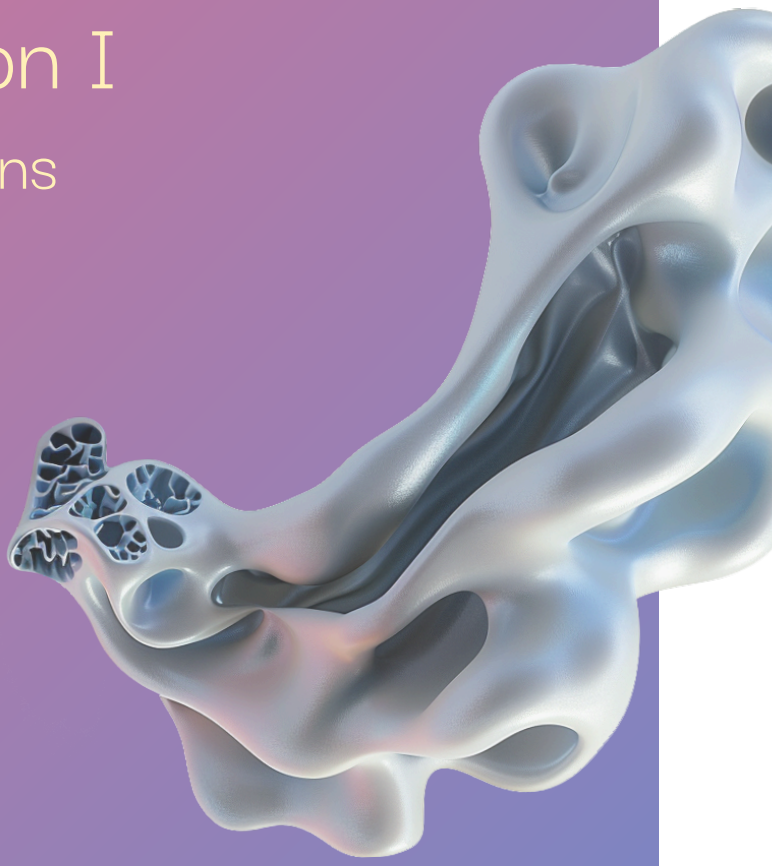
AI for Children

Artificial Intelligence Curriculum for Elementary and Secondary Schools

Music Education I

Sound Transformations



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Form for comments

These teaching materials were translated using ChatGPT.
Please note possible imperfections in the expressions or wording.

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AI for Children's Artificial Intelligence Curriculum Teaching material
for the Development of Digital Competence for Elementary and Secondary Schools

Sound Transformations

A few words to begin

Dear Teacher,

You are receiving a Teaching material developed to support the teaching of artificial intelligence at the elementary and secondary school levels. In this lesson, students learn to recognize unique tonal characteristics and timbre, while working with an application that uses artificial intelligence to transform any sound into a musical instrument. The goal of the lesson is to show students that every musical instrument has its own distinctive sound features–and that these features can not only be recognized but also replicated through machine learning.
Thank you for your willingness, energy, and courage to introduce children to the world of artificial intelligence.

– AI for Children team

15 min

Tone Transfer

This lesson uses freely available tools: Tone Transfer and Google Song Maker. No registration is required for either. We recommend exploring them in advance to become familiar with their features before the lesson.

Lesson presentation in PDF

Editable presentation in Canva

Lesson Overview

Recommended Age, Lesson Length
Students are already familiar with the difference between sound and noise. They understand the properties of sound–pitch, duration, timbre, and volume.
Children aged 10–16, 45–90 minutes.

Building Blocks
Musical instruments, sound characteristics.

What Are the Students Learning?
Each musical instrument has its own unique sound characteristics. Machine learning helps us not only recognize these features, but also imitate them.

Why Are They Learning This?
Students creatively use modern technologies in their own music-making.

