

## Ways of identifying and representing emotions

### Subjects and topics:

- Values Education/Civics and Ethics Education: Work on personal development, empathy, and emotional regulation.
- Language and Literature: Develops oral and written expression skills to communicate ideas and reflections.
- Nature science and biology: Study of the human body and the nervous system.
- Mathematics: Analysis, interpretation, and representation of data.
- Information and Communication Technologies: Digital Literacy, Programming, Data Sonification, Multimedia.
- Arts: Sound Design and Storytelling.

**Duration:** 2 weeks

**Grade level:** 6th - 12th

### Summary

*Interdisciplinary project that integrates emotional education, robotics, sonification and data analysis. This type of project fosters STEAM (Science, Technology, Engineering, Art and Mathematics) learning while developing emotional and social skills. By combining data analysis, artistic expression and robotic design, students learn in a hands-on and meaningful way, connecting concepts from different areas of the curriculum.*

## 1. FEEL

Emotional education is a fundamental tool for the integral development of people, as it allows us to understand, manage and express our emotions in a healthy way. In an increasingly fast-paced and complex world, where emotional stimuli are constant, it is crucial to know how to identify what we feel, to understand how our emotions fluctuate throughout the day and how they can influence our decisions and interpersonal relationships.

Do we really know how to identify our emotions? Often, the speed of everyday life or lack of reflection prevents us from recognizing what we are feeling. Often, we mistake one emotion for another or are not even aware of what we are experiencing. Moreover, emotions are not fixed; they can change in a matter of minutes, and this requires a capacity for self-awareness and emotional regulation that allows us to adapt to different contexts. Are we aware of how our emotions evolve over the course of a single day? It is also important to reflect on the types of emotions we identify in our daily lives: what emotions predominate in our daily lives, and can we recognize when we feel sadness, joy, fear, or anger?

And, beyond words, are we able to associate these emotions with images or sounds? Emotional education invites us to explore how these sensations affect our perception of the world and our relationships with others. Through emotional awareness, we not only improve our quality of life, but also develop key skills for personal and social well-being.

Emotional education not only teaches us to identify our emotions, but also to understand those of others, fostering empathy and connection. In today's dynamic world, being emotionally aware is not only desirable but essential to face the challenges of everyday life with resilience and well-being.

Example of previous activities to record emotions:

- **"The emotions map":**

Create a visual map where students associate emotions with colors, images, or sounds. Divide the classroom into stations with sensory activities:

- Listening to different types of music.
- Observing images or photographs of different scenes.
- Manipulating objects with different textures.

Students write down what emotions each stimulus arouses in them and classify them on their "Emotion Map".

- **"The Emotion Detective Challenge"**

Students should look around them during the day and detect what emotions they perceive in others (classmates, family, characters from series or movies).

Record how they think people feel and what signals (gestures, words, tone of voice) led them to that conclusion.

Reflect on whether they ever felt the same way and how they handled it. Students write down what emotions each stimulus aroused in them and classify them in their "Emotion Map".

### RESULTS OF THE FEEL PHASE:

*Identification of emotions and the relationship between emotions and different forms of expression or elements of the environment, as well as the fluctuation of emotions in daily life and their impact on personal relationships and personal well-being.*

## 2. IMAGINE

There are several classifications of emotions. We can take as a reference Paul Ekman's classification of basic emotions: joy, sadness, fear, anger, disgust and surprise.

Basic Emotions (according to Paul Ekman):

### Joy

- Characteristics: Smile, positive energy, sense of well-being.
- Colors: Yellow, orange.
- Sounds: Laughter, lively music.
- Images: Sun, flowers, happy moments (birthdays, meetings).

### Sadness

- Characteristics: Lack of energy, introspection, crying.
- Colors: Blue, gray.
- Sounds: Slow music, rain.
- Images: Cloudy landscapes, tears, loneliness.

### Fear

- Characteristics: Rapid palpitations, alertness, sense of danger.
- Colors: Black, dark red.
- Sounds: Tense silences, sudden loud noises.
- Images: Shadows, open eyes, threatening situations.

### Anger

- Characteristics: Muscle tension, impulsiveness, frustration.
- Colors: Red.
- Sounds: Screams, blows.
- Images: Fire, expressions of anger (frown).

