STEMscopes NEW YORK 3D
K-12 SCIENCE

LESSON SAMPLE
Seventh Grade

MIXTURES

LESSON SAMPLE

www.acceleratelearning.com/science/ny

Welcome to STEMscopes Science!

Using the proven 5E learning model, STEMscopes New York 3D allows teachers to seamlessly align their instruction with New York's new required investigations through hands-on activities that meet the New York State P-12 Science Learning Standards.

The Sample Lesson includes activities from the Mixtures scope (or unit) of our 7th Grade science curriculum. These hands-on activities are found within the Explore section of the scope. You'll notice a teacher set-up video, materials list, and facilitation points, as well as the student handouts that coincide with each activity.

To learn more about the STEMscopes New York 3D curriculum, reach out to your STEMscopes Account Manager or request a free 30-day preview at stempreview.com.

Mixtures

Explore 1: Activity - Matter Mix-Up

Everyday Phenomena

Can mixtures be separated?

Setup Video

Description

In this activity, students discover that mixtures are physical combinations of one or more samples of matter and can be separated by physical means.

ESTIMATED

30 min - 45 min

Materials

Printed Material

1 Matter Mix-Up (per student)

Reusable

1 Safety goggles (per student)

4-5 Plastic cups (per group)

2 Plastic bags, sandwich-size (per group)
1 Plate, paper or plastic
4-5 Plastic spoons (per group)
2-3 Magnets (per group)
1 Plastic beaker (per group)
1 Sheet black construction paper, cut into 4 squares (per group)
1 Strainer (per group)
1 Funnel (per group)
1 Tweezers (per group)
1 Pipette (per group)
1 Hand lens (per group)
Iron filings, 1 teaspoon (5 mL) (per group)
Sand, 1 cup (per group)
Magnetic BBs (small magnetic balls) or any other small magnetic objects, 1 teaspoon (5 mL) (per group)
Plastic BBs (small plastic balls) or any other small plastic objects, 1 teaspoon (5 mL) (per group)
Gravel, 1 tablespoon (15 mL) (per group)
1 Hot plate (per class) (optional)
1 Beaker, glass, 200-mL (per class) (optional)

Consumable
1 Toothpick (per student)
1 Coffee filter (per group)
Pepper, 1 teaspoon (5 mL) (per group)
Salt, 1 tablespoon (15 mL) (per group)
Water, 1 quart (1 L) (per group)

Preparation

- Print Matter Mix-Up pages for each student.
- **Part I: Mystery Mixture**
  - Prepare the sand and iron filing bags by adding the sand and iron filings to the sandwich bag. Fill the bag about half full of sand. Make sure the top of the bag is sealed with tape so that the sand and iron filings do not leak from the bag.
  - If you have enough materials, prepare enough bags so each student can have one. If not, prepare one bag per group. A hand lens and magnets will need to be included in addition to the sand and iron filings bag on their trays. If you use one bag, make sure students pass the bag around so each group member will be able to observe the mixture.
- **Part II: What's in There?**
  - Prepare bags by adding sand (about a half full), salt and pepper, small magnetic objects, small plastic objects, and gravel for each group. Add the following tools to their trays (enough for everyone in the group to have if possible): coffee filters, strainers, funnels, tweezers, plastic beakers, black construction paper squares, cups of water, spoons, paper plates, hand lenses, magnets, and pipettes.

Procedure and Facilitation Points

Part I: Mystery Mixture

1. Provide students with the sandwich bags containing the sand and iron filings.
2. Discuss:
   a. Present this part to students by saying that there are two mystery substances in the sandwich bag that need to be identified.
   b. Ask them how they think they can identify the two substances without opening the sandwich bag. Students will come up with several ideas, and many will recall the Hook activity, which required magnetism to separate items.

3. Instruct students to begin the activity.
4. Observe the mixture in the sealed sandwich bag. There is a mystery mixture that must be identified, but you CANNOT open the sandwich bag. Review the word mixture again at this time. It was introduced in the Hook activity.
5. Draw the mixture and list any physical properties you observe in the table.
6. Using the tools at your table, try to separate the mystery mixture. Students should use the hand lens to observe that there is sand in the mixture and use the magnet to observe there is something magnetic in the mixture.
7. How many substances were you able to separate out from the mystery substance? Two
8. In the data table, record what substances you think were found in the mystery mixture and list their physical properties.
9. Discuss the following:
    - Did the physical properties of what you observed change after you separated the mixture? No, the iron and sand still had the same physical characteristics before and after separating. Explain why this was just a physical change.
    - What is the "mystery" substance made of? How do you know? Sand and iron. By separating the mixture, you are able to observe the physical properties without changing the chemical composition.
    - If you had a larger sample of this substance, would it still be a mixture? Would a smaller sample still be a mixture? Yes, the size of the sample does not matter; it will still remain a mixture.

