Lesson 28 - Science Experiment
Banana DNA

28

Instructional Targets

Standards for Scientific Inquiry

- Identify questions that can be asked about the natural environment.
- Conduct simple scientific investigations.
- Use tools to gather data and information.
- Analyze and interpret data.
- Communicate procedures and explanations about an investigation.

Differentiated Tasks

Level 3 Students will...	Level 2 Students will...	Level 1 Students will...
• Follow steps of a scientific process related to grades 6-8 science topics.	• With support, follow steps of a scientific process related to grades 6-8 science topics.	• Actively participate in a scientific process related to grades 6-8 science topics.

Topic Connection

Throughout this unit, students explore how traits are inherited from parents through DNA. In this lesson, students will examine items with a microscope and then extract DNA from a banana.

Topic Words

cell	parent
DNA	trait

Science Words

ask*	guess	process
conclusion	hypothesis	question*
data	observe	scientific
experiment		

* Power Words

Lesson at a Glance

	Activity 1	Activity 2	Activity 3	Activity 4
Instructional Activities	Introduce the Experiment	Make a Guess / Hypothesis	Conduct the Experiment	Review and Share Findings
See how these activities fit into the **Suggested Monthly Plan**.				
ULS Materials and Resources	**Picture/Word Cards** small objects banana	**Experiment Steps 1 and 2**	**Experiment Steps 3 and 4** **Picture/Word Cards** rubbing alcohol banana zip-top bag salt hot water small bowl craft stick dish soap coffee filter glass cup masking tape Banana DNA	**Experiment Steps 4 and 5**
	Instructional Tools: Scientific Inquiry Processes			
Additional Materials	**Real Objects** small objects that can be looked at under a microscope banana		**Banana DNA Experiment Video** https://askabiologist.asu.edu/activities/banana-dna **Experiment Materials** rubbing alcohol 1/2 ripe banana, peeled quart-size zip-top bag 1 t salt ½ C hot water small bowl craft stick ½ t dish soap coffee filter narrow glass cup masking tape	

Instructional Targets

Standards for Scientific Inquiry

- Identify questions that can be asked about the natural environment.
- Communicate procedures and explanations about an investigation.

Instructional Routine

Introduce	• Introduce the activity by asking a focus question. For example, display a microscope and ask, "Is this a radio or a microscope?" Discuss students' responses. • Discuss how scientists use microscopes to look at things. Explain that microscopes are used to see things that we can't usually see with our eyes. Point out that many discoveries have been made using microscopes. • Display an object, such as a banana, and tell students they will explore items by looking at them under a microscope. For example, say, "Today, you are going to observe and ask questions about items using a microscope." • Review the learning goal with students: **I will observe and ask questions about items using a microscope.**
Model	• Model using a microscope to look at an object. For example, look at the object under the microscope and say, "I can see things I coudn't see without the microscope. I can see smaller parts of objects with a microscope." • Continue modeling by noting other details of the objects you see while looking under the microscope. • Model exploring small objects in the classroom and small pieces of food under a microscope. For example, hold up a banana and say, "I am going to look at a piece of banana under the microscope. I can see smaller parts of the banana that I can't see with my eyes."
Provide Practice	***Provide students with an assortment of small objects, including small pieces of banana. Aid students in the manipulation of the microscope.*** **Level 3:** Have the student observe different objects using a microscope. Encourage the student to ask questions and share observations with his or her peers. **Level 2:** Have the student observe different objects using a microscope. Encourage the student to ask questions and share observations, using visual support as needed. **Level 1:** With support, guide the student to observe an object using a microscope. For example, show the student what a small piece of banana looks like under a microscope. Have the student use their active participation mode to select a word that describes what they see from a field of 2-3 choices (or errorless choice).
Review	• Revisit the learning goal. For example, ask, "What did you notice about the objects when you used the microscope? Could you see different things when you used a microscope than when you were just looking with your eyes?" • Tell students that, next, they will begin an experiment to find out if they can see banana DNA without a microscope.

Check Understanding

Level 3: Can the student make and share an observation?