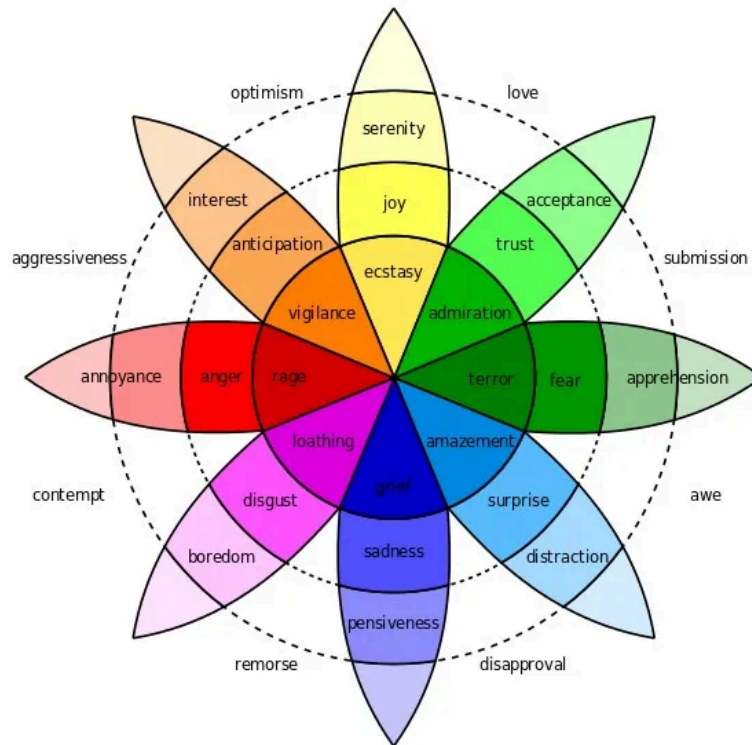
### Disgust

- Characteristics: Repulsion, rejection, need to move away.
- Colors: Green, brown.
- Sounds: Nausea, moans of displeasure.
- Images: Rotten food, dirt.

### Surprise

- Characteristics: Opening of eyes and mouth, startle, curiosity.
- Colors: White, gold.
- Sounds: Exclamations, applause.
- Images: Confetti explosions, bright lights.

We can also take as a reference Plutchik's wheel that identifies eight basic emotions and eight advanced emotions, each one composed of two basic emotions. It also identifies four axes of opposition: Joy - sadness; Anticipation - surprise; Disgust - confidence; Anger - fear.



Building on the identification of emotions, what can we do to become more aware of our own emotions and how they influence our perception of our moods? For example, we can keep an “emotional diary” and record all the emotions we experience in a day. How could we design a prototype to help us record all the emotions we feel throughout the day? We can use the Micro:bit and program it to record all our emotions, and we can even associate those emotions with colors and sounds.

Examples of using Micro:bit and Makecode to register emotions are shown below.

First of all, in order to store the data in the micro:bit it is necessary to install the Makecode [datalogger](#) extension. Here you can find more details and information on how to [collect and store data with micro:bit](#).

Secondly, we can use the sensors in the micro:bit to record emotions.

```

on button A pressed
  log data column "joy" value 1
  show icon [happy face]

on shake
  log data column "anger" value 1
  show icon [angry face]

on button B pressed
  log data column "sadness" value 1
  show icon [sad face]

on logo pressed
  log data column "surprise" value 1
  show icon [surprised face]
  
```

Once we have recorded the different emotions over a given period of time, we can see the data generated and download it

time (seconds)	joy	sadness	surprise	anger
13.395				1
14.193				1
15.592		1		
16.329			1	
17.707			1	
18.355				1
21.028		1		
21.762			1	
22.579	1			
23.962	1			
24.674	1			

We can also download the generated data for further processing and sonify the recorded data.

Another option using the micro:bit is to use an extension kit with extra sensors and actuators that allow you to record emotions with more information. For example, you could use a strip of LEDs so that each time an emotion is recorded it lights up with a different colour associated with each emotion.

### RESULTS OF THE IMAGINE PHASE:

*Prototype micro:bit to record the emotions we experience over a period of time and a CSV file with the recorded emotions.*

## 3. CREATE

Transforming emotions into forms of expression such as sound is a creative way to explore and communicate what we feel. We can associate emotions with **specific musical elements**, for example:

- Joy: fast rhythms, high-pitched tones, major chords.
- Sadness: Slow melodies, low tones, minor chords.
- Anger: High volume, intense percussive sounds.
- Calm: Soft harmonies, rhythmic repetitions.

For this we can use **instruments**, digital music applications or simply our voices to create melodies that represent how we feel.

We can also associate emotions to **environmental sounds**, for example:

- Sadness: Rain, wind, slow steps.
- Joy: Laughter, birds singing, bells.
- Fear: Metallic noises, echoes, rustling.

Or we can even assign specific **frequencies to different emotions**, i.e. use a synthesizer or a sound application to build a scale of emotions based on frequencies.

- Bass for heavy emotions like sadness or fear.
- Treble for light emotions such as joy or surprise.

We could also create an interactive system by associating **colors and sounds**:

- An intense red circle (anger) can generate a loud, percussive tone.
- A soft blue (sadness) can be transformed into a melancholic and sustained sound.

Data sonification consists of translating numerical or qualitative information into sounds. Here is a simple example using a record of daily emotions and how to convert it into a sound piece.