How Do We Know They Have Learned It?
They identify instruments by ear during listening activities.
After listening, they verbally describe the timbre of different instruments.

Tools
Teacher: projector, presentation slides, computer, speakers.
Students: one or more melodic instruments, a percussion instrument, device, and an external microphone.

Bloom's Taxonomy
Remembering: Students learn and recall terminology related to the properties of sound and the basics of machine learning.
Analyzing: They analyze the sounds of musical instruments and compare original audio with AI-transformed versions.
Creating: Students compose original musical pieces using AI tools.

Digital Competence
Professional Engagement.
Digital Content Creation.

Five Big Ideas
5-D-I AI for Social Good (Democratization of Artificial Intelligence)

Note: Gender equality is key for AI for Children, but for brevity, we use masculine formulations in our teaching materials.

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Glossary of terms

Artificial Intelligence (AI)
There is no universally accepted definition of artificial intelligence. However, most descriptions agree that it refers to a system capable of simulating human thought and actions.
AI typically takes the form of a computer program designed to solve tasks that once required significant human intellect and were considered uniquely human.
AI is also a scientific field that emerged in the first half of the 20th century. It seeks not only to understand intelligent systems but primarily to create them.

Machine Learning (ML)
Just as humans can learn from examples and experience, so too can machines built by humans.
Machine learning is the method that enables this kind of learning. It allows AI systems to go beyond a fixed set of programmed instructions and come up with new solutions on their own.
The goal of machine learning methods is to uncover patterns within large volumes of data.

Source Separation Using Machine Learning
This technique allows machine learning models—often based on deep neural networks—to analyze and distinguish individual audio components within a recording.
By training on large sets of audio samples, these models learn to identify and separate elements such as voices, musical instruments, or background noise, without needing prior knowledge of the specific sounds.
Machine learning models mimic how the human ear and brain recognize and analyze sound: by distinguishing based on frequency (pitch) and temporal patterns (rhythm and sequence).
These models apply similar principles to identify and isolate different sound sources within complex audio signals.

Tone Transfer

In this lesson, we use the Tone Transfer tool from Google.
Tone Transfer is an application that allows you to transform recorded sounds into tones played by various musical instruments. It works using a machine learning model trained on large datasets of musical recordings.
Through this training, the model learned to recognize key sound characteristics and reproduce them in the style of different instruments.
With this tool, you can convert ordinary sounds—like singing, speech, or environmental noise—into the tones of a flute, saxophone, trumpet, or violin, while adjusting output features such as pitch and volume.

Tone Transfer runs directly in a web browser (no installation required) and does not require signing in.
You can upload a pre-recorded audio clip or record your own 15-second sample right in the browser.
The recording can then be transformed into one of the following instrument sounds:
1) Flute
2) Saxophone
3) Trumpet
4) Violin

How to use tone transfer
Open the app and click the Let's play button. To begin, you can experiment on the left by transforming the sound of preloaded audio clips (such as Acapella singing, Birds chirping, etc.). Then, upload or record your own audio by clicking the +Add your own button. At the bottom of the window, you'll see options to Record or Upload.
If you choose to record directly in the browser, make sure to allow microphone access.
If you're recording your own audio, try out one of the following:
– Voice recording: humming, singing, spoken word, etc.
– Melodic instruments: record a linear melody (not just chords).
– Get creative: make sounds using anything in the classroom – plastic bottles, sliding desks, tapping on the board, and so on.
You can record up to 15 seconds. Then click the Transform button. The system will process your recording and, in under a minute, generate transformations across all available instruments. You can further refine your track using the Fine tune icon at the bottom left, next to the Play button.
The transformed audio clip can be downloaded – however, only in its original transformed version, without any additional changes made using the Fine tune function.

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Engage

5 min

Think about it.

