Anton van Leeuwenhoek 2A

Introducing the Read-Aloud *10 minutes*

What Do We Know? *5 minutes*

What country was Anton van Leeuwenhoek [*LAY*-van-huke] from and how long ago was he alive? (Anton was from Holland and he lived four hundred years ago.) What does Anton van Leeuwenhoek's name mean in Dutch? (Anton who lives on the corner of Lion's Gate) What else did Nick Nutri say about Anton? (Anton is one of Nick's heroes.)

Vocabulary Preview *5 minutes*

Bacteria

1. In today's read-aloud, you will hear that Anton van Leeuwenhoek was the first person to observe and describe *bacteria*.
2. Say the word *bacteria* with me three times.
3. [Show image(s) of bacteria you have prepared in advance.] Bacteria are very small living things that cannot be seen with the naked eye. Some bacteria may cause disease or make you sick.
4. Washing your hands with soap helps prevent harmful bacteria from attacking your body.
5. Describe the bacteria you see in this image. What shape is it? Does it have color? Is it made up of many parts? Is bacteria big or small?

Microscope/Magnifies

Show image 2A-2: Student microscope

1. In today's read-aloud, you will hear about how a *microscope magnifies* very small objects.
2. Say the word *microscope* with me three times.
   Say the word *magnifies* with me three times.
3. Magnifies means makes something look larger than it really is. A microscope is a tool that scientists use to make very small objects look much bigger.
4. My grandmother's magnifying glass magnifies the print in her book so that she can read more easily.
   The students took turns looking through the microscope to see the ant's antennae.

Show image 2A-12: A microscope today and Anton's microscope

5. [Point to each microscope as you talk about it.] Look at this image of a microscope we would use today and Anton van Leeuwenhoek's microscope. Describe how they are different from one another. (Anton's is held in his hand, whereas today's is placed on a flat surface; Anton's must be held up to the object, but today's has a piece of glass, or slide, that the object is placed on; Anton's is much smaller than today's; Anton's had one small area to look through, whereas today's has a long tube to look through.)

Purpose for Listening

Tell students that you are going to give them a hint about why Anton van Leeuwenhoek is Nick Nutri's hero. Tell them that four hundred years ago, Anton made an important discovery that helps present-day scientists like Nick Nutri. Ask them to listen carefully to find out what Anton discovered.

Presenting the Read-Aloud — *15 minutes*

Anton van Leeuwenhoek

Show image 2A-1: Nick Nutri and Leeuwenhoek

Hi, boys and girls. Last time we were together, I said that I would tell you about Anton van Leeuwenhoek [*LAY*-van-huke] today. I do plan to do that, but first I want to tell you a story about me.

When I was about your age, one day my father came home with a present for me under his arm. When I first opened it, I wasn't sure what it was.

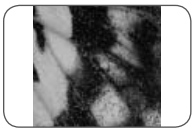
Show image 2A-2: Student microscope [1]

It looked like this. Do you know what this is called or what it does? My father explained that it was a **microscope**.[2] That was nothing I had ever dreamed of wanting. I spent most of my time playing outside and could barely sit still to read a book. Why would I want this funny looking instrument?

"You are so curious about everything. I thought perhaps you'd like to see what a butterfly wing looks like close up," my father said.

1 [If there is a microscope in the classroom, direct students' attention to it.]

2 Who knows what a microscope is? [Pause for students' answers.] A microscope is a type of scientific equipment that uses pieces of curved glass to make very small things look bigger.



Show image 2A-3: Butterfly wing under a microscope

I peered through the **lens**[3] of the microscope and saw the tiny veins and hairs of a butterfly's wing. I looked at insect eyes and blades of grass. I looked at oak leaves and dead bumblebees and toy soldiers. It was the best present I had ever received.

3 or curved piece of magnifying glass

Show image 2A-4: What does a magnifying glass do? [4]

Have you ever used a magnifying glass? Who can tell me what a magnifying glass is used for? Yes, it **magnifies** objects. It makes objects look hundreds of times larger than they really are. It shows things that are too small to see with the human eye alone. Sometimes people use magnifying glasses to read really small print or to find splinters buried deep in the skin. Well, a microscope is a lot like that but much more powerful.

4 [Point out to students the magnifying glass in your classroom.]

