

Coding RocksGrade 4 – Rocks and Minerals

<h2 style="color: #1a3d54;">Coding Rocks</h2>	Coding Tool	BBC Micro:bit
	Cross-curricular	Electricity (circuits)

<p><b>Big ideas</b></p> <ul style="list-style-type: none"> <li>Rocks and minerals have unique characteristics and properties that are a result of how they were formed.</li> <li>The properties of rocks and minerals determine society’s possible uses for them.</li> </ul>	<p><b>Specific Expectations</b></p> <p><b>2.2</b> use a variety of tests to identify the physical properties of minerals.</p> <p><b>2.3</b> use a variety of criteria to classify common rocks and minerals according to their characteristics</p> <p><b>3.2</b> describe the properties that are used to identify minerals</p>
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**Description**

Conductivity is one of the properties that geologists can use to identify minerals. In this lesson, students will create a device using circuits that measures conductivity through two iron nails, and lights up an LED. They will also code their Micro:bit to output a numerical representation of the conductivity levels of each mineral. Then they will sort the minerals as “Conductive” or “Non-Conductive” materials.

<p><b>Materials Per Group</b></p> <ul style="list-style-type: none"> <li>1 Micro:bit</li> <li>5 double ended alligator clipped wires</li> <li>2 iron nails</li> <li>1 330 ohm Resistor</li> <li>1 LED</li> <li>1 Laptop/Chromebook</li> <li><b>Variety of conductive minerals:</b> Gold, silver, nickel, iron, graphite, pyrrhotite, pyrite, bornite, and magnetite</li> <li><b>Variety of non-conductive minerals:</b> Bauxite, calcite, chalcopryrite, fluorite, gypsum, hematite, microline, muscovite, quartz, and talc</li> </ul>	<p><b>Computational Thinking Skills</b></p> <ul style="list-style-type: none"> <li>Algorithmic Thinking</li> <li>Variables</li> <li>Conditional Statements</li> <li>Loops</li> </ul>
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**Introduction**

- Introduce, or reintroduce the Micro:bit. Explain that it’s what we call a “microcontroller” and can be coded to do all sorts of things. Explain that microcontrollers are small computers that are used to control electronic devices, but also mention that the Micro:bit is special because it already has plenty of functions built in.
- Explore with your students some of the distinguishing characteristics of minerals. Since different minerals have different characteristics, we can use this to identify a mineral that we may not know. Some properties that we can look for include the

colour, the streak, the hardness and its conductivity. This experiment will use the Micro:bit and the code that we create to test if a mineral is conductive or not. Conduction is an important property that can distinguish true metals from metallic looking minerals.

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## Action

### Step 1: Code Your Microbit

- Have students connect to their Micro:bit via usb and go to **makecode.microbit.org**
- Create a new program and pair the Micro:bit by clicking on the **gear symbol** selecting **Pair → Pair Device → Select Micro:bit → Connect**
- Use the '*Teacher Coding Sheet*' to guide students in coding their Micro:Bit. This sheet will detail what each line of code does to help direct students.
- The '*Student Coding Sheet*' has the complete code that students can use to follow along. This will be especially useful for beginner coders so they can follow the colours of the code.

### Step 2: Connect the LED

- To wire the LED, have your students take a double ended alligator clipped wire to the **GND** of the Micro:bit then clip the other end to one end of the 330ohm resistor.
- Next clip another double-ended wire to the other side of the resistor and clip its other end to the **SHORT** leg of the LED.
- Take another double-ended wire and clip one end to the **LONG** leg of the LED and the other end to **Pin 1** on the Micro:bit.

### Step 3: Connect the Probes

- Take a double-ended alligator clip and clip one end to the **0 pin** of the Micro:bit and the other to an iron nail.
- Take the last double-ended alligator clip and clip one end to the **3V** and the other to an iron nail.

### Step 4: Test the Conductivity of the Minerals

- Now we can use these two nails as probes to test the conductivity of objects including minerals, it works by sending power through one nail and the having the other nail read the amount of power is reaching through the material by analog reading the **0 pin**.
  - Have students test the materials by placing a nail on either end of the minerals, make sure the nails do not touch as they will ruin the test results.
  - Have your students read the conductivity of the minerals you have provided, they'll be able to read the graph on the face of the Micro:bit and get a numerical reading of the current by pressing A.
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- Students can record their findings using the *‘Mineral Identification Handout’*

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### **Consolidation/Extension**

Now that the Micro:bit has been coded to read conductivity, you could also use this device to detect soil moisture and record the values given by the Micro:bit at different levels of moisture.

You can also use it to test the conductivity of everyday household items.

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### **Assessment**

The Mineral Identification Handout can be used as a form of summative assessment to gauge if students were able to identify which minerals were conductive.

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### **Additional Resources**

- Teacher Coding Sheet
  - Student Coding Sheet
  - Mineral Identification Handout
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