Talk Science

Professional Development

Transcript for Grade 4 Scientist Case: The Under Foot Investigations

1. Properties of Rocks and Minerals, Through the Eyes of a Scientist

In this scientist case, rock collector Michael Haritos examines and discusses the physical properties of four common rocks – the same four rocks that your students investigate in the Under Foot Section of the 4th grade Inquiry Project curriculum. The students make careful observations of physical properties, such as color and texture, of rocks and the minerals they are made of.

A core science concept in the Inquiry Project curriculum is material. Objects can be described in terms of the materials they are made of. Michael focuses on the observable physical properties that characterize different materials as he describes rocks and minerals. These observable properties are the starting point for rock identification. After making preliminary observations, geologists use tools to perform additional tests. They look for additional material properties that would confirm or change their identification.

Watch which properties Michael focuses on as he observes a rock. As an expert, he is able to draw on both observation and his experience as a rock collector to identify rocks and minerals. Your students are just learning what properties are important. Knowing how a scientist observes and describes the properties of rocks and minerals will help you to support your students as they learn to make observations and to associate materials – and their properties – with objects.

2. What Does a Scientist See When He Looks at Granite?

Text on Screen

Watch

What properties Michael observes to identify the minerals in granite.

Sara: What can you tell about a rock by looking at it?

Michael: I look for certain clues. Just like if I was reading a book I'd look at letters and try to make a word, here I'm looking for certain colors and shapes and those will give me clues about perhaps what that rock is.

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Sara: What can you tell about what that particular rock is made of?

Michael: Well, I can see here what appears to be feldspar crystals, and I can tell that because they are kind of shiny when you flip the light back and forth on them and you can see the little grooves in them.

And I can see this white material which I think is quartz. It's a lot like this quartz, but this is a crystal of quartz and here this has been rounded. So the difference, of course, is it's sort of hidden but I can still make out the color and I think it is quartz.

Sara: What color is the feldspar?

Michael: The feldspar in this is an orangey pink.

Here's a piece of granite that has not been in the water and this came off a piece of the mountain that I was climbing. And if you look at it you can see different colors that represent different minerals in the granite.

See this black here? This represents the mineral biotite.

And this here, this pinkish material, that represents the mineral feldspar. And the pink color is because it has a lot of the element potassium in it, which we call "Special K" because that is its abbreviation. [The chemical symbol for potassium is K.] So we rock hounds call it "K-spar" instead of potassium feldspar.

And we have here little glassy pieces. See that? That's quartz again. Like that, except of course this is a crystal of quartz and there are no crystals in here because they all grew together and so they lost their definition or their identity.

So this is a piece of granite, this is a piece of granite. Granite has many variations.

I was walking by the John Hancock building one year and they were putting in new sidewalks. All granite. Can you believe that? And I asked the man – he was sawing pieces to fit – and I said, "Could I have a piece?" and he said, "Sure, buddy," and he gave me a bunch of this stuff.

The pink is, of course, potassium feldspar.
The white is sodium feldspar.
The black is biotite mica.
And the glassy material here and here are quartz – the mineral quartz.

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Text on Screen

Summary

Michael uses material properties such as color, luster, and translucence, to identify the minerals quartz, feldspar, and mica in a granite rock.

3. How Does a Scientist Think about the Difference Between Rocks and Minerals?

Text on Screen

Listen

To how Michael explains the difference between rocks and minerals.

Sara: I can see different colors of what looks like different minerals in both of these [rocks].

Michael: They are minerals, and they are random.

Sara: But in this stone, what am I seeing here?

Michael: It's black color (and there aren't too many rocks that are black) and fine grain – (Can you see minerals in there? You can't see anything. There's no texture here.) So I would say that this formed outside of the earth's surface, from lava. And I would say it probably has iron and magnesium in it from the color, and I would probably call it basalt. If I had to make a guess, I'd call that basalt.

Sara: Is basalt a name of a rock, or a name of a mineral?

Michael: Almost all rocks are made up of more than one mineral. There are only a couple of minerals where the mineral is so pervasive that only one mineral makes up the rock. One of those is halite – you know, when you dig in the mines for salt – and the other's limestone. Limestone is made of the mineral calcite – calcium carbonate. And those two can have humongously big beds made up of one mineral. But almost every other rock you can find is made up of more than one mineral.

