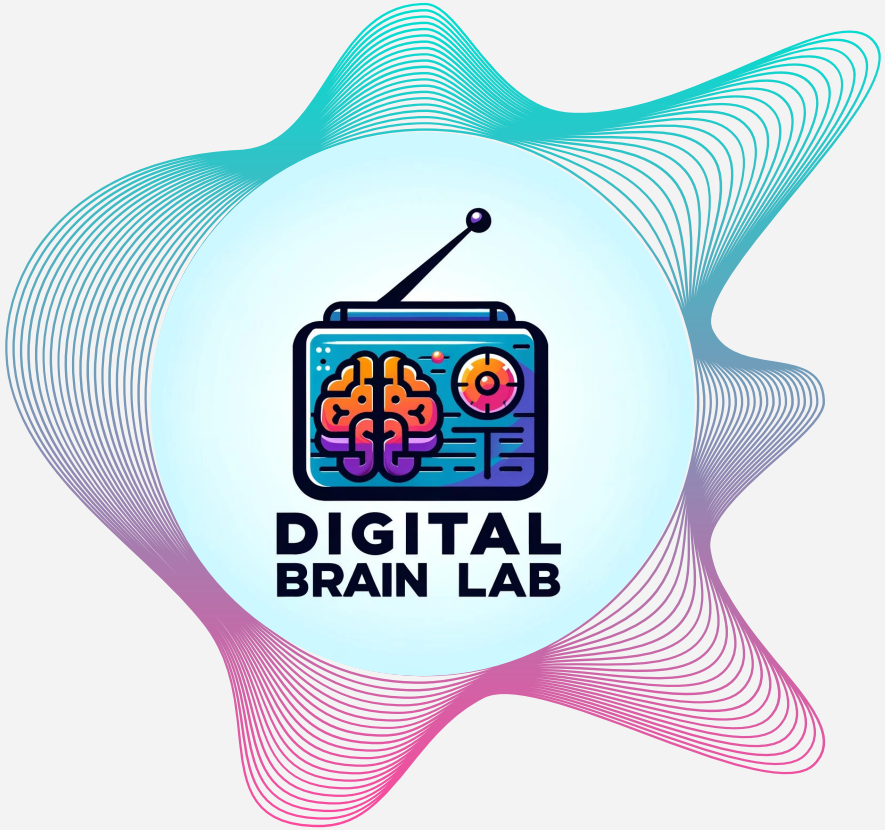


Radio Interference

2023W 490034-1 Development Spaces: Educational Robots and Social Diversity

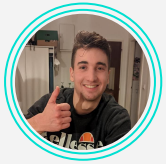
Our team

Barbara

Visionary Visualizer
(VV)

Reinhard

Grand Technomancer
(GT)



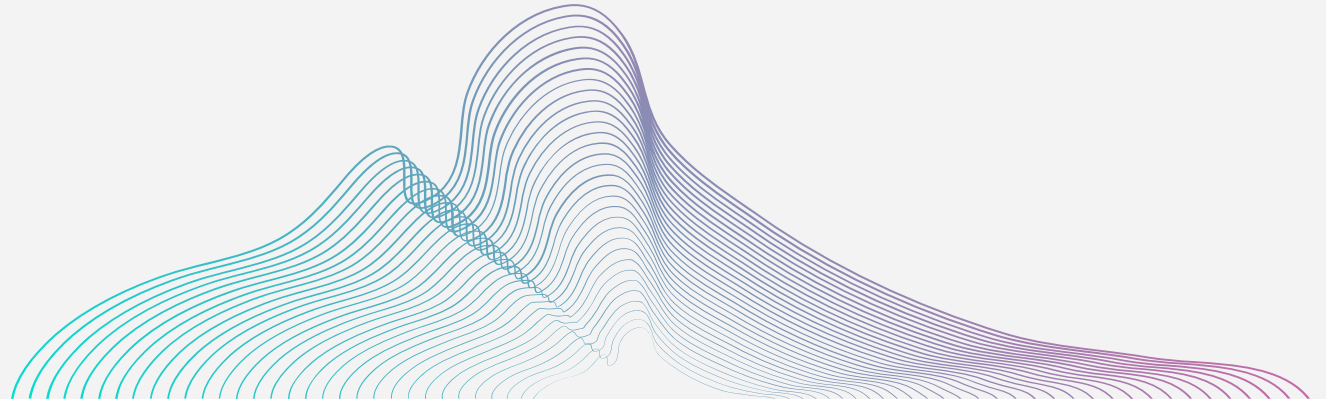
Thomas

Chief Storyteller
(CS)