Part II: What's in There?

1. Students will be observing the sand, salt and pepper, magnetic objects, and plastic objects mixture.
2. Instruct them to follow the instructions to complete the activity. Monitor and give suggestions if they get stuck on ways to separate the mixture.
3. Tell students there is a mixture of five solids in the bag. Using the hand lens on their tray, identify, describe, and record the properties of all five solids.
4. Instruct students to empty the mixture onto the paper plate. Using the various tools on their tray, have them separate all five solids into their individual cups or piles.
5. Record the names of the materials and their physical properties in the chart.
6. Record how and what tools you used to separate them.
7. Discuss:
    - Some of you used the strainer to separate parts. If we were to give a name to that action or process, what would it be? Filtration
    - How could you separate the salt from the pepper? You could dissolve it in water and then let it evaporate. Review these terms with the students:
    - Dissolve: to spread out evenly in a liquid
    - Evaporate: change a liquid to a vapor or gas
8. Answer the following question: Did you observe any changes in the physical properties of the substances? Explain. No, the items kept their own properties as they were mixed together.
9. Leave the students with the following question: Are there other ways you can separate mixtures other than magnetism?
10. Have students start a list of possible tests they can do on their own to further explore this topic! They will use the list to help them plan and conduct their own investigation in Explore 3!

Explore

Name: _____ Date: _____

Matter Mix-Up

Directions

Part I: Mystery Mixture

1. Observe the mixture in the sealed sandwich bag. This is a mystery mixture that must be identified, but you CANNOT open the sandwich bag.
2. Draw the mixture and list any physical properties you observe in the table.

Draw your mixture.	List the physical properties you observe.

3. Using the tools on your table, try to separate the mystery mixture.
4. How many substances were you able to separate out from the mystery substance?

5. In the data table, record what substances you think were found in the mystery mixture and list their physical properties.

Substances in the Mystery Mixture	Physical Properties

6. Did the physical properties of what you observed change after you separated the mixture?

7. What is the “mystery” substance made of? How do you know?

8. If you had a larger sample of this substance or a smaller sample, would it still be a mixture?

Explore

Part II: What's in There?

1. There is a mixture of five solids in the bag. Using the hand lens on your tray, identify, describe, and record the properties of all five solids.
2. Empty the mixture onto the paper plate. Using the various tools on your tray, separate all five solids into their individual cups or piles.
3. Record the names of the materials and their physical properties in the chart.
4. Record how and what tools you used to separate them.

Substances	Physical Properties	Tool Used to Separate from Mixture
1.		
2.		
3.		

Did you observe any changes in the physical properties of the substances? Explain.

Mixtures

Explore 2: Scientific Investigation - Where Did It Go?

Everyday Phenomena

What are solutions?

Setup Video

Description

Students conduct an investigation to discover if all solid substances that are mixed with liquids create solutions.

Materials

Printed Materials

1 Where Did It Go? (per student)

1 Where Did it Go? CER (per student)

Reusable

1 Graduated cylinder (per group)

*It is very important to make sure this is sterile.
1 Stirring rod (per group)
*It is very important to make sure this is sterile.
3-4 Hand lenses (per group)

Consumable
Lemon juice, 1 tablespoon (15 mL) (per group)
Pepper, 1 teaspoon (5 mL) (per group)
Powdered drink mix, 1 tablespoon (15 mL) (per group)
Salt, 1 tablespoon (15 mL) (per group)
Water, 1 quart (1 liter) (per group)
5-6 Empty plastic cups (per group)
1 Box of toothpicks (per group)Plastic cups with sample substances (per group)

Preparation

- Organize the materials for each group, including hand lenses, graduated cylinders, extra plastic cups for mixing solutions, and toothpicks, and separate plastic cups for water (over 200 mL), lemon juice (over 20 mL), salt (over 20 mL), powdered drink mix (over 20 mL), pepper (over 20 mL), and sand (over 20 mL).
- Copy one Where Did It Go and one Where Did it Go? CER for each student.