Sara: Well, what about quartz?

Michael: Quartz is not a rock. It's a mineral and it's made up of silica and oxygen.

Sara: Is this not a rock, as an object?

Michael: Rocks are aggregates of minerals. You need these [minerals] to make these [rocks]. The definition of a mineral is naturally occurring, inorganic (never been alive; that's why coal is not a mineral) crystalline solid with a definite repeating pattern. That makes a mineral.

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So, that's a mineral. Here's a quartz crystal again, but it's smoky because it's been irradiated naturally, so that's another mineral. Here's some feldspar crystal. It's very unusual to have feldspar crystals. And then this is rock. This rock is made up of quartz and feldspar and it's put together in such a way that it has other minerals in it as well. These minerals have attached or grown upon the rock. It's sort of like it's been a seed for them.

This is a quartz crystal, but it's very special. Hold it in your hand and see how clear it is and notice how geometric it is. And notice the form to it. It has all the interesting things that we rock people really like.

Sara: It has six sides. Is that typical of quartz?

Michael: Yes, because it's a hexagonal prism and you're holding the prism faces. All quartz, all over the world no matter where you are, if you measure those angles, they'll all have the same degree angle. That's part of what quartz is.

Text on Screen

Summary

- Each mineral is characterized by properties such as color, luster and crystal type.
- Minerals are not rocks. Rocks are aggregates of minerals, typically formed when several minerals are joined together.

4. What Does a Scientist See when He Looks at Sandstone?

Text on Screen

Notice

The physical properties that characterize sandstone.

Michael: The pressure squishes everything down and forms another kind of rock called sedimentary rock.

This is sandstone. It has these wonderful layers in it -- see the layers there? It's also gritty. And the reason these are different colors is that these layers came at different times, from different places.

Sara: We saw before that the pink was feldspar and the white was quartz.

Michael: Actually, the glassy is the quartz. The white could be another feldspar.

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Sara: What do we see here?

Michael: Well, I don't know. A lot of this material suffers weathering as it travels. It could be some iron in it that causes it to stain this way [pink]. I don't know, but you do know there are different events here, and there are different times for the events. See, there are very thin layers and there are thick. Almost like tree rings. Like when you get a big wide tree ring when the tree is as happy as a clam at high tide, and then you get a narrow ring because things are not going well. So, these events occur over periods of time, and they are from different places. It's a nice rock. I like it.

Sara: So this rock is made of minerals, but you can't tell what minerals?

Michael: I can't tell from looking at it. No.

Text on Screen

Summary

Michael observes physical properties -- layering and gritty texture -- to conclude that the rock is sandstone, a sedimentary rock deposited in layers.

5. What Does a Scientist Think when He Looks at Conglomerate?

Text on Screen

Notice

How Michael describes conglomerate rock.

Michael: What's interesting about this rock is that all these parts came from somewhere else. They were originally rocks somewhere. They were weathered (broken down) and then eroded (carried away) and deposited somewhere else and they became a rock again.

Sara: It looks to me like I am looking at pink that would look like feldspar.

Michael: Could be, but I can't identify it.

Sara: I'm looking at white that looks like quartz. In fact, to me this looks like it is made of the same stuff as granite.

Michael: It looks close, doesn't it? Rocks are not always easy to decode. One of the things that would help you, you'd have to do an analysis under the microscope. And it is

conceivable that a conglomerate could have all the parts you mention and more. But again, in a granite you'll notice that the grain size is a bit larger. And you don't see any biotite mica there, or muscovite [mica]. Even though it's black, it's not mica. I can tell. That probably means that it's not a granite, because granites have to have mica in them to be granite, by definition. So, that's part of the problem. If you were looking at a book of letters, and you saw lots of t's you would think they all sound the same, but they don't necessarily depending on where they are in the word or the sentence. So all the rocks may look the same, but they aren't necessarily depending on where they came from and perhaps other ways of identifying them.

Text on Screen

Summary

Michael considers physical properties -- colors and texture -- and his knowledge of minerals to conclude that the rock is conglomerate, a sedimentary rock consisting of rounded fragments.

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