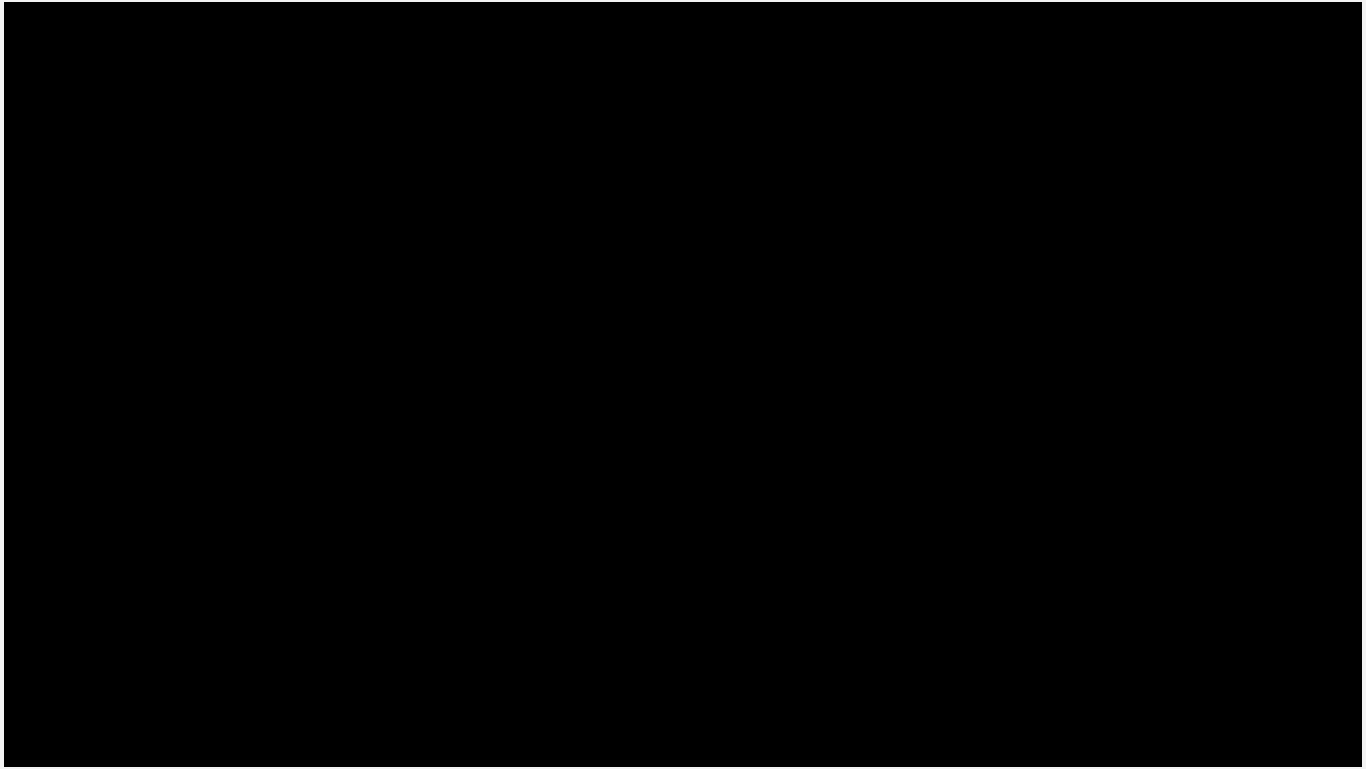
Table of Contents

What is interference?

