CaSTL

A Microscope

Boys and Girls Club After School Science
NSF Center for Chemical Innovation
Chemistry at the Space Time Limit (CaSTL)
https://www.castl.uci.edu/

Standard(s) Addressed:

Children will learn about and use tools that aid in scientific inquiry.
California Department of Education, Science Content Standards, Grade 2 IE: Use magnifiers or microscopes to observe and draw descriptions of small objects or small features of objects.

Lesson Objective:

Children will understand what a microscope is, how to care for and use it, what it does, and how it works.

Materials Used:

a Brock Microscope
Index cards to make their own letter "e" slide
attached worksheet "My Brock Microscope" and "Coin Observation" sheet from the prior lesson.
Bag of "Microscope Word Cards"
glue
students' own objects from previous lesson

Classroom Management:

Setting up: Have 1 microscope per team/pair/individual. Cut up "Microscope Word Cards" and place in little baggies for each team.

During Explore: Encourage students to use caution with and care for the microscopes.

Clean Up: Make sure students give back all materials.

Signal: Stand silently in front of the room, raising hand in the air to get the children's attention.

Funding and Credits:

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ENGAGE: ***Connect to Prior Knowledge and Experience, Create Emotionally Safe Learning Environment, Preview New Vocabulary*** **Estimated time: 5 – 7 minutes**

Description of Engage: Students will connect to their prior knowledge by recognizing ways that scientists can look at objects and materials more closely. Students will connect to their background knowledge by discussing what they know about microscopes.

Teacher's Role	Teacher Questions	Children's Role
Teacher revisits previous lesson by asking students what they remember about the various ways that scientists can look at objects to record their detail.	What are some ways that scientists look at objects to observe and record their characteristics/details? Why would scientists want to record details?	*"They can use their eyes."* *"Scientists use hand-lenses."* *"Scientists might use different tools to observe objects in different ways."*
Teacher shows students a Brock Magiscope (Microscope) and asks them what it is?	What is this tool? What do you think it does? Have you seen it before?	*"It's a microscope."* *"You can see really small things in there."* *"I've seen it before in school."*
Teacher tells the students that they will be using a microscope today to look at objects, but first, like scientists, they must understand the tool, how it works, and what it does.		

EXPLORE: ***Hands-On Learning, Contextualize Language, Use of Scaffolding (Graphic Organizers, Thinking Maps, Cooperative Learning), Use of Multiple Intelligences, Check for Understanding*** **Estimated time: 20 – 25 minutes**

Description of Explore: Students will learn how to use and care for the microscope by investigating its parts. They will then test how it works by experimenting with a slide of the letter "e" and noting how the letter appears in the lens.

Teacher's Role	Teacher Questions	Children's Role
The teacher tells the class that each pair of students will get a microscope and investigate its parts.		
Teacher reviews the names of the 6 parts that they will be looking for. In partners and using the "Microscope Word Cards", students will place the small card of the names on the line (in the picture of the microscope) where they think	What do you think that is? What do you think it does?	*"I think this is the eyepiece because you look through it with your eye."* *"Do you think this is the specimen stage? I think it might be because things go here to look at. The word*

it belongs. Students will attempt to justify their choices and talk about what each part of the microscope does.		stage *is in it… a stage is where a show happens, so maybe this is where you put the stuff to be looked at."*
Teacher has students report what they think the parts are by having students come up to the class microscope and worksheet on the Elmo. Once the class decides on all of the names of the parts, students can adjust and glue down their cards on the diagram.	What do you think that part is? What do you think it does? What might you put there?	Students listen to the discussion about the parts of the microscope and glue down their word cards, making any adjustments needed.
Next, teacher lead students in a discussion about caring for microscopes. Teacher scribes some rules that students come up with for using the microscopes. Teacher helps students fill in any rules that they might be missing by asking questions. (See Care and Handling/Rules section below to make sure that all the rules are discussed and written for students to see)	Why do you think that it's important for us (as scientists) to know how to take care of these microscopes? What are some rules do you think scientists need to follow when using the microscopes?	*"These tools are expensive. We don't want to break them."* *"Scientists need the microscopes for lots of investigations. If they treat them poorly, then they won't be able to use them again."* *"We can't run while holding them."* *"We shouldn't touch the lens part with our fingers."*
Lastly, teacher explains that they need to explore how the microscope works. Teacher reviews again what each of the pieces does. She invites the students to see it in action by observing what happens to the letter "e" when it is looked at on the specimen stage. She models how to draw their own "e" on an index card and place it down and how to look at it.	Do you notice how I am placing the object carefully?	
Students then try to observe their letter "e". They document how it appears on another index card.	What do you notice about how the letter looks? Can you draw it on your paper? Why is this happening? Try moving your card to the right, how does it move? Try	Students draw the letter "e" as it appears. *"It's upside down!"* *"The light through the lens makes it turn upside down."* *"It's moving the other way in*

	moving it up.	*the eyepiece."*

EXPLAIN: ***Listening, Speaking, Reading, and Writing to Communicate Conceptual Understanding*** **Estimated time: 5-8 minutes**