Level 2: Can the student make an observation?
Can the student share an observation?

Level 1: Can the student participate in making a supported observation? How?
Can the student communicate about a supported observation? How?

Instructional Targets

Standards for Scientific Inquiry

- Identify questions that can be asked about the natural environment.
- Communicate procedures and explanations about an investigation.

Instructional Routine

Introduce	• Introduce the activity with a focus question such as, "What can you use to see smaller parts of objects—a microscope or a microwave?" Remind students that a microscope is often used to see small objects or small parts of objects. • Continue discussion by reading the "What We Know" statements in the Experiment. Compare or have students compare these statements to what they learned about microscopes in Activity 1. • Tell students that they will now begin an experiment with bananas. For example, say, "When we do an experiment, we ask a question and make a guess or hypothesis. Today, it is your job to ask a question and make a guess/hypothesis." • Review the learning goal with students: **I will ask a question and make a guess/hypothesis.**
Model	• Display Science Experiment Steps 1 and 2. • Read Step 1. Emphasize that right now you can only make a guess or hypothesis about the answers to these questions. Point out that the final answers will come from doing the experiment. • Read Step 2 and model making a guess/hypothesis. For example, say, "Microscopes help you see things that are very small. DNA is in cells. Cells are small. I do not think that we can see DNA without a microscope." • Continue modeling to show the students how to record your guess/hypothesis.
Provide Practice	**Level 3:** Have the student make a guess/hypothesis by writing or dictating what they think will happen. **Level 2:** Have the student make a guess/hypothesis using visual supports as necessary. **Level 1:** Have the student make a guess/hypothesis by choosing from 2 to 3 choices (may be errorless).
Review	• Revisit the learning goal. Point out that today, students completed the first two steps of the scientific process—they asked a question and made a guess/hypothesis. • Tell students that next, they will conduct the experiment and gather data.

Check Understanding

- **Level 3:** Can the student make a guess/hypothesis by writing or dictating?
- **Level 2:** Can the student make a guess/hypothesis with visual support?
- **Level 1:** Can the student make a guess/hypothesis from 2 to 3 choices (may be errorless)?

Instructional Targets

Standards for Scientific Inquiry

- Conduct simple scientific investigations.
- Use tools to gather data and information.

Instructional Routine

Introduce	• Introduce the activity by displaying a banana and asking a focus question such as, "What is a set of directions that tells the cells of this banana what it should look like?" Discuss students' responses. • Review the guesses/hypotheses students made in Activity 2. Then introduce the materials needed for the Experiment. Picture/Word Cards are provided to support vocabulary development. • Tell students they will now complete Steps 3 and 4 of the scientific process. For example, say, "Today, your job is to do an experiment and gather and record data." • Review the learning goals with students: **I will do an experiment.** **I will gather and record data.**
Model	• Display the experiment page. Model reading and following the directions in Step 3 to complete the experiment. • When you come to Step 4 in the directions, model how to gather and record data. For example, say, "I can see the banana DNA without a microscope. I will mark that on the data sheet."
Provide Practice	**Level 3:** Have the student follow the directions to conduct the experiment and gather and record data. **Level 2:** With support, have the student follow the directions to conduct the experiment and gather and record data. **Level 1:** Have the student use his or her active response participation mode to participate in conducting the experiment and gathering and recording data.
Review	• Revisit the learning goals by discussing the steps to the experiment, as well as what happened during the experiment. • Point out that today, students completed steps 3 and 4 of the scientific process—they conducted an experiment and they gathered data. Explain that the next step is to review and discuss the data they gathered and find the conclusion.

Check Understanding

Level 3: Can the student independently follow steps to complete an experiment?
Can the student independently gather and record data?

Level 2: Can the student follow steps to complete an experiment with support?
Can the student gather and record data with support?

Level 1: Can the student actively participate in an experiment? How?
Can the student actively participate in gathering and recording data? How?

Instructional Targets

Standards for Scientific Inquiry

- Analyze and interpret data.
- Communicate procedures and explanations about an investigation.