Let's suppose we keep a daily record of emotions for a week:

Day	Joy	Sadness	Anger	Surprise
Monday morning	1	0	0	0
Monday evening	1	0	0	0
Tuesday morning	0	1	0	0
Tuesday evening	0	1	0	0
Wednesday morning	0	0	0	1
Wednesday evening	0	0	1	0
Thursday morning	1	0	0	0
Thursday evening	1	0	0	0
Friday morning	1	0	0	0
Friday evening	1	0	0	0

We can assign **tones to emotions**:

- Joy: high pitch (xylophone or flute).
- Sadness: Slow and low melodies (cello or piano).
- Anger: Intense percussion (drum or beats).
- Fear: Sharp and tense sounds (violin or synthesizer).
- Calm: Soft and prolonged sounds (harp or bells).

And also translate the data into **sound parameters**, for example, using intensity:

- Volume: The intensity of the emotion defines how loud the instrument sounds.
- Duration: More intensity = longer sounds.

In this way we could create a time series for each day, for example:

For Monday:

- Joy (4): A high flute tone, medium-high volume.
- Sadness (2): A low piano chord, soft volume.
- Anger (1): A subtle drum beat.
- Fear (3): A high-pitched violin sound.
- Calm (5): A harp with long, soothing notes.

You can use the following data sonification canvas to design your sonification: <https://sonification.design/resource.html> Follow the steps below to complete it:

1. Use Case: Define who your users are, and what the goals and the context of your sonification are.
2. Mapping Choices: Define how you map data parameters to sound parameters.
3. Sonification Approach: Find out the position of your approach to the sonification.
4. Listening Experience: Imagine how your users will listen to the sonification.

There are different tools for sonification, we can use the Micro:bit or other more specific sonification software such as TwoTone (<https://twotone.io/>) or Sonic Pi (<https://sonic-pi.net/>), which allows us to encode music from data.

In the Soundscapes project you can find examples of data [sonification a posteriori techniques](#).

This activity proposes an example of sonification, which involves using TwoTone software to create sound representations of the emotion diary data that was recorded with a micro:bit device, as shown above. You can also use your imagination to sonify with the resources available to you. For example, you can record your own sounds.

It is important to ensure that the data uploaded to Twotone is organized, with each parameter in a separate spreadsheet column and the parameter names listed in the first row as follows.

The file generated by the micro:bit is a CSV file and will need to be converted into a table in XLSX format. You will find many online tutorials on this topic. One of the options is:

1. Open the CSV file with Microsoft Excel. You will see that the data are separated by points or columns.
2. Select the column of the data and go to Data > Text in columns
3. In the first window select 'Delimited. Characters like commas or tabs separate fields'.
4. In the second window choose the Comma delimiter.
5. Continue > Finish.

Your document will change from being separated by commas to displaying data in columns.

	A	B	C	D	
1	time (seconds),	joy,	sadness,	surprise,	anger
2	26.446,,,	1			
3	27.277,,,	1			
4	27.917,,,	1			
5	28.884,,,	1			
6	29.997,,,	1			
7	31.424,,,	1			
8	32.304,,,	1			
9	33.021,,,	1			
10	33.738,,,	1			
11	34.453,,,	1			
12	35.152,,,	1			
13	35.159,,,	1			
14	37.081,,,	1			
15	37.548,,,	1			
16	37.791,,,	1			
17	40.234,,,	1			
18	40.949,,,	1			
19	41.66,,,	1			
20	42.37,,,	1			
21					