Description of Explain: Students explain how their observations and their tools have varied over the last investigations. Students review what parts of the microscope make it magnify objects in greater scale than the hand lens.

Teacher's Role	Teacher Questions	Children's Role
Teacher reviews that microscopes allow scientists to examine everyday objects in extraordinary ways. She reviews that a hand lens can be a simple microscope because it has one lens and bends the light coming from an object to your eye. However, these microscopes are compound in that, like the ones they made in the previous lessons, they have 2 lenses. She asks students how they think this might make for more magnified viewing. Teacher shows the students how, in the microscope, the light bounces off the object, is bent through the objective lens, and then bent again through the ocular lens, where it is seen by your eye.	You saw objects with your hand lenses. How do you think they would look with the microscope? What happened to the letter "e"? How is this different than what happened with the hand lens?	*"They would look bigger with the microscope because there are two lenses."* *"They are magnified with two lenses on the microscope."* *"The letter 'e' was upside down. This is different from the hand lens."*

EVALUATE: ***Thinking Maps, Summarize Lesson and Review Vocabulary, Variety of Assessment Tools, Games to Show Understanding*** **Estimated time: 5 -10 minutes**

Description of Evaluate: The children will be assessed on their understanding of what a microscope does and how it works.

Teacher's Role	Teacher Questions	Children's Role
Teacher has the students do an inside-outside circle or line. The students bring their diagram of the microscope. Teacher counts off students in	What is your part of the microscope? What does it do? How does it work?	*"This is the eyepiece. You look through it. It has a lens."* *"This is the objective lens. It is the second lens of the microscope."*

1-6. Each one shares about 1 part of the microscope as they go around the circle/line.		

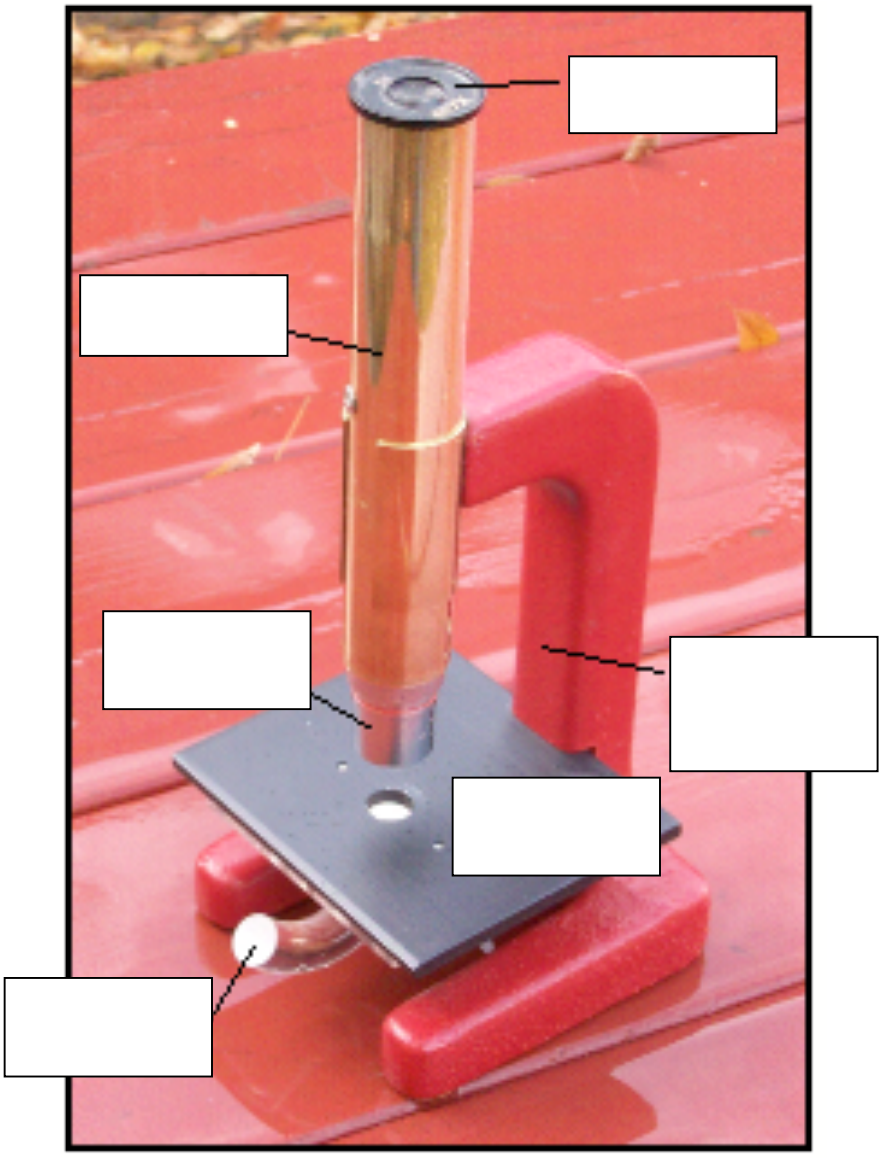
EXTEND/ELABORATE: ***Group Projects, Plays, Murals, Songs, Connections to Real World, Connections to Other Curricular Areas*** **Estimated time: 10 minutes**