So, what does that have to do with Anton van Leeuwenhoek? Well, just like me at seven years old, the year I received my first microscope, Anton was very curious. He also had a fascination with magnifying objects. Although Anton was not a scientist, his work with microscopes changed the way people thought about the human body and how it works.

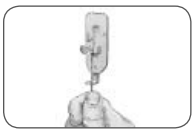
Show image 2A-5: Threads of cloth under a magnifying glass

At sixteen, Anton began working in the textile[5] business. His shop sold cloth, buttons, sewing supplies, ribbons, and lace. His customers were very particular, expecting the very best textiles, or cloth, for their suits and dresses. Anton used a magnifying glass to make sure the threads of the cloth were straight and tightly woven. His customers appreciated Anton's careful **observations.**[6]

When he was about thirty years old, Anton took a trip from his home in Holland to nearby England. There he discovered a book called *Micrographia,* meaning small images.[7]

Show image 2A-6: Lice

Written by Robert Hooke, the book was full of drawings and descriptions of objects seen through a microscope. Anton was fascinated by how large and detailed the micro, or small, objects looked when seen through the lenses of a microscope.[8] It was a little like someone with poor eyesight putting on eyeglass lenses for the first time and discovering that the blurry tree in the distance was actually made up of individual leaves. He couldn't wait to get home to experiment with his own objects.



Show image 2A-7: Anton's microscope

Upon his return to Holland, Anton began to build his own single-lens microscopes.[9] He shaped his lenses very carefully, grinding them down with sand and polishing them smooth with putty.[10] Anton's simple microscopes magnified objects from fifty to two hundred times their natural size.

5 or cloth

6 Observations are made when you look closely at the details of something.

7 Do you have any ideas of what these images, or pictures, were about?

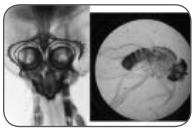
8 or pieces of curved glass that magnified what he could see

9 or a type of microscope having only one lens

10 or polishing powder

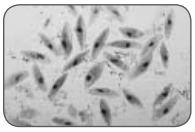
Anton had been interested in science and nature ever since he was a boy, and now he had the opportunity to study nature at a much closer range. He carried squiggly wormlike insect larvae around in his pocket, eager to watch the entire life cycles of insects with the aid of a microscope. [11]

11 Who remembers what insect larvae are? (early stage of insects' life between egg and pupa)



Show image 2A-8: Mosquitos under a microscope

Using the microscopes he made himself, he studied people's skin, mosquito wings, and sheep hairs. He observed duck hearts, fish scales, cow eyes, and water bugs. What a strange man, others thought. But this patient man was driven by his curiosity, and he wanted to learn more. He never lost interest in the scales on a gnat's wing or the hairs on a fly. He looked at the same things again and again—comparing, measuring, and recording his findings.



Show image 2A-9: Pond water under a microscope

Anton conducted many experiments with water—drinking water from his well, water from lakes and from the sea, rain, and melted snow. He discovered what looked to him like tiny "little animals" in lake water. He called these "little animals" animalcules. Anton claimed he saw even more animalcules swimming about in rainwater. They were everywhere, he said. He estimated [12] that one thousand of these tiny creatures could fit on the head of a pin. [13] People called him a liar and a magician, thinking him quite mad. [14]

But, in fact, Anton was not mad at all. His "little animals" were not really animals, but they were definitely alive. He was the first to observe and describe many tiny living things in nature not visible with the naked eye, including **bacteria,** or germs. [15] Many scientists believe that these tiny life forms have been on Earth for more than 3 billion years. They surround us in air, water, and on land, but no one was aware of their existence before Anton recorded what he saw. He discovered a whole new world!

12 or guessed

13 [Show Image Card 1 (Pins).] What do you use a pin for? (sewing) The head of the pin is the flat top part.

14 or crazy

15 When something cannot be seen with the naked eye, it means you can't see the object with just your eyes. You need a tool such as a microscope, telescope, or magnifying glass in order to see it. In other words, bacteria cannot be seen with the naked eye.

Show image 2A-10: Close-up of a smile

Ever curious, Anton began studying the saliva from inside his mouth. He discovered even more bacteria. He found that the sticky coating on the outside of his teeth was crawling with millions of tiny organisms.[16] You have them too, but don't worry. They won't hurt you. We'll learn more about them another day.

