

# EDUCATIONAL PROGRAM

Primary School Cycle 2,  
Secondary School Cycle 1 and 2

Musée des ondes Emile Berliner

Address:

1001, rue Lenoir, A-108, Montréal, QC, H4C 2Z6

The MOEB is on the list of the program

[Culture éducation – Volet scientifique](#)

(<https://www.education.gouv.qc.ca/enseignants/dossiers/culture-education/programme-la-culture-a-lecole/culture-scientifique/aide-financiere/>)

4 walking minutes from the Metro Station Place Saint Henri

Contact:

Dr. Anja Borck

[info@moeb.ca](mailto:info@moeb.ca)

514-932 9663

The Musée des ondes Emile Berliner is open 7 days a week: Weekdays from 10 a.m. to 4 p.m. and weekends from 2 p.m. to 5 p.m. Price per student: \$ 7, entrance fee included. Minimum participants: 15. Maximum group size: 35.

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## LEARNING OBJECTIVES AND PROGRAM CONTENT

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### GENERAL OBJECTIVE OF THE PROGRAM

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A visit to the Musée des ondes Emile Berliner aims to introduce its visitors to the technological history of sound and electromagnetic waves. It aims to inspire students through the technology of the past so that they can one day contribute to its evolution. The scientific workshop, on the other hand, awakens curiosity and personal interests in the participant through observation, questioning, analysis, reflection and problem solving. The Museum aims to increase interest and intellectual curiosity among participants. For more information about Emile Berliner and the museum itself, please visit our website <https://moeb.ca>.

### SPECIFIC LEARNING OBJECTIVES

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According to the provincial curriculum, one of the objectives of the field of science and technology is to "make [students] aware of the role that such a culture [science and technology] can play in their ability to make informed decisions and to introduce them to the pleasure that can be derived from science, technology and their applications". (Ministère Éducation et Enseignement supérieur Québec, 2011, p. 2). Taking into consideration this objective, the educational activities presented here propose to familiarize visitors with the themes of the Museum, using the educational collection. It is through manipulation, experimentation, questioning and identification of technological objects, their mechanisms and their functioning that students will be able to appropriate the history of technology related to sound recording and reproduction. In addition, these activities encourage social exchanges between students as well as individual and group involvement in the discovery of objects.

### THE TARGET AUDIENCE

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The users of this project are students in upper primary (grade 5 and 6) and both cycles of secondary school. The academic subjects that are related to the Museum's theme are science and technology, scientific technological applications, environmental technological sciences and history of technology.

### CONTENT OF THE PROGRAM

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The content of the program was developed by the Musée des ondes Emile Berliner in 2023. The program supports the aims of the programs of the Ministère de l'Éducation, du Loisir et du Sport and follows the recommendations published by the Ministère Éducation et Enseignement supérieur Québec (2011, p. 5).

The educational program is therefore developing the following three skills:

- seeking answers or solutions to scientific or technological problems,
- using scientific and technological knowledge and
- communicating using the languages used in science and technology

The proposed educational program will solicit the curiosity of participants through scientific and technological activities, putting into context the history of technology in scientific culture and discovering the main inventors who have enabled their development. Students will discover, experiment and explore

the constitution of devices and objects of the past and present in order to better understand the progress made in the technical field.

## THE LOCATION OF THE AUDIO LAB

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The workshop will take place in the permanent exhibition spaces. The scientific workshop is a combination of several workshops and demonstrations, so the amount of time allocated to each activity is written next to the activity. The demonstration workshop can also come with a visit to the temporary and permanent exhibition lasting from 30 minutes to 45 minutes, depending on the amount of time the teacher gives to the museum. These will be given in their respective rooms.

## THE AUDIO LAB

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The Audio Lab is a scientific workshop that includes several demonstrations of technological objects from the educational collection. It can also include visits to the permanent and temporary exhibitions before or after the workshop.

The structure of the program is based on the taxonomy of Benjamin Bloom, an American psychologist specializing in pedagogy. Its model proposes classified levels of knowledge acquisition: knowledge, understanding, application, analysis, synthesis and evaluation.

Workshops marked with a (\*) can easily be conducted in a class room setting as a follow-up activity.

### GENERAL INTRODUCTION OF THE DEMONSTRATION ACTIVITY

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Are young people aware of the historical importance of the transformations resulting from technological developments?