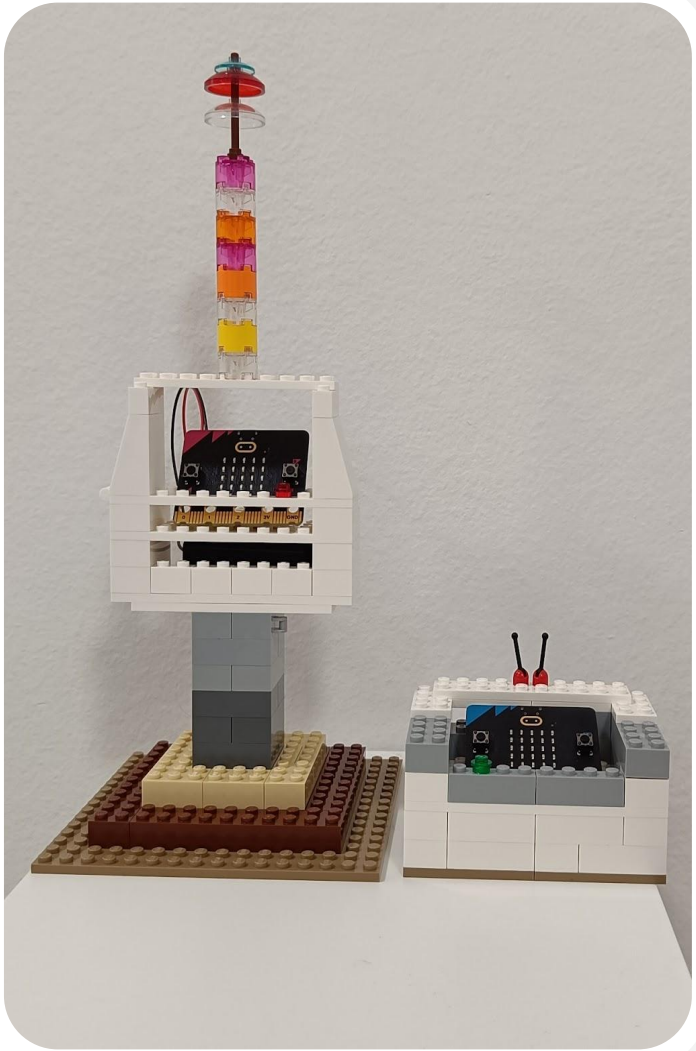
Where do the noises on the radio come from?



Digital Story

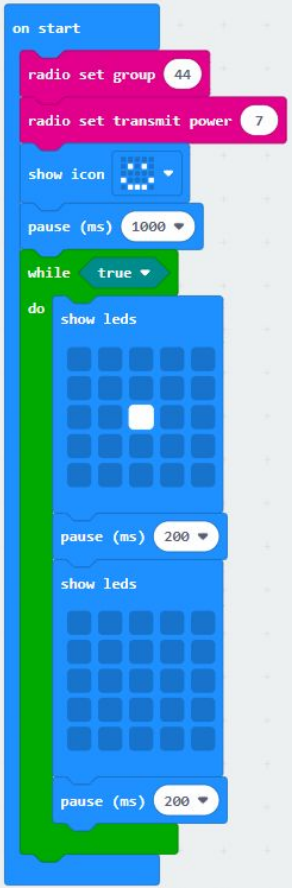


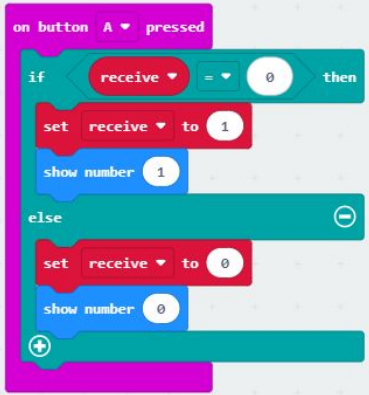
Images created with Dalle3 | Music & Sound Files CC0 1.0 Universal

