

Earthquakes and a Digital Seismograph

(micro:bit)

Duration: 90 min

Integrated Subjects: Science, Geography, Technological Education, Mathematics

Activity Type: Interactive Lesson + Digital Experiment

Teacher: Goran Podunavac

1. Intended Competencies

Science: Understanding earthquakes, acceleration, and how ground vibrations are recorded.
Geography: Recognizing seismic activity as part of Earth's structure and tectonic movement.
Technology: Using Micro:bit sensors, digital interfaces, and data-export tools.
Engineering: Building and testing a simple digital model of a seismograph.
Mathematics: Interpreting numerical data, analysing patterns, and creating line graphs.
Practical Skills: Programming, experimenting, collecting, visualising, and interpreting data.

2. Learning Objectives

By the end of the lesson, students will be able to:

- Recall key concepts related to earthquakes.
- Program a Micro:bit to continuously measure acceleration.
- Test and observe real-time sensor values using the simulator and device.
- Export and analyse data to create a line graph in Excel.
- Explain how a seismograph records Earth vibrations over time.

3. Necessary Resources

- Micro:bit devices (one per pair)
- USB cables
- Computers with internet access
- Projector
- Printed working instructions
- Excel or compatible spreadsheet program

4. Activity Flow

A. Motivation – Diagnostic Quiz (10 min)

The lesson begins with a brief diagnostic quiz assessing prior knowledge about earthquakes. Students complete it individually and discuss selected answers with a partner. The teacher

reviews the correct answers and highlights the concepts needed for the digital experiment.

Quiz link: <https://wayground.com/admin/quiz/6930bb5d795e374fac9d4d66>

B. Introduction to Tools (5 min)

The teacher presents the Micro:bit, USB cable, and computer setup. Students learn how to connect the device and open the programming environment makecode.microbit.org.

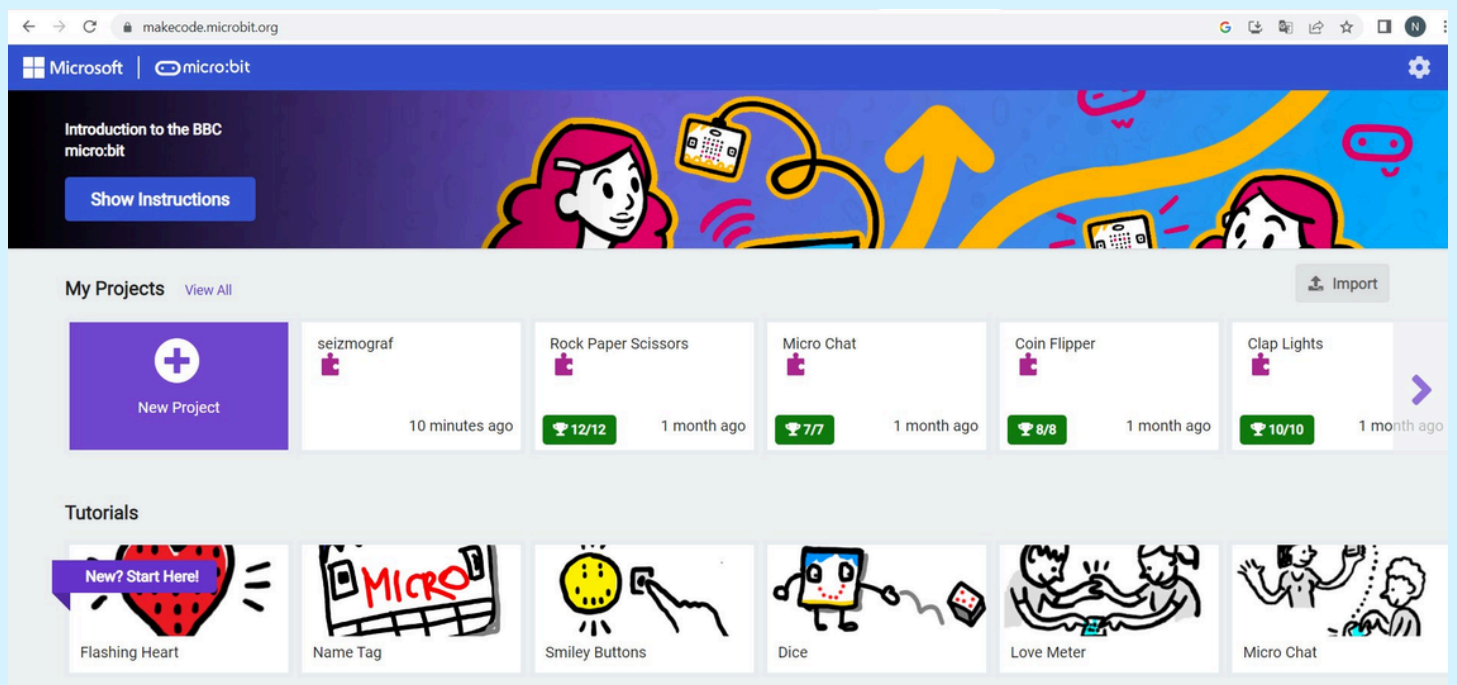
C. Digital Experiment – Building a Simple Seismograph (45 min)