16 or living things

Show image 2A-11: Engraving of Anton from the Royal Society

Anton kept a journal[17] to record his detailed observations. He made friends with two English doctors who belonged to England's Royal Society of London. They told him that their fellow English scientists kept similar journals to share their scientific discoveries, and they invited Anton to share his work with them. And so, for the next fifty years, Anton sent hundreds of letters to England. His letters described in great detail the tiny structures that he saw through his homemade microscopes. He described fungus on stale bread; the stingers, eyes, and mouths of bees; even tiny lice. Because he could not draw well, Anton hired someone to illustrate his writing. The English society loved everything he sent and published his letters for others to read.

17 or writing book

Show image 2A-12: A microscope today and Anton's microscope

Anton van Leeuwenhoek did not invent the microscope, nor was he the first to use one, but he used his own simple microscope more than most people of his day. Compared to modern microscopes, Anton's was very simple indeed. It was even more simple than other microscopes used in his day. The entire instrument was only three to four inches long and had to be held up close to the eye.

Anton's microscope used only one lens. Modern microscopes have two or more lenses—one in the eyepiece that you look through; and at least one lens at the bottom of the tube, or barrel, to enlarge things even more.

Today, objects are put on glass slides to be viewed. These objects remain in one place. It is the lens that moves, not the objects. Instead of keeping the objects in one place, Anton mounted his objects on the end of a sharp pointed pin sticking up in front of the lens and moved the objects instead of the lens. Anton's invention required good lighting and great patience to use. His lenses were the clearest and most powerful lenses of his day, but he never shared his secret for creating them. No one came close to matching the quality of Anton van Leeuwenhoek's microscopes for more than one hundred years after his death. Of the four to five hundred microscopes that Anton is believed to have made, no more than nine exist today.

Show image 2A-13: Pond water under a microscope

Anton is one of my heroes because he was the first person to describe bacteria, tiny living things not visible with the naked eye. And his discovery of bacteria made it possible to see other small living things, such as the small building blocks of all life on Earth. As a nutritionist, I am fascinated by how the human body works and the tiny building blocks that make up the human body. The next time we meet, I look forward to teaching you about the amazing body's amazing building blocks.

Discussing the Read-Aloud **15** *minutes*

Comprehension Questions **10** *minutes*

If students have difficulty responding to questions, reread pertinent passages of the read-aloud and/or refer to specific images. If students give one-word answers and/or fail to use read-aloud or domain vocabulary in their responses, acknowledge correct responses by expanding students' responses using richer and more complex language. Ask students to answer in complete sentences by having them restate the question in their responses.

1. *Literal* What was Anton van Leeuwenhoek's important discovery? (bacteria, tiny living things not visible with the naked eye)
2. *Inferential* What instrument made Anton's discovery possible? How? (He used a microscope with its magnifying lens to magnify drops of water, his own saliva, and many other things.)
3. *Evaluative* If you could choose one word to describe Anton van Leeuwenhoek, what would it be? Why? (Answers may vary. Possibilities include: *curious, patient, hardworking, smart, observant, brave*)
4. *Evaluative* Anton had a name for the living things he saw under his microscope's lens. What did he call these living things? (animalcules or "little animals") Do you think that was a good name? Why or why not? (Answers may vary, but may include that he named them from his own experience, and they probably looked more like animals than anything else he had ever seen.)
5. *Inferential* Anton lived a very long time ago, so how do we know so much about his discoveries? (He kept detailed journals, many of which were published in England.)

[Please continue to model the *Think Pair Share* process for students, as necessary, and scaffold students in their use of the process.]

I am going to ask a couple of questions. I will give you a minute to think about the questions, and then I will ask you to turn to your neighbor and discuss the questions. Finally, I will call on several of you to share what you discussed with your partner.

6. *Evaluative* Some people say "seeing is believing," meaning they can't believe something exists unless they see it themselves. Before the microscope was discovered, or people had the opportunity to look into a microscope themselves, they didn't believe tiny things impossible to see without a microscope, like bacteria, could exist. Remember how crazy people thought Anton was when he told them about the animalcules? Our microscopes are very powerful now, and we can see many, many things even smaller than bacteria. Do you think it's possible, that there may still be things too small to see even with our powerful microscopes? Do you think "seeing is believing"? Why or why not? (Answers may vary.)
7. After hearing today's read-aloud and questions and answers, do you have any remaining questions? [If time permits, you may wish to allow for individual, group, or class research of the text and/or other resources to answer these questions.]