How is it possible to tell the sound of a violin from a trumpet?
We can distinguish the sound of a violin from that of a trumpet thanks to their unique sound characteristics and the way each instrument produces sound. A violin creates sound by drawing a bow across its strings, resulting in a rich and complex tone with many harmonic components. In contrast, a trumpet produces sound through the vibration of the player's lips against a metal mouthpiece, generating a brighter and more piercing tone. These differences in sound production and harmonic spectrum make it easy for our ears to tell the violin apart from the trumpet.

Share

Have you ever tried making music using a smart app?

Understand

30 min

5 min

Activity 1

Create a 15-second audio recording together as a class.

Explain to the students that you'll be using an app that can transform the recording into the sound of a specific instrument. To ensure the cleanest possible audio, ask the students to stay quiet during the recording. Do not project or show the instrument selection window to the students, as they will later try to recognize the individual instruments.

You can find instructions on how to use the Tone Transfer app on page 2 of this material.

We recommend using an external microphone for recording. You might try, for example:
– voice recordings: humming, singing, spoken word...
– a melodic instrument: a linear melody (not just chords),
– experiment: create sounds with anything you find in the classroom (plastic bottles, sliding desks, etc.).

Record a 15-second audio clip and click the Transform button to let the app process your recording.

5 min

Activity 2

Play each transformation one by one and let the students guess which instruments they hear.
Ask them which instrument is currently playing and how they recognized it – what helped them identify the sound?

Briefly explain how the app learned to simulate instrument sounds.
This is thanks to something called machine learning – a method that allows artificial intelligence to learn. Simply put, the program analyzed a large number of recordings – examples of how different instruments sound, what makes each one unique, and how they differ from one another. As a result, it can now create completely new sound recordings on its own.
A more detailed explanation can be found on page 02 of this material.

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20 min

Activity 3

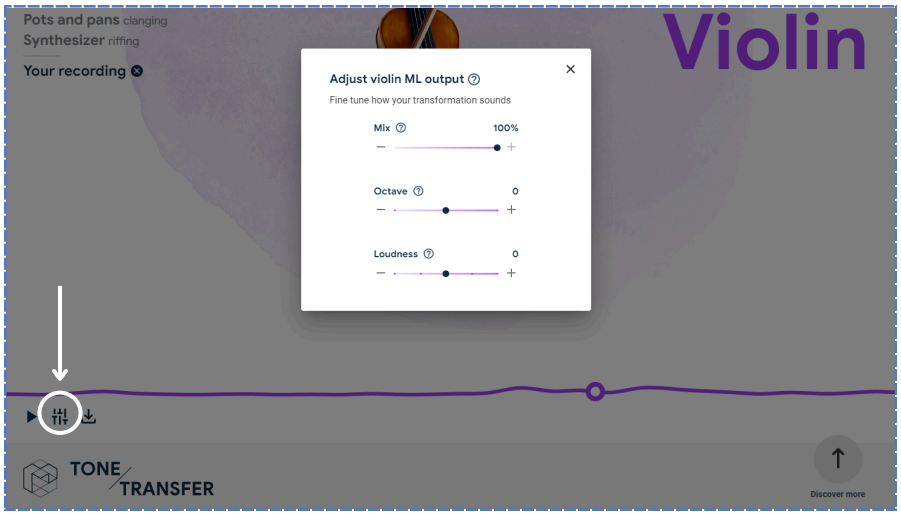
Presentation slide 02

Introduce students to the Tone Transfer app.
Show students a video about the Tone Transfer app: youtu.be/bXBliLjImio?si=vBfutkvvdX-A1BhY

Application
Tone Transfer

Presentation slide 03

Students create their own recordings and experiment with editing the transformed audio tracks.
Show the students the app interface (project it on the board) and go through all the functions together. Explain how they can edit the transformed recording using Fine Tuning.



Sample songs

Presentation slide 04

Now all students can start working with the app – independently, in groups, or as a whole class. Instead of recording sounds directly in the classroom, they can also use a melody created in a simple app like Song Maker. You can also play them sample tracks we've prepared specifically for this guide. You'll find them in our shared Drive folder.