Students work in pairs and follow the printed instructions.

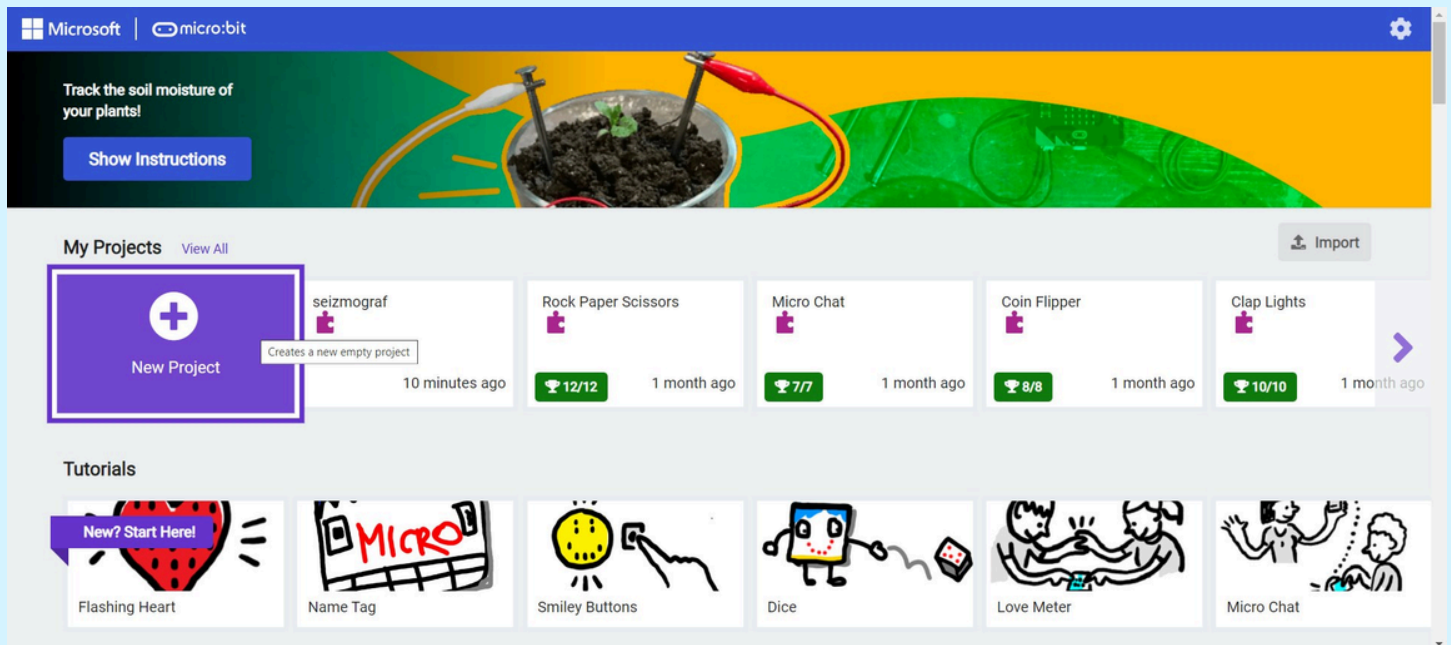
Working Instructions

1) Connect the Micro:bit to the computer using the USB cable.