Word Work: Observations *5 minutes*

1. In the read-aloud you heard, "His customers appreciated Anton's careful *observations.*"
2. Say the word *observations* with me.
3. Observations are information gathered by closely watching someone or something.
4. When drawing a flower, Rusty made detailed observations of its petals.
5. When is it important to make observations? When is it important to closely watch someone or something to get information? [Ask two or three students. If necessary, guide and/or rephrase students' responses: "It is important to make observations when . . . "]
6. What's the word we've been talking about?

Use a *Making Choices* activity for follow-up. Directions: I am going to read some sentences from the read-aloud. If the sentence describes one of Anton's observations, say, "Anton made an observation." If it does not describe one of Anton's observations, say, "Anton did not make an observation." Remember to answer in complete sentences.

Note: You may wish to point out to students that all of the statements are true, but only some of them are observations.

1. At sixteen, Anton began working in the textile business. (Anton did not make an observation.)
2. Anton used a magnifying glass to make sure that the threads of the cloth were straight and tightly woven. (Anton made an observation.)
3. Anton found that the sticky coating on the outside of his teeth was crawling with millions of tiny organisms. (Anton made an observation.)
4. Anton discovered what looked to him like tiny "little animals" in lake water. (Anton made an observation.)
5. Anton made friends with two English doctors who belonged to England's Royal Society of London. (Anton did not make an observation.)

Complete Remainder of the Lesson Later in the Day

Anton van Leeuwenhoek 2B

Note: Extensions may have activity options that exceed the time allocated for this part of the lesson. To remain within the time periods allocated for this portion of the lesson, you will need to make conscious choices about which activities to include based on the needs of your students.

Extensions — *20 minutes*

Multiple Meaning Word Activity — *5 minutes*

Definition Detective: Slides

Note: You may choose to have students hold up one, two, or three fingers to indicate which image shows the meaning being described, or have a student walk up to the poster and point to the image being described.

1. In the read-aloud you heard the word *slides* in this sentence: "Today, objects are put on glass *slides* to be viewed [using a microscope]."
2. With your partner, think of as many meanings for *slides* as you can, or discuss ways you can use the word *slides*.
3. [Show Poster 1M (Slides).] Which picture on the poster shows how the word *slides* is used in the lesson?
4. *Slides* also means other things. *Slides* means moves smoothly along a surface. Which picture shows this meaning of *slides*?
5. *Slides* can also mean play structures with a slippery surface that children slide down. Which picture show this meaning of *slides*?
6. Did you or your partner think of any of these definitions?
7. Now quiz your partner on the different meanings of *slides*. For example you could say, "My father slides the door open so the dog can go in the yard. Which *slides* am I?" And your partner should point to the boy sliding on the ice to show you that you meant that kind of *slides*.

Syntactic Awareness Activity 5 *minutes*

Adjectives and Adverbs

Note: The purpose of these syntactic activities is to help students understand the direct connection between grammatical structures and the meaning of text. These syntactic activities should be used in conjunction with the complex text presented in the read-alouds. There may be variations in the sentences created by your class. Allow for these variations, and restate students' sentences so that they are grammatical.

1. We know that some words describe other words.
   Words that describe nouns—or people, places or things—are called adjectives.
   Words that describe verbs—or action words—are called adverbs. Today we will practice using adjectives and adverbs.
2. The word *careful* is an adjective that describes a person who is safe and cautious.
   For example: My mother is a very *careful driver*.
   Careful is an adjective that describes the noun—driver.
3. In today's read aloud, you heard that when Anton began to build his own microscopes, he *shaped* his lenses very *carefully*.
   The word *carefully* is an adverb that describes how he shaped his lenses.
   Carefully is an adverb that describes the verb—shaped.
4. I will ask some questions. If my question asks you to describe a noun, use the adjective *careful* in your answer. If my question asks you to describe a verb or an action, use the adverb *carefully* in your answer. [Emphasize the italicized words.]
   - How should you *cut* with scissors? (You should cut carefully.)
   - How would you describe a *firefighter* who checked to make sure that no one was left in the burning house? (a careful firefighter)
   - How should a mother *hold* a little baby? (The mother should hold the baby carefully.)