Description of Extend/Elaborate: Students will get the opportunity to look at a dime and their own objects from outside in the microscope. This brings this lesson together with the prior lesson from the day before.

Teacher's Role	Teacher Questions	Children's Role
Teacher asks students to close their eyes and predict what the dime and their "found object" from the prior lesson might look like under the microscope.	What do you imagine a dime would look like under the microscope? How about your objects from yesterday?	*"I bet the dime is upside down."* *"I think I could see much more detail in [my leaf]."*
Teacher models how students should place the objects under the microscope to observe. She explains that they must then record their observations on the data record sheet from the day before. Students share their observations with tablemates.	What do you see? How is that different from your memory/naked-eye/or hand lens?	*"I see much more detail."*

Name _____

Parts of My Brock Microscope



Microscope Word Cards (one per team)

Eyepiece	Optical tube	Objective lens
Solid metal body	Specimen stage	Light pipe

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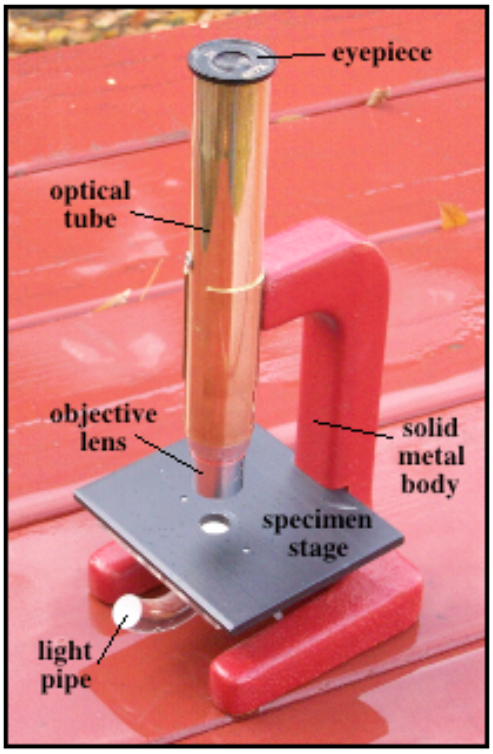
Care and Handling of a Microscope

(http://www.cas.miamioh.edu/mbi-ws/microscopes/care.html)

Transporting:		When you pick up the microscope and walk with it, grab the arm with one hand and place your other hand on the bottom of the base. **DON'T SWING THE MICROSCOPE !**
Handling & Cleaning:		Never touch the lenses with your fingers. Your body produces an oil that smudges the glass. This oil can even etch the glass if left on too long. Use only LENS PAPER to clean the glass. **TOILET PAPER, KLEENEX, AND PAPER TOWELS HAVE FIBERS THAT CAN SCRATCH THE LENSES.**



Observations on the letter "e"

When a slide of the letter "e" is placed on the microscope several observations can be made. The picture below illustrates the orientation of the letter "e" viewed with the microscope. How is it different from what you might have expected? Try drawing the letter "e" right side up and then as it appears here. Furthermore, if you move the slide to the left across your microscope stage, the letter "e" seems to move to the right. What will happen if you move the slide away from yourself?

Total Magnification of 40X