Safety Precautions

- If you choose to include the sense of taste in this experiment, be sure to take the necessary precautions, such as using sterile graduated cylinders for measuring, using sterile stir sticks for stirring, using clean and sterile clear plastic cups for tasting, and having plenty of toothpicks for individual tasting. Ensure that no one in the class is sensitive to any of the materials used (some might be sensitive to the red dye in powdered drink mixes). Do not allow them to taste the sand and the sand and water mixture! Extra precautions may be necessary for students who have breathing issues due to the use of pepper. Be sure to review that wafting is how we observe the smell of something in science.

Procedure and Facilitation Points

1. Discuss with your students:
    - Imagine that you are getting ready to drink a tall glass of sweet iced tea on a hot, summer day. What's in it? Students should be able to come up with water, tea, and sugar
    - Is this a mixture? Yes, it is made of several different substances physically combined.
    - Can you see all of these substances in the tea? No
    - Tea is an example of a type of mixture called a solution. Solutions are liquid mixtures with a uniform composition. This means that it looks the same throughout—you can't see each individual part. Many solutions are solids dissolved in liquids. For something to be considered dissolved, it needs to be spread out evenly in a solution.
2. Present the question that the students will be testing:
    - Are all solid substances that are mixed with liquids considered solutions?
3. Students should state their hypothesis in their student journal. I think that not all solids that are mixed with a liquid are solutions.
4. Students should complete their tests and record results in their student journals.
    - Observe the properties of the substances in the cups on your tray using your senses. Record your observations. Students can taste the substances by using toothpicks and smell the substances by wafting.

- Measure 200 mL of water and 20 mL of lemon juice. Combine and stir in the lemon juice and water in a clear cup. Observe and record any changes. Students can use toothpicks to taste the substances and wafting to smell.
- Determine if the mixture is a solution or not. Remind students that they are looking for a uniform solution.
- Measure 200 mL of water and 20 mL of salt. Combine and stir the salt and water in another clear cup. Observe and record any changes. Determine if the mixture is a solution or not.
- Measure 200 mL of water and 20 mL of Kool-Aid. Combine and stir the Kool-Aid and water in the third clear cup. Observe and record any changes. Determine if the mixture is a solution or not.
- Measure 200 mL of water and 20 mL of pepper. Combine and stir the pepper and water in the fourth clear cup. Observe and record any changes. Determine if the mixture is a solution or not.
- Measure 200 mL of water and 20 mL of sand. Combine and stir the sand and water in the fifth clear cup. Observe and record any changes. Determine if the mixture is a solution or not. Please do not have them taste the sand and sand and water mixture.

5. Give students a chance to share/discuss their data analysis together and as a class.
   The water and lemon juice, salt and water, and Kool-Aid and water mixtures are solutions because you can dissolve them and the solution was uniform throughout. The pepper and water and sand and water are mixtures, not solutions, because you cannot dissolve them in the water and the mixture is not uniform throughout.
6. Give students the Where Did it Go? CER and have them write a scientific explanation that explains whether all solid substances that are mixed with liquids are solutions.
7. Have students write down other things they are wondering about regarding mixtures. They will use these questions to help come up with their own testable question in Explore 3.
   - Have students add to their list of possible tests they can do on their own to further explore this topic. They will use the list to help them plan and conduct their own investigation in Explore 3!

Explore

Name: _____ Date: _____

Where Did It Go?

Question: Are all solid substances that are mixed with liquids considered solutions?

Hypothesis:

Materials:
5- 6 Empty plastic cups (per group)
3-4 Hand lenses (per group)
1 Graduated cylinder (per group)
1 Stirring rod (per group)
Several toothpicks (per group)
Plastic cups with sample substances (per group)

Make sure you use the wafting technique when smelling the substances.
Once you have used your toothpick to taste a substance, throw the toothpick away!