2) Open makecode.microbit.org.

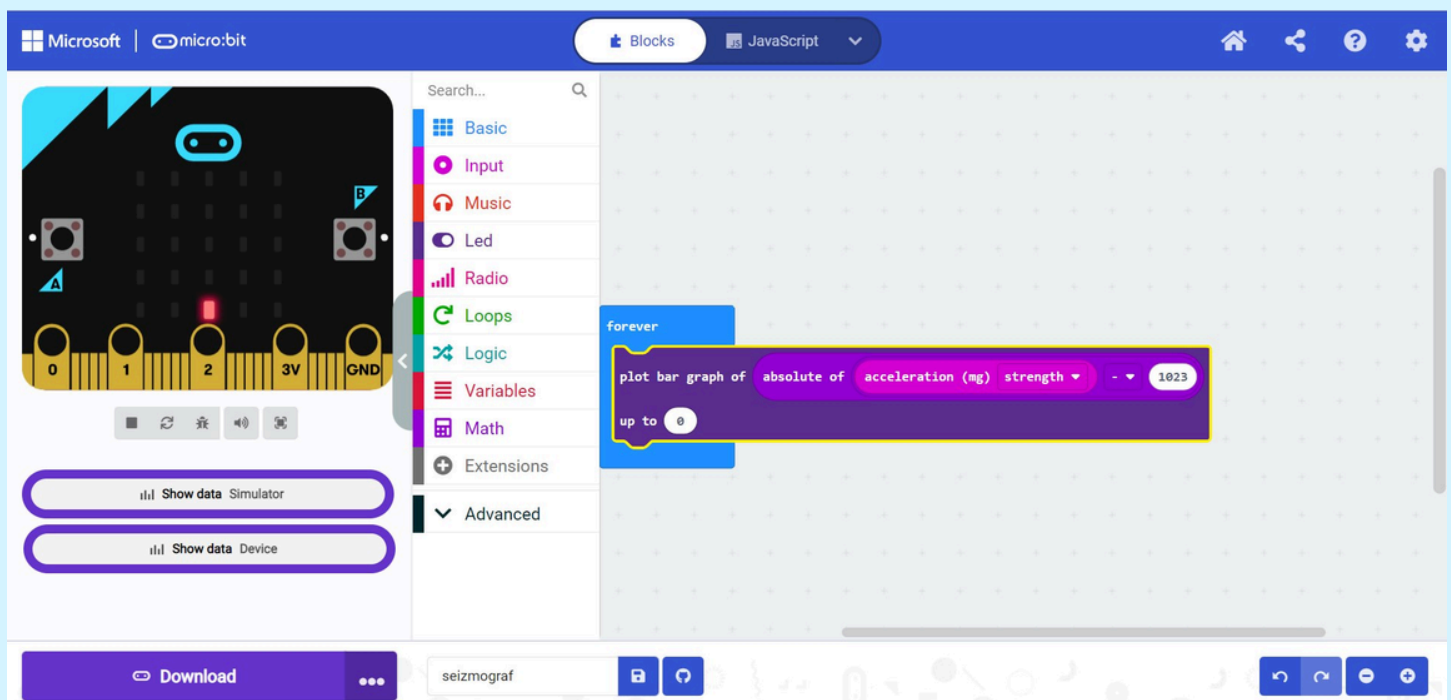


3) Select “New project.”



4) Program the Micro:bit to continuously measure acceleration using variables and display the values graphically.

- Earth's gravity corresponds to a value of 1023.



