
- make a program to Lego EV3
- make a robot for the experiment
- test robot and program
- Acquire practical experience by working in pairs.

Skills pupils develop during the scenario (connect to curriculum →)

- Abstract physics phenomenons
- New words, electromagnetic waves, frequency, source, program
- Technical equipment: control module, sensor, speaker. program.
- Working together, sharing ideas.
- Develop something new, extend ideas to the next level. Cognitive experience and expertise for everyday life.

Applying the 7 key competences

- Thinking and learning to learn
- Taking care of oneself and others, managing daily activities, safety
- Cultural competence, interaction and expression
- Multiliteracy
- ICT-competence
- Competence for the world of work, entrepreneur-ship
- Participation and influence, building the sustainable future
- Development as a human being and as a citizen

Estonian model of digital competences based on The Digital Competence Framework 2.0 of EU (https://ec.europa.eu/jrc/en/digcomp/digital-competence-framework) states that by the end of 6th class students should be able to:

- find information from different digital sources;
- uses digital information for constructing new knowledge;
- uses different digital technology with the help of the teacher;
- uses and connects different devices for importing and exporting digital information.
- uses digital technology safely in order to protect devices, content, personal data and privacy in digital environments.

Target group: 7-9 class

Age of students: 14-16

Number of pupils: in pairs

Duration (estimated time/number of lessons): 45-90 min

Prerequisites (necessary materials and online resources):

- Lego EV3 Mindstorm kit, color sensor
- computer for programming
- 7 different color papers that give 7 different results with color sensor.

Introduction to the scenario *(incl. possible applications, alternatives and risks)*:

- Make a machine that translates different light waves to different sound waves.
- Analyze where might such a machine be useful and implemented for practical use?

Before the program begins (preparatory work for teacher):

- Before beginning, students should think about the nature of light waves and sound waves.
- What might be the source of the different light waves?
- Colour sheets should be chosen so that the color sensor gives different results with every one of the seven sheets.

The main part of the scenario:

- Open discussion about light waves, sound waves and possible sources. Discussion about sensors to determine light waves.
- Watch video - https://youtu.be/8hHJ3oXClO0
- Students put together Lego Ev3 with the necessary equipment. Every pair has seven different colored paper sheets.
- Connect Lego EV3 with computer via Bluetooth and find out how the color sensor reacts to color sheets.
- Start programming so that for every color lego ev3 makes different sound frequencies.
- Test machine functions and functionality.
- Try to make music. Select an appropriate volume level so that everybody can work unperturbed in the classroom.
- Analysis of where such color determination can be more useful?

Learning outcomes:

- Student's acquire a better understanding of the differentiating factors between lightwave vs sound wave.
- Students can measure different light waves and make different sound frequencies in a practical way.
- Learn how to connect Lego EV3 with the computer.
- Learn programming skills. Inputs vs outputs.
- Can think about new technical solutions.