The advent of sound technologies has profoundly marked the human experience during the twentieth century. Their evolution has helped to change the very experience of contemporary life. If it is possible for us today to follow live sports event on the other side of the globe, it is thanks to new technologies. It is also because of new technologies that we can now hear, see and share together, from generation to generation, music events or cinematographic masterpieces. If we were able to go to the moon and speak famous words that the whole planet could hear, it is again because of new technologies. The world is really not the same as it was 100 years ago.

## DEMONSTRATION ACTIVITY: A TURNTABLE

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Type of demonstration: Interactive and teamwork demonstration.

Calls for questioning, analysis and sharing of hypotheses.

Time: 15 minutes

Materials used: A record player and a record.

Objective: The goal is to show students how a record player works and to understand the mechanisms that are used. Students will be able to learn the technological terms specific to the record player.

### SCENARIO

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The facilitator will ask students to make assumptions about how the object works by trying to guess and identify the parts and mechanisms of the record player that are used to form the sound we hear. The students, in teams of 2 or 3, will have two minutes to reflect and analyze the object with observation only. Once the two minutes are up, the teams will share their hypothesis with the group.

The facilitator will then choose the team with the best answer and will gradually explain, following the steps of the hypothesis shared by the group, the functioning of the object: the needle that passes through the groove and moves on the disc, the vibration, the means of amplification of the sound, the needle that rotates and the speed of the disc, etc.

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### ADDITIONAL INFORMATION ACTIVITY:

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If the record player is a hand-crank, explain what the spring motor is, how it connects to a speed regulator and that it does not need electricity or batteries to operate. If time permits and it is possible to play several 45 rpms, the facilitator could explain how the 45 rpm works and its difference from the 33 rpm and the older 78 rpm records.

### STRATEGIES, PROCESSES, MEANS AND THEIR RELATIONSHIP WITH THE THEME

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The strategy used in this demonstration is the active participation of groups of students in the development of hypotheses for the functioning of the object. The main objective is to discover the object, accompanied by the guide animator who will transmit his knowledge of the object to the participants by identifying the mechanisms and introducing technological terms specific to the theme of the Museum.



## WORKSHOP: TURNTABLE

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Type of demonstration: Handling workshop and teamwork.

Draws on knowledge from the previous demonstration.

Time: 20 minutes

Materials used: A toothpick, a sheet of paper, a turntable and a disc.

Objective: The purpose of the workshop is to apply the knowledge learned in the previous demonstration.

The teams will have to reproduce the process of amplification and transmission of waves through the diaphragm of a gramophone

## SCENARIO

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Students will have to try to reproduce the process of amplification and transmission of waves with the material provided by the facilitator.

## STRATEGIES, PROCESSES, MEANS AND THEIR RELATIONSHIP WITH THE THEME

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This workshop was based on the formula of pedagogy of freedom, created by Roger Cousinet. The active methods used in the activity, the toothpick, the sheet of paper, the turntable and the disc, are learning instruments and not teaching tools. The objects that are part of the educational collection are instruments manipulated directly by the students so that they can better identify the mechanisms of the object and reproduce them.

## DEMONSTRATION ACTIVITY: VOICE WAVES

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Type of demonstration: Participatory demonstration.

Uses frequency illustration and prediction.

Time: 20 minutes

Materials used: An oscilloscope and a microphone.

Objective: Understand what an oscilloscope is used for and demonstrate what it means to visualize an electrical signal and measure waves: wavelength, frequency, etc., experimenting with voice and sound types.

Example, when speaking loudly, high, deep, in a soft voice, etc., the waves will be different depending on the vocal characteristics.

## SCENARIO

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The facilitator will ask the same teams from the previous activity to think about hypotheses about how the object works and how it is used. Then, the facilitator will explain its general operation and show how to predict the differences of the wave using the voice, with the help of a few participants who will want to try it.

## STRATEGIES, PROCESSES, MEANS AND THEIR RELATIONSHIP WITH THE THEME

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This demonstration will allow students to experiment directly with the object by manipulating it and using their voice. The knowledge learned in this demonstration is verified in a concrete way, with the use of the object by the participant who can see in real time the characteristics of his voice and identify them using the knowledge transmitted by the facilitator.