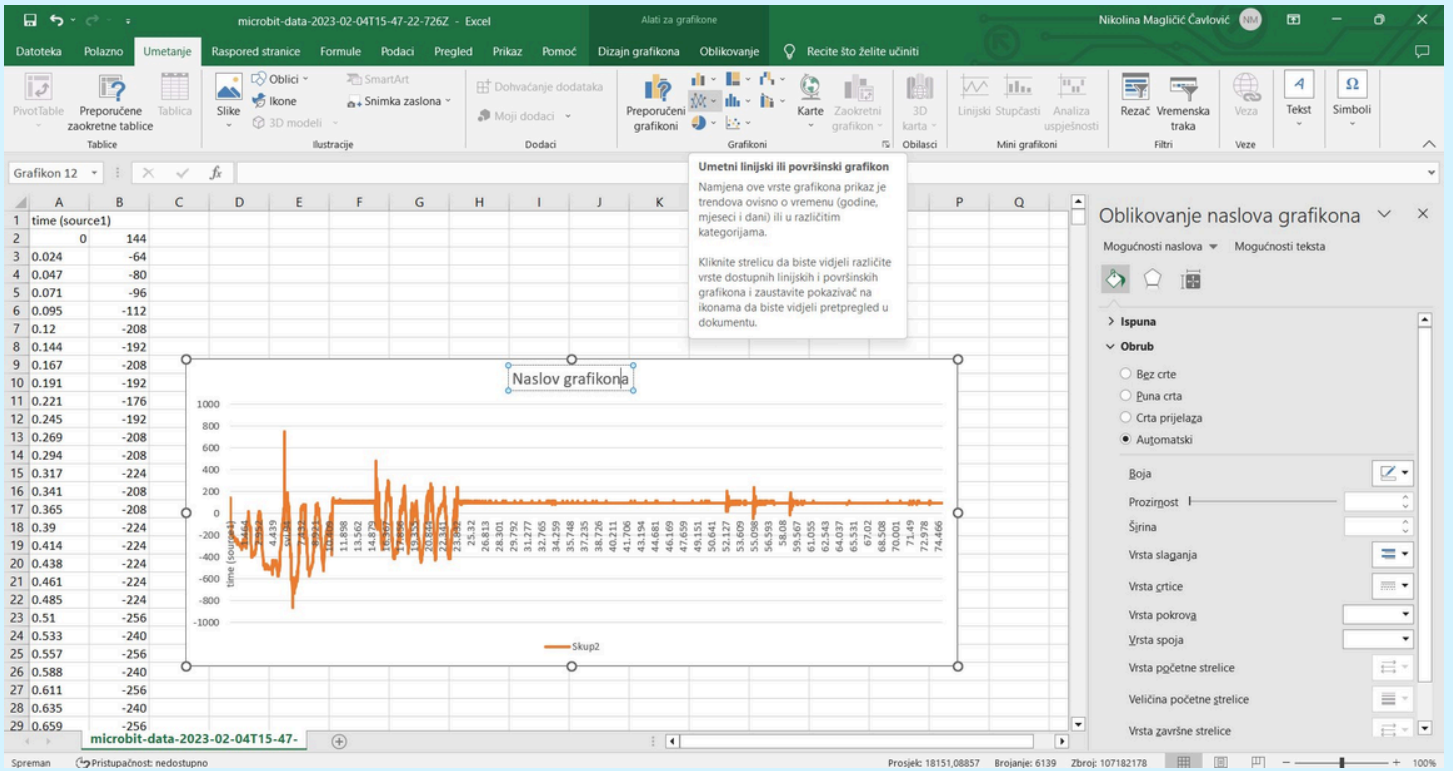
5) Test the program in the simulator; movement changes the acceleration and LED display. Observe the physical Micro:bit; moving it also changes the LED output.

The screenshot shows the Microsoft MakeCode editor interface. On the left is a virtual micro:bit board. The main workspace is split into two panes. The top pane shows a real-time graph of data from a device, with a red waveform fluctuating between approximately -320 and 656. The bottom pane shows a list of data points: 96, 112, 112, 96, 96. The 'Show data Device' button is highlighted with a purple oval.