- How would you describe a *child* who looks both ways before she crosses the street? (a careful child)
- How should you *carry* a full glass of milk? (You should carry it carefully.)
- How would you describe a *student* who always double-checks his work to make sure there are no mistakes? (a careful student)

5. What are words that describe nouns called? (Adjectives describe nouns.)
   What are words that describe verbs, or action words, called? (Adverbs describe verbs.)

Vocabulary Instructional Activity *5 minutes*

Word Work: Curious

1. In the read-aloud you heard Anton's father tell him, "You are so *curious* about everything. I thought perhaps you'd like to see what a butterfly wing looks like close up,"
2. Say the word *curious* with me three times.
3. *Curious* means interested in learning or knowing about something.
4. The curious puppy knocked over the box because he wanted to know what was inside of it.
5. Tell about a time that you were curious about something. What were you curious about? What did you do to find out more about it? Try to use the word *curious* when you tell about it. [Ask two or three students. If necessary, guide and/or rephrase the students' responses: "I was curious about . . ."]

Use an *Antonyms* activity for follow-up. Directions: I will say several sentences. If what I say is an example of someone being curious, say, "He/She is curious." The antonym or opposite of *curious* is *uninterested*, meaning *not interested*. If what I say is an example of someone who is uninterested, say, "He/She is uninterested."

- My friend returned his book to the library because he didn't want to finish it. (He is uninterested.)

- The girl asked her teacher questions about the Cherokees because she wanted to know more about them. (She is curious.)
- My little sister went looking in my room to see what toys she could find. (She is curious.)
- Our classmate did not want to play the game because he thought it was boring. (He is uninterested.)
- The boy went to the library to find books about trains so he could learn more about them. (He is curious.)

Using a Magnifying Glass (Hand Lens) (Instructional Master 2B-1) — 20 *minutes*

- Begin by talking about tools that help people experience the world in new ways, referring back to Lesson 1 and the use of hearing aids and glasses. Other items include canes, crutches, wheelchairs, prosthetic limbs, microscopes, telescopes, etc. You may choose to extend this discussion to include bikes, cars, planes, as well as technological tools like cameras and computers.

Observations

- Have students look at an object far away from them, perhaps on the other side of the room. Ask them how they might see the object better without moving closer to it. They may suggest a variety of tools to make the object appear larger—glasses, magnifiers, binoculars, microscopes, and telescopes.
- Hand out magnifying glasses, one per student if possible. Tell students what they are, and ask if anyone has ever used one or knows anything about it. Provide a simple explanation of how they work: the lens is curved outward like a dome on both sides (convex). This curved lens makes objects appear larger.
- Encourage students to experiment with the magnifying glasses, looking at each other and at objects around the room. Have them look through the lenses with both eyes open and then with one eye closed. Have them hold the lenses at various distances from their eyes to see what works best for them. Students will

probably see best with the non-viewing eye closed and with the magnifying glass held five or six inches away from their faces. They should understand that the closer they hold the glass to an object, the larger the object appears.

Draw What You See

- Once students have had the opportunity to experiment with the hand lenses, give each student Instructional Master 2B-1, a fabric swatch, and a pencil. Ask them to make two drawings. On the top part of the page, ask them to draw patterns from their fabric swatches without the aid of the magnifying glasses. When their first drawings are complete, ask them to each select a section of their fabrics to observe more closely. Using their magnifying glasses, they should then draw the magnified view of what they see.

Under a Microscope — 10 *minutes*

- Set up several microscopes with various slides showing a variety of objects. Some ideas include slides of skin, onion membrane, an insect, a drop of blood, or pond water. If microscopes are unavailable, present images of these various items as seen under a microscope.
- Have students view the slides, and then ask them to describe what they see either orally, or by writing or drawing about the various items. If students write about or draw what they see, have students share their work with the class.

My Human Body Journal (Instructional Master 2B-2) — 15 *minutes*

- Distribute a copy of Instructional Master 2B-2 (Journal Page 2) to each student. Encourage students to write three complete sentences about Anton van Leeuwenhoek. The first sentence should introduce Anton, and the following two sentences should be two facts or two interesting things that students learned about Anton.