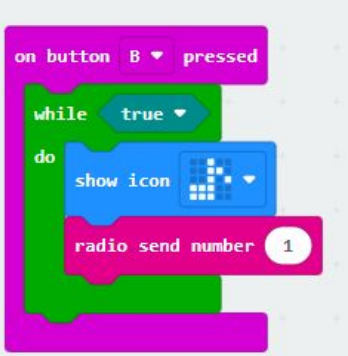


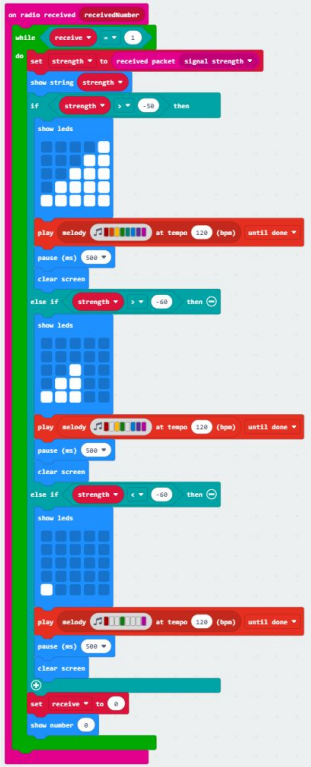
Our solution

Solution Code 1

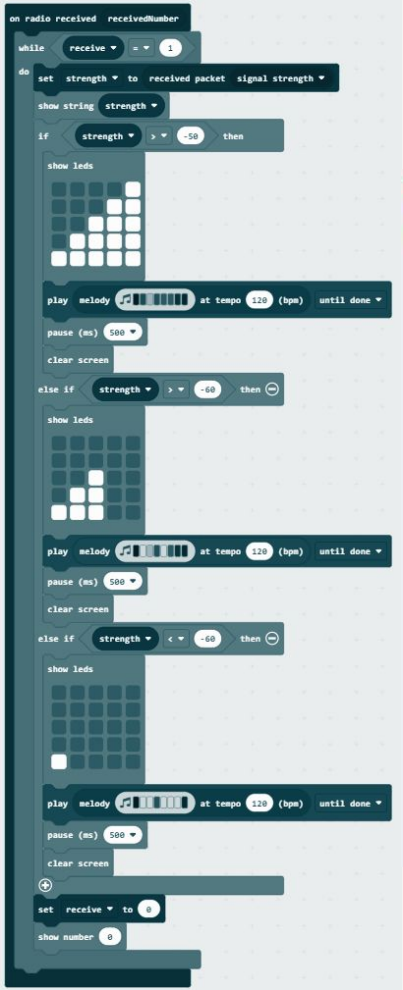


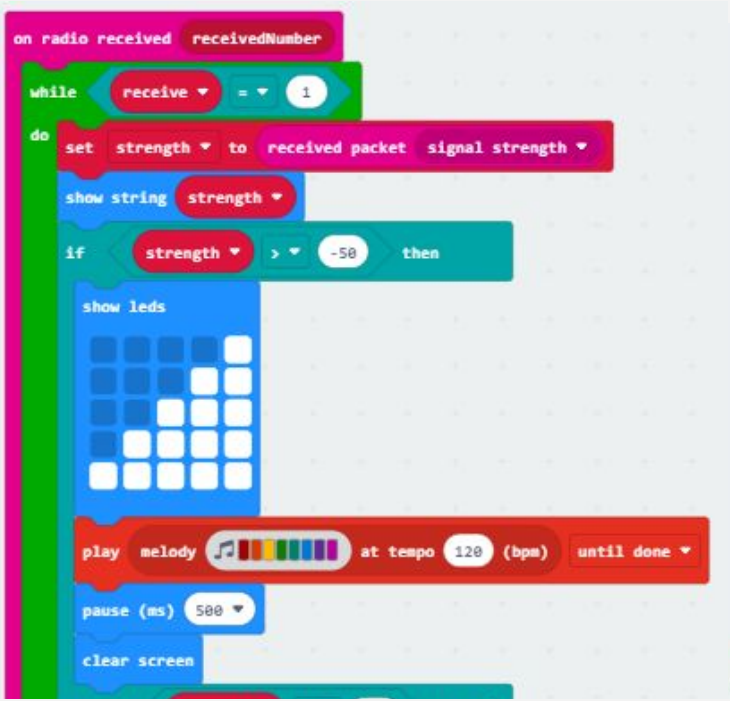


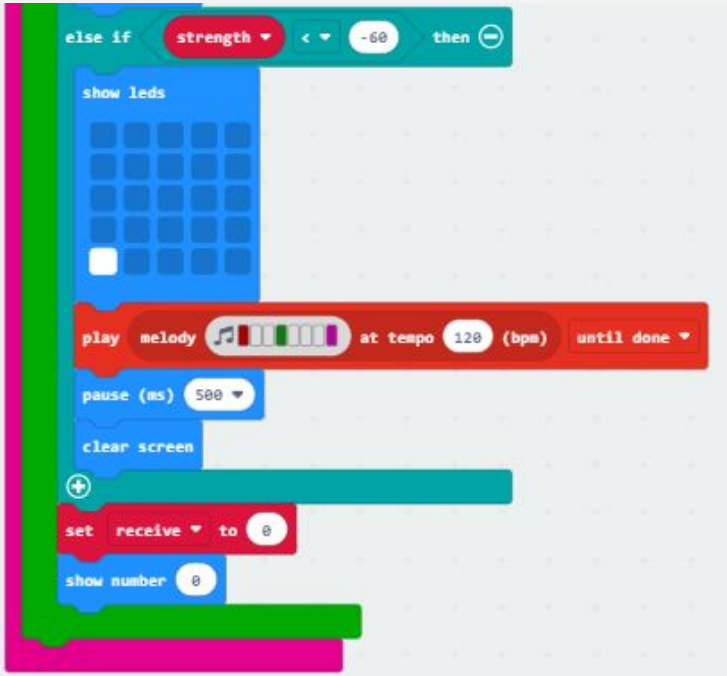




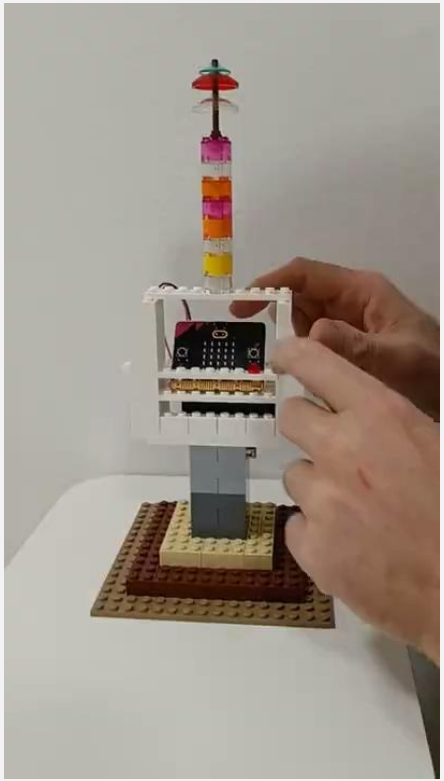
Solution Code 2



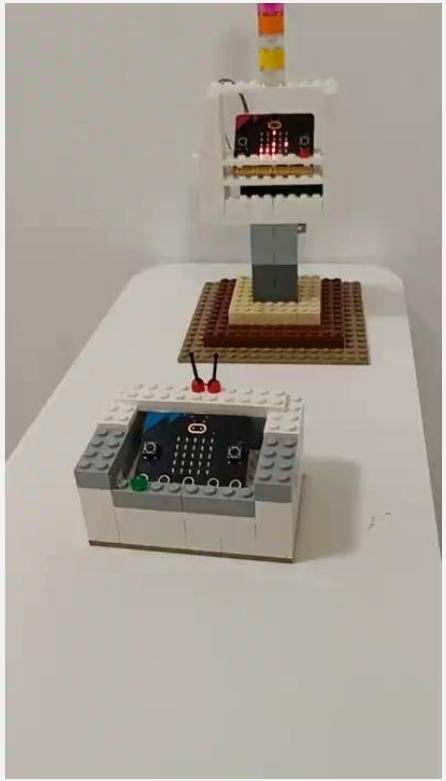




Solution Videos



Turning on the transmitter



Receiving a good signal

Receiving a weaker signal

Receiving a weaker signal

Goals & Objectives

Upper-secondary students:

- Train computational thinking.
- Acquire a basic understanding of coding.
- Solidification of knowledge and understanding of electromagnetic waves for upper-secondary students.

Lower-secondary students:

- Learn about communication via radio waves.
- Acquire a basic understanding of the factors contributing to successful transmission of radio waves.
- Gather technical knowledge and understanding of the world they live in.

Students can

- Actively participate in the classes
- Work together to understand the mechanism of the device
- Use their skills to fulfill the goal

The plan - Lesson 1

Duration: 100-150min

Target group: 11th grade students

Reference to curriculum: AHS-Oberstufe (Informatik/Physik)

Contextualisation: prior lessons on electromagnetic waves

Procedure:

1. Revision
2. Exploration of Micro:Bit
3. Project Work (coding transmission function)

The plan - Lesson 2

Duration: 50min

Target group: 5th grade students

Reference to curriculum: AHS-Unterstufe (Digitale Grundbildung/Physik)

Contextualisation: prior lessons on technology and electricity

Procedure:

1. Introduction: Digital Story
2. Exploration of Signal Strength
3. Concluding Explanation/Reflection

Assessment and reflecting strategies (for the upper-secondary students)

Can students build a radio receiver and a transmitter antenna using Micro:Bits?