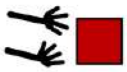
Instructional Routine

Introduce	• Introduce the activity by asking a focus question such as, "Can you see banana DNA without a microscope?" Discuss students' responses. • Prompt students to recall the experiment. For example, say, "We did an experiment with bananas. We gathered and recorded data. Today, it is your job to look at the data and decide if the guess/hypothesis you made in Step 2 was correct." • Review the learning goal with students: **I will decide if my guess is correct.**
Model	• Display a completed data form from Step 4. • Model using the data to answer the questions in Step 5. • Discuss why the guess/hypothesis you made in Step 2 is correct or incorrect.
Provide Practice	**Level 3:** Have the student use data from Step 4 to answer the questions in Step 5 independently. **Level 2:** Have the student use data from Step 4 to answer the questions in Step 5. Provide support as necessary. **Level 1:** Review the data from Step 4 with the student. Then have the student answer each question in Step 5 by selecting an answer from a single option or errorless choice.
Review	• Revisit the learning goal. For example, discuss what happened in the experiment and have students share their findings. Use the additional information at the end of the experiment to discuss student learning. • Explain that students have now completed all five of the steps in the scientific process. Review the steps.
Extension	• Have students repeat the experiment with a different fruit such as a strawberry. • Have the students look at the DNA they extract with a microscope. Have the students explain and draw what they see.

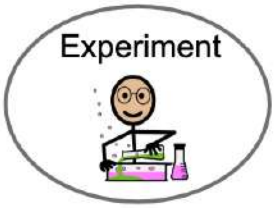
Check Understanding

- **Level 3:** Can the student use data to independently decide if a guess/hypothesis was correct?
- **Level 2:** With support, can the student use data to decide if a guess/hypothesis was correct?
- **Level 1:** Can the student make a selection from a single option or errorless choice to indicate if a guess/hypothesis was correct?

NEED



experiment



Banana DNA

rubbing alcohol

½ ripe banana, peeled

quart size zip-top bag

1 t salt

½ C hot water

small bowl

craft stick

½ t dish soap

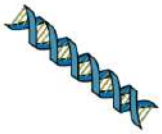
coffee filter

narrow glass cup

masking tape

What We Know:

- All living things have DNA.
- DNA in cells is very small.



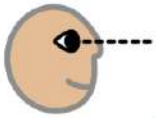
Step 1: Ask a Question

- Can we see DNA without a microscope?

Step 2: Make a Guess / Hypothesis

I think...

We can see DNA without a microscope.



We cannot see DNA without a microcope.

My guess:

_____

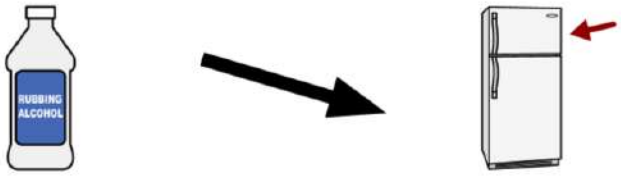
_____

_____

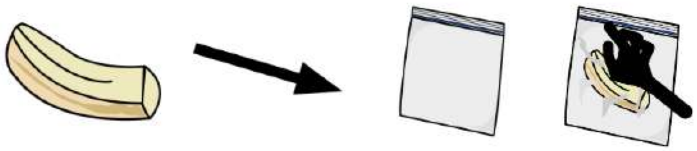
See Experiment Steps 1-2

Step 3: Do an Experiment

1. Put rubbing alcohol into freezer.

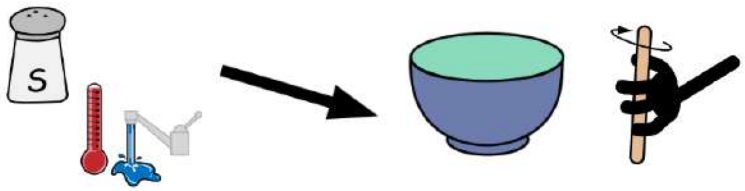


2. Put banana into zip-top bag and close bag.

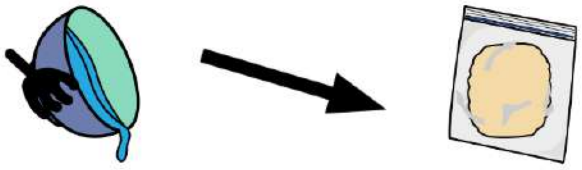


3. Mash banana in the bag until all lumps are gone (it will look like pudding).

4. Put salt and hot water into bowl. Stir until dissolved.



5. Carefully pour salt water into bag.

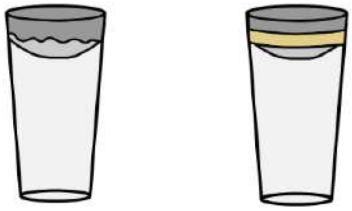


Step 3: Do an Experiment

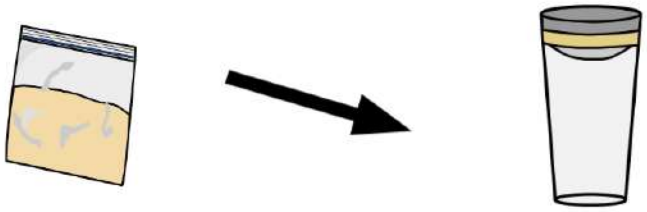
6. Close bag and squeeze gently to mix the salt water and banana together (about 45 seconds).

7. Put dish soap into bag and mix gently.

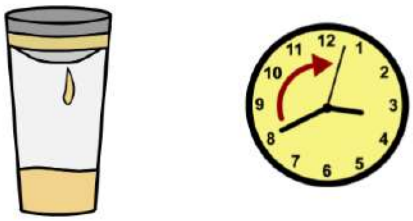
8. Place bottom of coffee filter into glass cup. Secure to cup with tape.



9. Carefully pour banana mixture from bag into filter.



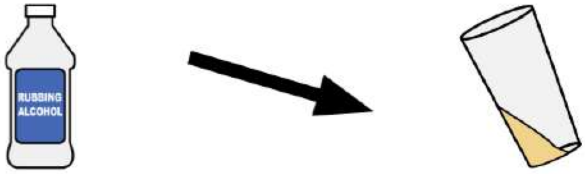
10. Let banana mixture sit for several minutes until all of the liquid has dripped into the glass cup.



Step 3: Do an Experiment

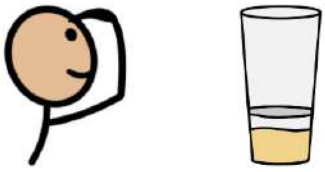
11. Remove filter and throw it away.

12. Tilt the glass and slowly pour the cold alcohol down the side into the cup until there is a layer that is 1 to 1 ½ inches thick.



13. Let mixture sit at least 8 minutes.

14. Watch for bubbles and clumps to form between the banana layer and the alcohol layer. The clumps are DNA!



15. Reach into cup with craft stick. Lift out the DNA.

Step 4: Organize Data

Can we see DNA without a microscope?

We can see DNA without a microscope.

We cannnot see DNA without a microscope.

See Experiment Steps 1-4

Step 5: Find the Conclusion

Can you see DNA without a microscope?

yes

no

Was your guess correct?