## WORKSHOP: VOICE WAVES (\*)

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Type of demonstration: Team experimentation workshop.

Draws on knowledge from the previous demonstration and material handling.

Time: 15 minutes.

Materials used A thin rope, a metal fork and a hard surface where to hit the fork.

Objective: Reproduce and understand the resonances of sound.

### SCENARIO

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The facilitator will lend each team a rope and a metal fork. It will show how to hear the resonances of sound.

Manipulations: Tie the fork right in the middle of the string with a solid knot. Hold both ends of the string and bang the fork on the table. We hear the sound that travels in the air from the fork to the ear. Now wrap the string a few turns around the index fingers. You have to make the same number of turns on each side so that the fork stays right in the middle. Place the index fingers in the ears, like headphones. Bring your head close to the table so you can bang the fork again with your fingers in your ears. "How is the sound you hear different from the first one? Is it longer or shorter? More or less strong? What for? »

Once a student on a team has done the experiment, he will lend the rope with the fork to his partner and the latter will repeat the experiment.

### STRATEGIES, PROCESSES, MEANS AND THEIR RELATIONSHIP WITH THE THEME

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Students will be able to experiment with the material provided by the facilitator and try out the different waveforms that are created by knocking the fork on the surface. They will be able to share their opinion and comments on the experience.

## DEMONSTRATION ACTIVITY: VOICE RECORDING

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Type of demonstration: Participatory demonstration.

Calls for the introduction of new knowledge about history.

Time: 20 minutes.

Materials used: A microphone, a cassette recorder and a blank audio cassette whose contents can be erased.

Objective: To demonstrate the operation of a tape recorder as a playback and recording medium by explaining how to record with magnetic tape, explaining the multitude of functions existing on the device and showing how recordings are erased.

## SCENARIO

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Ask either a group of two students, one student or the entire group, depending on their comfort, to sing their favorite song into the microphone in order to test the cassette recorder. This will allow the guide-animater to follow up with the history of the tape recorder and its operation. Then, as a team, students will have to make assumptions about the object by asking themselves: what are the tools of today that use this sound recording technology or a more modern version of it. (Example: on our phones, there is an application to record voice. In the film industries or in the world of music, voice recording is used, etc.)

## STRATEGIES, PROCESSES, MEANS AND THEIR RELATIONSHIP WITH THE THEME

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By becoming familiar with the cassette tape recorder and its functions, students will be able to analyze the object and identify objects that exhibit the same functions, but in their everyday environment.

## WORKSHOP: SOUND AND RESONANCE (\*)

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Type of demonstration: Team experimentation workshop.

Involves material analysis, comparison of experiments and sharing of results.

Time: 20 minutes.

Materials used: One string and three identical weights. Students will experiment and discover new ways to put into practice the concept of sound resonance.

### SCENARIO

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Introduction: Each object has its own frequency. If it is allowed to vibrate freely, it always vibrates at the same frequency. If you hit a bell, for example, it always gives the same note. In the same way, the pendulum of a clock always swings at the same rate. By pushing them at the right time, objects can vibrate faster or slower than their natural frequency. These are forced vibrations.

Operation: When an object is pushed at exactly the same rate as its own frequency, the vibrations are amplified, this is the resonance.

Make three pendulums by attaching different lengths of string to each weight and tie them equidistant on a string tightly stretched between two fixed points. Push each pendulum successively and observe what happens.

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### ADDITIONAL INFORMATION ACTIVITY

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If the stationary pendulums have the same frequency as the oscillating clock, i.e. if they have strings of the same length, they will also begin to oscillate. When two pendulums have the same length, as soon as one of the pendulums is launched, the other starts immediately: they enter into resonance. When the three pendulums are the same length, all three of them resonate and oscillate together.

### STRATEGIES, PROCESSES, MEANS AND THEIR RELATIONSHIP WITH THE THEME

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In the workshop, students will experiment with the materials provided and formulate hypotheses about the results of the experiment. The subject of resonances is used in a new form of workshop, which makes it possible to keep the same theme without repeating itself.

## DEMONSTRATION ACTIVITY: CED (CAPACITANCE ELECTRONIC DISC)

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Type of demonstration: Participatory demonstration.

Calls for the introduction of new knowledge about the history of RCA's decline.

Time: 15 minutes.

Materials used A TV with remote control, a CED player and a movie.

