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Assessing with
Learning
Progressions in
Science

FOSS MIXTURES AND SOLUTIONS

Photo source: Microsoft

Instructional Tools |

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**Northwest Educational
Service District 189**

Together We Can

Funding information:

Mathematics & Science Partnership under Title II, Part B

Program Code: 62

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Instructional Tools

In this packet you will find a set of instructional supports for science materials. These documents represent the work-in-progress of teachers in the Assessing with Learning Progressions in Science Project, a Math Science Partnership through the Northwest Educational Service District in Washington State. While we encourage others to use the materials, please know the power of these tools lies in the collaborative discussion and analysis that occurs during their creation. We strongly suggest that anyone utilizing these tools make them your own, adjusting them to fit your teaching context and district priorities. Professional development tools to aid you in this process are available on the ALPS project web page www.nwesd.org/nwalps. For access to editable versions of these documents please contact Nancy Menard nmenard@nwesd.org.

Overview of the Tools (not every unit tool-set will include all of these tools)

Unit Overview

The unit overview grid lays out learning targets or important scientific ideas from Washington State Standards for each investigation in the module and clarifies the success criteria for each learning target. It also details the formative assessments that have been designed to assess each target in the investigation.

Learning Progressions

A learning progression is a graphical representation of the path students take toward mastery of a science “big idea”. The ALPS *Learning Progression* documents include a description of an important big idea from the *Washington State Science Learning Standards* and the progression of building-block learning targets that students master on their way toward an understanding of that big idea. For each building-block learning target the student success criteria is identified and one or more formative assessment tasks to elicit evidence of student understanding are suggested.

Formative Assessment Tasks

The suggested formative assessment tasks are examples of tools used by the teachers in the ALPS project to gather evidence of student understanding. The *Assessment Task Cover Sheet* details each assessment and gives administration tips and suggestions for instructional adjustments based on some of the common student struggles they encountered.

Student Work Samples

Selected student work samples from students in ALPS classrooms give a picture of the range of student responses gathered from sample formative assessments. The *Student Work Sample Cover Sheet* describes the student work samples and the teacher’s interpretation of student understanding.

Mixtures & Solutions Unit Overview

Lesson	Learning Targets & Success Criteria		Assessment
Investigation 1 Parts 1-4	Matter	<ul style="list-style-type: none"> 🎯 Mixtures are combinations of substances whose chemical properties are preserved. ✓ I can...explain the difference between a mixture and solution. 	I Think-We Think
Investigation 1 Parts 1-4	Matter	<ul style="list-style-type: none"> 🎯 The total amount of matter is conserved when it undergoes a physical change ✓ I can...explain that dissolved substances have not disappeared, and cite evidence to determine that the substance is still there 	Annotated Student Drawings
Investigation 2 Parts 1-3 Investigation 3 Parts 1 & 2	Matter	<ul style="list-style-type: none"> 🎯 Substances have characteristic intrinsic properties such as density and solubility, which are independent of the amount of the sample. ✓ I can...use solubility and density to identify unknown substances. 	Saturation Puzzle (Based on OSPI Application template)
Investigation 3 Part 3	Application	<ul style="list-style-type: none"> 🎯 Possible solutions should be tested to see if they solve the problem. ✓ I can...design a procedure to solve a problem 	Mystery Solution (Based on the Application Template from OSPI)

Assessing with Learning Progressions in Science

Math Science Partnership
File Name: MS_overview

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Lesson	Learning Targets & Success Criteria		Assessment
Investigation 4 Parts 1-3	Matter	<p>🎯 Compounds are substances that are chemically formed and have different physical and chemical properties from the reacting substances.</p> <p>✓ I can...identify the evidence that a chemical reaction took place.</p>	Concept Cartoon

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Learning Progression

FOSS Mixtures and Solutions

Learning Target 1:

4-5 APPE

Possible solutions should be tested to see if they solve the problem.

Inv. 1 Part 4

Inv. 2 Part 3

Inv. 3 Part 3

Inv. 4 Part 4

Success Criteria:
I can...design a procedure to solve a problem.