Can students adjust the parameters affecting signal strength?

Can each student explain the code and understand how it reflects reality?

Can students simplify and explain how radio interference works to younger students?

How can we track students' learning?

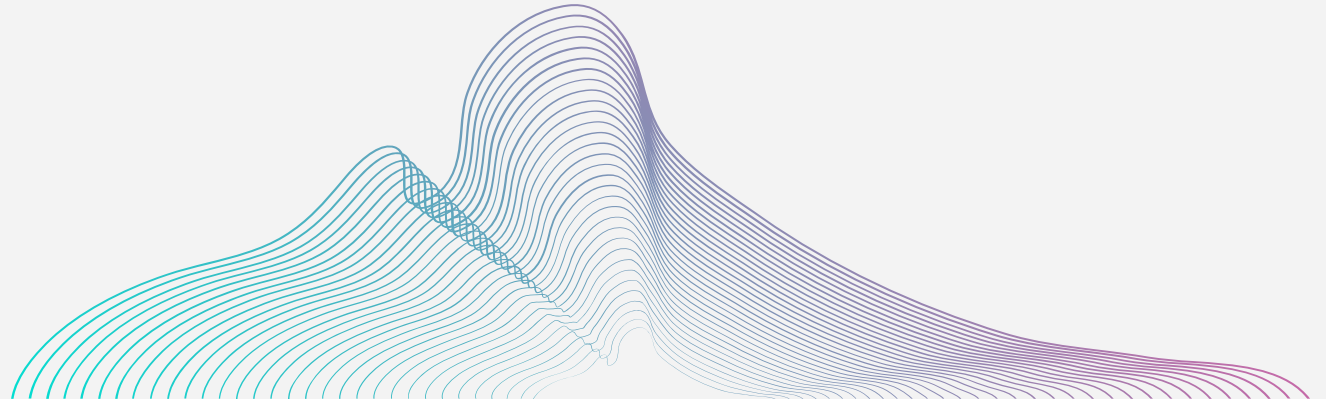
1. Baseline Assessment: before starting the topic, conducting an informal discussion to understand where each student is starting from.
2. Observing students during class activities and provide immediate, constructive feedback.
3. Asking questions to check comprehension.
4. If needed, helping students by giving practical tips and guiding questions.
5. End evaluation: open discussion about the project outcomes.

Thanks!

Do you have any questions?

The End

It’s time to interrupt this broadcast.



Lesson Plan

- Target group:
  - 11th grade students/ 5th grade students
- Duration:
  - ~ 150 mins
- Relevant subjects:
  - Physik, Informatik, Digitale Grundbildung
- Materials:
  - Micro:Bits/Blackboard/Whiteboard

Lesson Plan

Aims:

- Upper-secondary students train computational thinking.
- Upper-secondary students acquire a basic understanding of coding.
- Solidification of knowledge and understanding of electromagnetic waves for upper-secondary students.
- Lower-secondary students learn about communication via radio waves.
- Lower-secondary students acquire a basic understanding of the factors contributing to successful transmission of radio waves.
- Lower-secondary students gather knowledge technical knowledge and understanding of the world they live in.

Lesson Plan:

Reference to curriculum

This lesson plan is based on the some of the requirements/guidelines described in the curriculums for the AHS-Oberstufe, and the AHS-Unterstufe in the subjects Physik, Informatik, and Digitale Grundbildung. For example, the AHS-Unterstufen curriculum states that students should explore information on the transfer of energy and information through radiation (**Original wording:** “Informationen zur Energie- und Informationsübertragung durch Strahlung recherchieren (W)“ (AHS Unterstufen-Lehrplan: Physik 2023)) Additionally, the AHS Unterstufen Lehrplan focuses on the exploration and comprehension of elements of computational thinking through practical examples. (**Original wording:** “(T) an Beispielen Elemente des Computational Thinkings nachvollziehen und diese zur Lösung von Problemen einsetzen.” (AHS-Unterstufen Lehrplan: Digitale Grundbildung 2023)) These two aspects will be addressed in the framework of this lesson plan. Concerning the upper-secondary curriculum, the lesson plan will focus on the students’ ability to explain, design, illustrate, and implement algorithms in a programming language. (**Original wording:** “Algorithmen erklären, entwerfen, darstellen und in einer Programmiersprache implementieren können” (AHS-Oberstufen-Lehrplan: Informatik)) The contribution to the understanding of physics in the upper-secondary classroom is ensured, as the lesson plan also focuses on the generation and properties of electromagnetic waves. (**Original wording:** “Elektromagnetische Wellen: Erzeugung und Eigenschaften” (AHS-Oberstufen Lehrplan: Physik 2023)). All in all, the lesson plan intends to form a basic understanding of the aforementioned aspects for each group. A major emphasis will be placed on practical exploration of the relevant concepts.

Lesson Plan:

Contextualisation (before the lesson):

In prior physics classes, the upper-secondary 3rd students were familiarized with electromagnetic waves, and particularly with radio waves. They were taught the intricacies of this field of physics concerning the production and properties of the waves. In the Informatik lessons underlying this lesson plan, the students will combine their knowledge of radio waves with simple coding practices. This will be done using the Micro:Bits. Concerning the lower-secondary class, prior Digitale Grundbildung lesson were centred around exploring their surroundings and finding interesting pieces of technology used in everyday life, whose inner workings seem to be indecipherable. In this lesson, the teacher provided the students with the most important information about electricity and its application in some real-life examples (i. e. kitchen machines, electric cars, …).

Lesson Plan: 11th grade

rough time frame	procedure	interaction format	materials	notes
5 min	T introduces the topic (coding, electromagnetic waves, sound transmission using radio waves). Brainstorming: Ss are asked to name key words in connection with the topics.	T-S	blackboard	These key-words mentioned by the students will be noted on the blackboard and discussed shortly.
10 min	T gives brief revision of the topics, stating the most important aspects and reactivating the students' knowledge.	T-S	None	The teacher will connect the keywords on the blackboard, add the missing ones (if necessary), and explain the topic coherently to create a wholistic understanding of the subject matter.
15 min	T teacher introduces the Mirco:Bit to the students, and lets them play around with it. Students will be split in groups, in which they can explore the Micro:Bit.	T-S S-S	Micro:Bit	He showcases the Micro:Bit shortly, introduces one or two functions. Afterwards, the students are left to their own devices to explore the device.

Lesson Plan: 11th grade

5 min	The teacher tells the student about their next project, which will be at the centre of the following lesson/s and gives the instructions for task.	T-S		The teacher shortly presents our project to the students. Following after, the teacher tells the students that they will be working on a project for the next lesson/s. **Instructions for project**: Use the Micro:Bits coding function to create a similar device, which showcases that signal strength is influenced by distance and obstacles. You will present your final product in a lower-secondary class, in which you will explain the concept of radio waves to the students.
15 min	The remaining time will be used to start the project. Students will work individually in groups of 3.	S-S	Micro:Bit	**Important note:** The following lesson/s will be used to finish the project.

Lesson Plan: 5th grade

rough time frame	procedure	interaction format	materials	notes
5 min	T introduces the topic (radio waves) by showing them our digital story.	T-S	Digital Story + Whiteboard	For this lesson you need lots of space, so contemplate letting the students roam a part of the school, which you can overlook, while also providing enough space.
5 min	The students shortly discuss the story and how they think the radio works.	S-S	None	If there are any questions, the teacher answers them.
5 min	The teacher introduces the upper-secondary students to the class, and puts them in groups.	T-S S-S	Micro:Bit	Two lower-secondary students are assigned to each upper secondary student.

Lesson Plan: 5th grade

5 min	Short explanation and following exploration.	T-S		The upper-secondary students shortly explain, how to use the Micro:Bit. They also give the **instruction**: Find out what makes the signal stronger or weaker. Try to get no signal, medium signal, and good signal, and take photos of your signals. The lower-secondary students are then left to their own devices in exploring the device.
20 min	The lower-secondary students explore the device.	S-S	Micro:Bit	If they do not move toward the right answer, give them some constructive tips.
10 min	The upper-secondary students ultimately explain the intricacies of radio waves work using the Micro:Bit as a reference.			