Procedure

1. Observe the properties of the substances in the cups on your tray using your senses. Record your observations.
2. Measure 200 mL of water and 20 mL of lemon juice. Combine and stir the lemon juice and water in a clear cup. Observe and record any changes. Determine if the mixture is a solution or not.
3. Measure 200 mL of water and 20 mL of salt. Combine and stir the salt and water in another clear cup. Observe and record any changes. Determine if the mixture is a solution or not.
4. Measure 200 mL of water and 20 mL of Kool-Aid. Combine and stir the Kool-Aid and water in the third clear cup. Observe and record any changes. Determine if the mixture is a solution or not.
5. Measure 200 mL of water and 20 mL of pepper. Combine and stir the pepper and water in the fourth clear cup. Observe and record any changes. Determine if the mixture is a solution or not.
6. Measure 200 mL of water and 20 mL of sand. Combine and stir the sand and water in the fifth clear cup. Observe and record any changes. Determine if the mixture is a solution or not.

Explore

Data

1. Record the physical properties of each substance. Be sure to include odor and taste.

Substance	Physical Properties
Water	
Lemon Juice	
Salt	
Kool-Aid	
Pepper	
Sand	

2. Record your observations after the substances are mixed together.

Mixture	What properties stayed the same?	What properties changed?	Is it a solution or not? Explain why.
Water and lemon juice			
Water and salt			
Water and Kool-Aid			
Water and pepper			
Water and sand			

Explore

Data Analysis

Write a paragraph summarizing the data you collected. Which substances were solutions, and which were not?