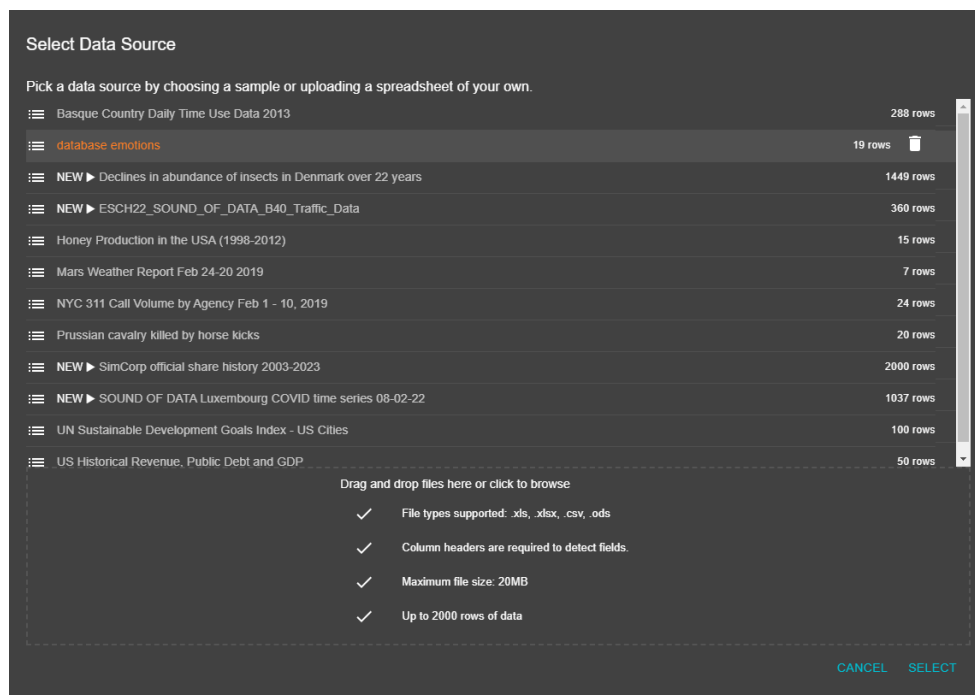
CSV file

	A	B	C	D	E	F
1	time (seconds)	joy	sadness	surprise	anger	
2	26.446	0	0	0	1	
3	27.277				1	
4	27.917			1		
5	28.884		1			
6	29.997			1		
7	31.424				1	
8	32.304	1				
9	33.021	1				
10	33.738	1				
11	34.453	1				
12	35.152		1			
13	35.159	1				
14	37.081	1				
15	37.548			1		
16	37.791	1				
17	40.234	1				
18	40.949	1				
19	41.66	1				
20	42.37	1	0	0	0	
21						

XLSX file

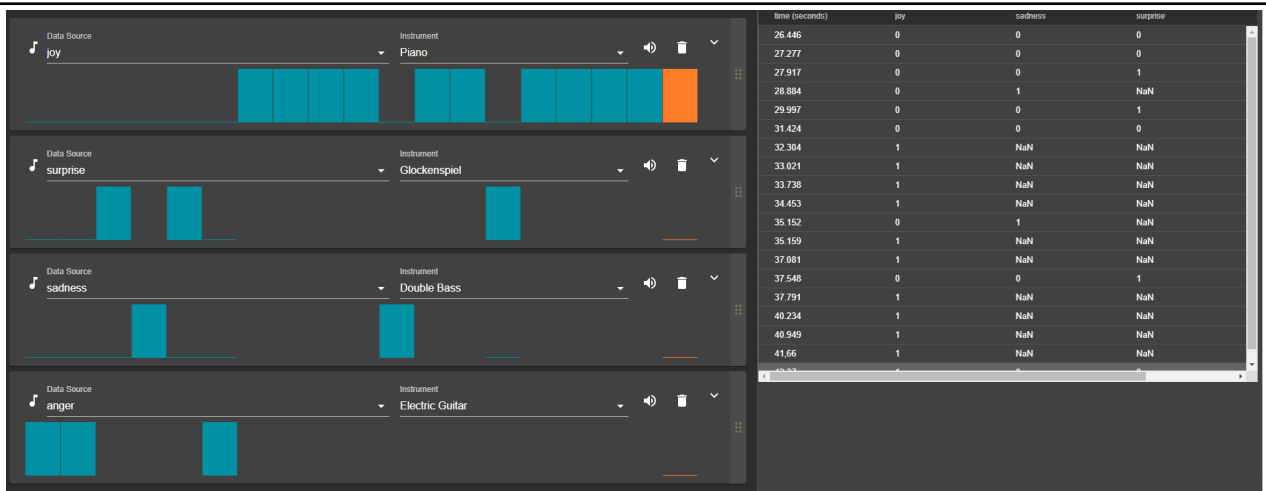
Once the data is well organized it is time to use TwoTone to sonify the data.

Go to TwoTone (<https://twotone.io/>) and include the XLSX file in the data source. Then select the uploaded data from the list.



Then you need to select each emotion as a new track and configure the sound parameters.





To configure the sound parameters (volume, key, scale range and other parameters) click the top-right arrow of each track. An example configuration for the example data used throughout this activity is shown below.



Press play and enjoy your creation. You can configure the parameters to adjust them according to the analysis and sonification canvas.

After completing your project you can export it to an mp3 soundtrack (or another format) by clicking the bottom right button “export”.

You can access through this [link](#) to the audio generated with this exercise.

#### RESULTS OF THE CREATE PHASE:

*An audio track of your emotion diary.*

## 4. SHARE

Encourage students to share with the class the audio tracks created and reflect on the emotions generated by each sonification.

Explore new ways of expressing emotions and, for example, while listening to the partner sonification, ask students to draw or visually represent the emotions or ideas that are generated. Compare and discuss the drawings created.

[Dear data](#) project is a good example of how data visualization can be done, through art and creativity.

#### RESULTS OF THE SHARE PHASE:

*A space for reflection in which students can share their experience during the development of the activity.*