01_SongMaker_song.wav – We created this song in the Google Song Maker app.

02_ToneTransfer_violin.wav – This is how we transformed it using the Tone Maker app. If you blend both tracks in Tone Maker using the Fine tune/mix function (as we did), you won't be able to download the final mixed version. Only the transformed track without any additional edits can be downloaded.

03_Final_Mix_Kapwing.mp4 – So, we combined both tracks using the Kapwing app instead (note: downloading the file from Kapwing requires signing in). However, this step is entirely optional if you don't plan to work further with the audio.

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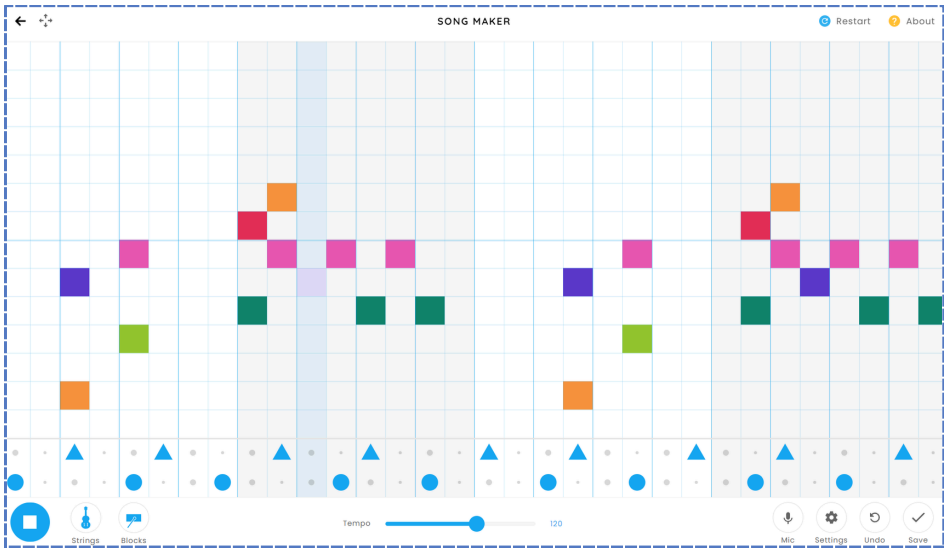
Google Song Maker

Presentation slide 05

The Song Maker interface



Reflect

10 min

Share

How well were you able to recognize the sounds of musical instruments? Was it easy or difficult for you?

Analyze

What makes each instrument's sound unique?
How can we tell the difference between the instruments we worked with today?
Flute: A pure, clear sound that can range from soft and delicate to sharp and piercing.
Saxophone: A rich, expressive tone characterized by a unique blend of smoothness and roughness.
Trumpet: A powerful, penetrating sound that can be loud and energetic or soft and lyrical.
Violin: A rich, emotive sound with a wide dynamic and emotional range—from a gentle whisper to a strong fortissimo.

Think about it.

Can we simulate some instruments ourselves by modulating our own voice?
For example, by imitating the sound of a trumpet or a flute using just our mouth?

When did the app manage to simulate the sound well, and when did it struggle? What didn't work as expected? How important is tone color (timbre) in music? What does it influence? Does the same melody sound different when played on a different instrument?
Tone color, also known as timbre, plays a crucial role in music. It defines the unique quality of a sound that distinguishes one instrument or voice from another—even when playing the same note at the same volume. Timbre is essential for recognizing instruments, expressing emotion and mood, and shaping musical style.

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If there's extra time

Presentation slide 06

Compare the overall sound of a piece – for example, Asturias – depending on the instrument used.

Guitar
Ana Vidovic

Piano
Álvaro Garrido

Orchestra
New Philharmonia Orchestra

You can also find interesting sound- and music-themed apps and games (not all of which use machine learning) at musiclab.chromeexperiments.com.

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