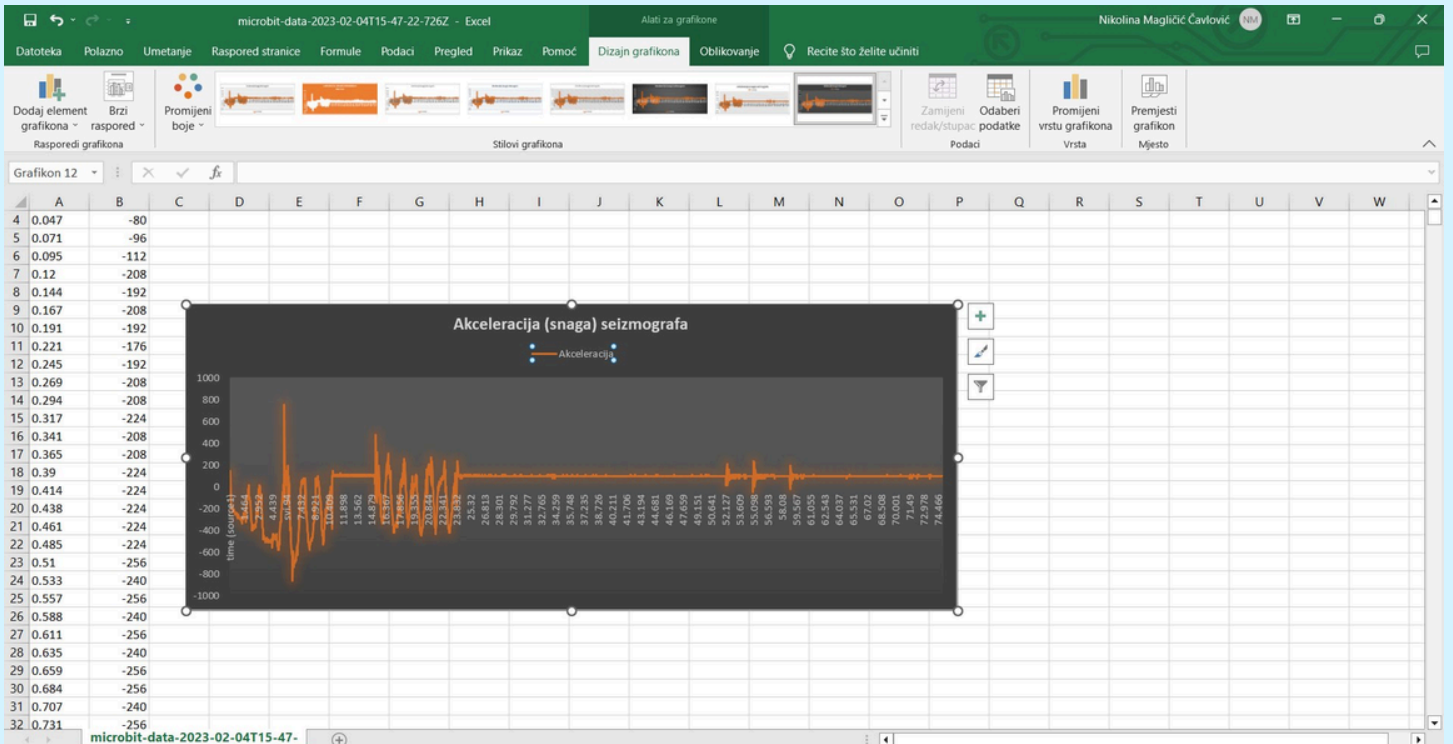
6) Select “Show data Device” to see real-time graphical data. Export the recorded data by selecting “Export data.”

This screenshot is identical to the one above, but the 'Export data' button (represented by a download icon) in the top right corner of the graph area is highlighted with a yellow circle.

7) Open the downloaded file in Excel, select the data, and create a line graph.



8) Customise the graph with Chart Elements, Chart Styles, and Chart Filters (axis titles, labels, appearance).



Scientific Principle:

This process models how a seismograph detects and records vibrations of the Earth's surface. The graph shows how the intensity of movement changes over time.

D. Results Analysis (15 min)

Pairs compare their line graphs and discuss the shape and changes in the acceleration data. The teacher leads a discussion connecting their graphs to how real seismographs capture seismic activity.

E. Reflection & Application (10 min)

Students reflect on what they observed and how sensors help scientists study earthquakes. They complete three short sentences:

- **I learned that...**
- **My graph showed that...**
- **A seismograph is important because...**

5. Evaluation

- **Participation in discussion**
- **Accuracy and completion of Micro:bit program**
- **Exported movement data and Excel graph**
- **Final written reflection**