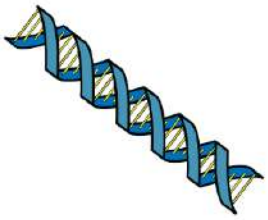
yes

no

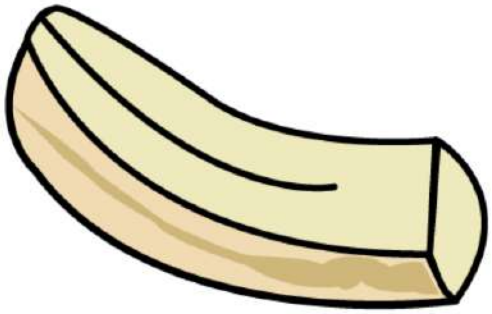
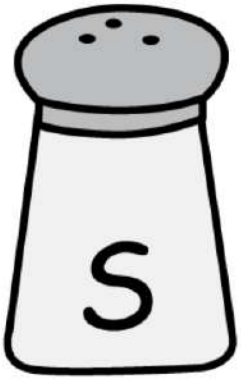
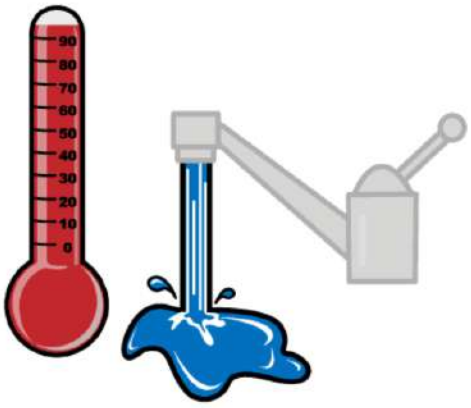
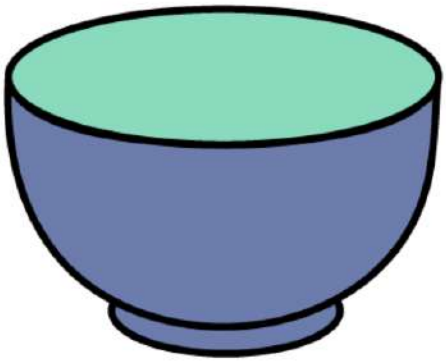
Step 5: Find the Conclusion

Explanation:

- Mashing the banana with salt water and adding dish soap helps to break apart the cell. This allows the DNA to be released. The salt and alcohol help to separate the DNA from other material in the cell and to get the DNA strands to stick to each other. When the strands stick together they form bigger clumps of DNA that you can see without a microscope!

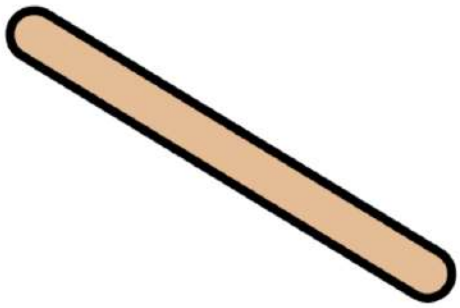


For hands-on instruction, print, cut out and laminate.

rubbing alcohol 	banana 
zip-top bag 	salt 
hot water 	small bowl 

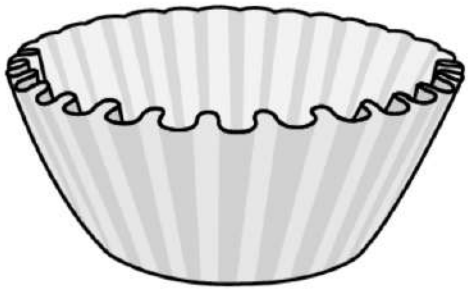
For hands-on instruction, print, cut out and laminate.

craft stick



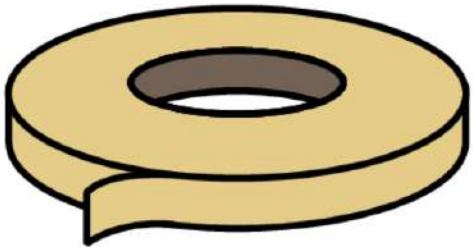
dish soap

coffee filter

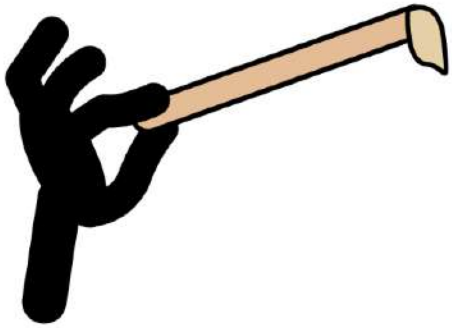


glass cup

masking tape



Banana DNA



small objects	banana