Objective: To show a video technology that relates to audio discs (groove, but in 3D, to compete with cassettes) and led to the decline of RCA.

### SCENARIO

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The facilitator explains to the students the functioning of the object and its technical components.

### STRATEGIES, PROCESSES, MEANS AND THEIR RELATIONSHIP WITH THE THEME

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This is a demonstration where students become familiar with the type of object through the traditional transmission of knowledge from the facilitator to the school group.

## DEMONSTRATION ACTIVITY: TUBE RADIO

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Type of demonstration Masterful demonstration.

Introduction of new knowledge on the history of radios in the 50's and the mechanisms of tube radios.

Time: 10 minutes

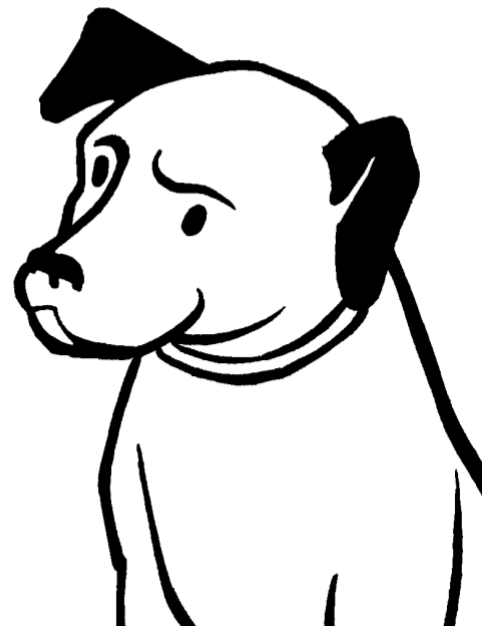
Materials used: A lamp radio, ideally where you can see the back of the object and the lamps.

Objective: Show what electric lamps (this is an active electronic component) that are used as signal amplifiers. The rectifier vacuum tube or amplifier has been replaced in many applications by different semiconductors, but has not been replaced in some areas such as high-power amplification or microwaves found in radios before the 50's. Understand waiting for a delay, heating lamps, etc.

## SCENARIO

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The facilitator explains to the students the functioning of the object and its technical components, strategies, processes, means and their relationship with the theme This is a demonstration where students become familiar with the type of object through the traditional transmission of knowledge from the facilitator to the school group.



## FURTHER INFORMATION AND LINKS

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The **Musée des ondes Emile Berliner** offers a vast amount of online content on its [home page](#). The museum updates the online services regularly. Teachers can use the museum's timelines ([radio history](#), [Canadian Music recording history](#)), [archives](#), online exhibitions and activities to enrich their teaching, prepare for the visit or to deepen the learning effect after the visit.

In the following list you will find technical museums in Canada that offer educational programs. You can visit their websites or contact them directly for the most up-to-date information on their educational offerings:

1. **Canada Science and Technology Museum** (Ottawa, Ontario):
  - The Canada Science and Technology Museum in Ottawa offers various educational programs for students and teachers, including workshops, guided tours, and interactive exhibits.
  - Website: [Canada Science and Technology Museum](#)
2. **Ontario Science Centre** (Toronto, Ontario):
  - The Ontario Science Centre is known for its hands-on and interactive exhibits. They provide educational programs for both students and educators.
  - Website: [Ontario Science Centre](#)
3. **Science World British Columbia** (Vancouver, British Columbia):
  - Science World British Columbia offers educational programs and interactive science experiences for students, families, and educators.
  - Website: [Science World British Columbia](#)
4. **Discovery Centre** (Halifax, Nova Scotia):
  - The Discovery Centre in Halifax offers a variety of STEM-related educational programs and workshops for students and teachers.
  - Website: [Discovery Centre](#)
5. **TELUS Spark** (Calgary, Alberta):
  - TELUS Spark offers educational programs and experiences related to science, technology, and innovation for visitors of all ages.
  - Website: [TELUS Spark](#)
6. **Canadian Museum of Science and Innovation** (Ottawa, Ontario):
  - The Canadian Museum of Science and Innovation often has educational programs and workshops for students and teachers.
  - Website: [Canadian Museum of Science and Innovation](#)

Please note that the availability and types of educational programs can change, so it's a good idea to check the respective websites for the most current information and to inquire about any specific programs or events you're interested in.

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