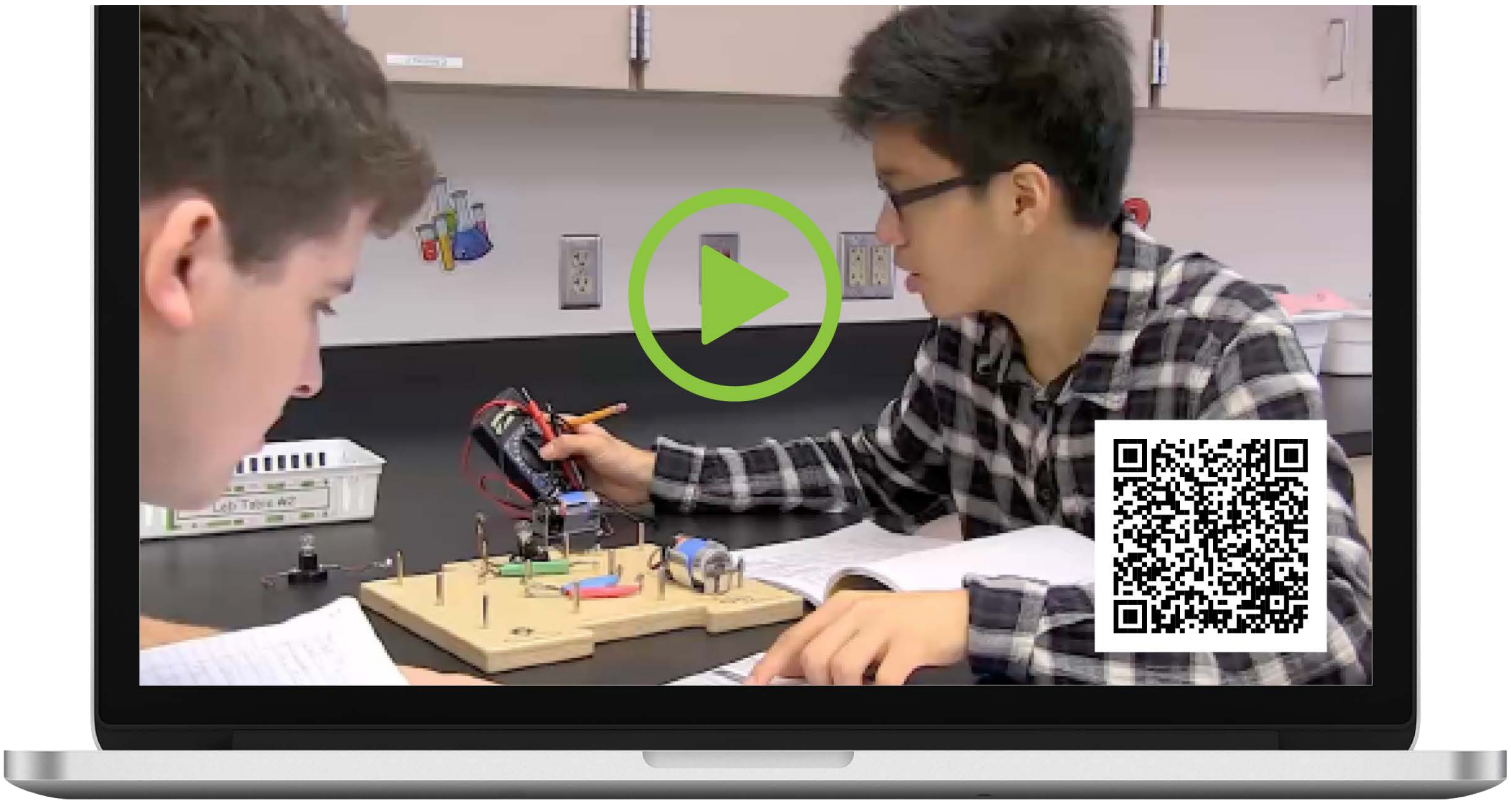
Mixtures

Explore 3: Inquiry Investigation - Investigating Mixtures

Everyday Phenomena

Can I make mixtures?

Setup Video



Description

ESTIMATED

1 hr - 2 hrs

Students plan and conduct an investigation to demonstrate that mixtures are combinations of substances that retain their physical properties.

This inquiry investigation is designed to align to the science and engineering practice associated with this PE:

“Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim.”

An inquiry-based investigation is one that students must build around a concept. This extended exercise promotes genuine thinking.

The purpose of the Inquiry Investigation is to foster students formulating their own question. This activity allows students to further explore a concept in-depth and helps the student organize their thinking in order to carry out an investigation to help answer their question. This investigation targets those questions that pop into our minds when we notice or wonder something. Encourage students to think back to what they have learned to help them form a testable question.

Materials

Print Materials
1 Investigating Mixtures (per student or group)

Procedures and Facilitation Points

Plan it!

1. Using information from previous activities, have students share along with their group question ideas for this investigation. If desired, students can plan and conduct the investigation individually.
2. Have student groups choose one question that they are interested in testing and write it on Investigating Mixtures.
3. Encourage students to choose questions that are easily testable within the classroom environment.
4. Have students identify the independent and dependent variables as well as the control within their investigation.
5. Instruct students to brainstorm how they will run their investigation and identify what materials they will need. Have students choose to:
    - Make an observation (e.g., what do I see, hear, feel, smell, or taste?)
    - Make a model
    - Measure and collect data
    - Design an experiment
6. Have students identify what materials they will need as well as the procedure they will follow.
7. Gather the materials your students will need to complete their investigation.

Test it!

1. In this part of the process, have students either conduct the investigation they planned as a group or as a class, choose one investigation.
2. As students complete their investigation, have them record their data and observations on Investigating Mixtures.
3. Help the students in deciding how they will record their data:
    - Tables
    - Charts
    - Graphs
    - Drawings
    - Journaling
4. Spend time with each group to ensure they are conducting fair tests. Encourage students to think about conducting multiple trials in order to gather enough data to generate a claim that answers their question.

Wrap it up!

1. After completing their investigation, have students analyze their data independently or as a group in order to answer their driving question.
2. Have students record their original question on Investigating Mixtures.
3. Have students generate a claim that answers their original question based on the results of their investigation.
4. Have students complete their CER, where they make a claim based on **evidence** they have gathered before explaining the **reasoning** that connects the evidence to the claim.

5. Encourage students to **rebuttal** when and where appropriate.

Explore

Name: _____ Date: _____

Investigating Mixtures

Plan it!

Question: (Reminder: Make sure you choose a question that is testable!)

Our ideas for answering our question:
Reminder:

- Make an observation (e.g., what do I see, hear, feel, smell, or taste?)
- Make a model
- Take a survey (e.g., ask my family and friends a question)
- Measure and collect data
- Design an experiment

What materials will we need?

What procedure will we follow?

Identification of Variables:

- *Independent Variable:*
- *Dependent Variable:*
- *Controls:*

Explore

Test it!

Data and Observations:

Explore

Wrap it up!

Conclusion and Scientific Explanation

Rewrite your original question:

Write a **claim** that answers your question.
(Write one sentence about the relationships addressed in the guiding question.)

What **evidence** did you gather that supports your claim?
(*Make sure to pull pieces of data you collected to support your claim.)*

What scientific **reasoning** connects the evidence to the claim?
(*Connect the evidence you collected during the investigation to prior scientific knowledge you have of the topic.)*

Can you write a **rebuttal** to anyone else's findings?
(*Provide counterevidence with alternative explanations to someone else's claim.)*