Formative Assessment:

Mystery Solution

Inv. 3 Part 3

Application Template from OSPI

FA4



Learning Target 2:

4-5 APPF

Solutions to problems must be communicated, if the problem is to be solved.

Inv. 1 Part 4

Inv. 2 Part 3

Inv. 3 Part 3

Inv. 4 Part 4

Success Criteria:
I can...distinguish a well written report of observations and conclusions from a poorly written report. I can explain what makes one report better.

Formative Assessment:
Inv.4, Part 2

FOSS Student Sheet #16
"Response Sheet—Fizz Quiz"



Big Idea:

EALR 3 Application
Work on individually collaborating to design and produce a product or procedure to solve a problem.

MIXTURES AND SOLUTIONS

Big Idea: **Application Work** on individually collaborating to design and produce a product or procedure to solve a problem.

Formative Assessment Task Cover Sheet

Learning Target #1, Assessment Task	
Assessment Task Details	Teacher Background
Brief Description of the Assessment Task: Mystery Solution Use the modified OSPI application template.	Administration Tips: Inv. 1 Part 4 Inv. 2 Part 3 Inv. 3 Part 3 Inv. 4 Part 4
Learning Target: Possible solutions should be tested to see if they solve the problem.	
Success Criteria: I can...design a procedure to solve a problem.	
Student Task Sheet Included: yes Student Work Samples Included: yes	

Name _____

Date _____

Mixtures & Solutions Learning Progression #2

Problem: Do these three mystery solutions have different concentrations?

Plan Summary: Write a summary of a plan. Include a scientific reason for the plan or for selecting one of the materials.

Test Solution/Results: Describe what evidence you will collect to solve the problem.

MIXTURES AND SOLUTIONS

Big Idea: **Application**

Work on individually collaborating to design and produce a product or procedure to solve a problem.

Target #1, Assessment: Application Template

Formative Assessment Student Work Cover Sheet

Student Work Description

Sample 1: Student understood what materials to use and the scientific reason for using it.

Sample 2: Student understood what materials to use but lacks the scientific reason for the plan and the materials.

Sample 3: Student has insufficient information leading to an incomplete plan.

Name _____

Date _____

Mixtures & Solutions Learning Progression #2

Sample 1

Problem: Do these three mystery solutions have different concentrations?

Plan Summary: Write a summary of a plan. Include a scientific reason for the plan or for selecting one of the materials.

Materials: 50ml of each solution, 4 cups, gram blocks, syringe, balance.

procedure:

- 1) put 50ml of solution in each cup
- 2) place one of the solution on balance
- 3) use gram blocks on cup to weigh
- 4) repeat steps 2-3 on both cups
- 5) subtract 50g from each solution

We are weighing it because that will find us what ways the most and has the most.

Test Solution/Results: Describe what evidence you will collect to solve the problem.

We will know when the problem is solved when we have weighed everything and know what ways the most

results: Green 7g, Blue 3g, and Red 5g

Green has more salt

Name _____

Date _____

Mixtures & Solutions Learning Progression #2

Sample 2

Problem: Do these three mystery solutions have different concentrations?

Plan Summary: Write a summary of a plan. Include a scientific reason for the plan or for selecting one of the materials.

materials: 3 beakers 50 ml of water 50 ml of solution
scale weights

Plan:

- 1) get materials
- 2) put one solution on scale
- 3) weigh
- 4) subtract 50 ml of water
- 5) do the same to the other solutions

Test Solution/Results: Describe what evidence you will collect to solve the problem.

We will have 3 fractions and we will know what the 3 concentrations is.

results

red: 5 over 50

blue: 7 over 50

green: 9 over 50

green is the most concentrated

ms. application SWZ

Name _____

Date _____

Mixtures & Solutions Learning Progression #2

Sample 3

Problem: Do these three mystery solutions have different concentrations?

Plan Summary: Write a summary of a plan. Include a scientific reason for the plan or for selecting one of the materials.

The colors are blue, green, and red and I saw that the blue was more concentrated so we are observing the all of the chemicals now we are going to use a syringe and a scale. We are going to use a cup, syringe, scale, mystery chemical

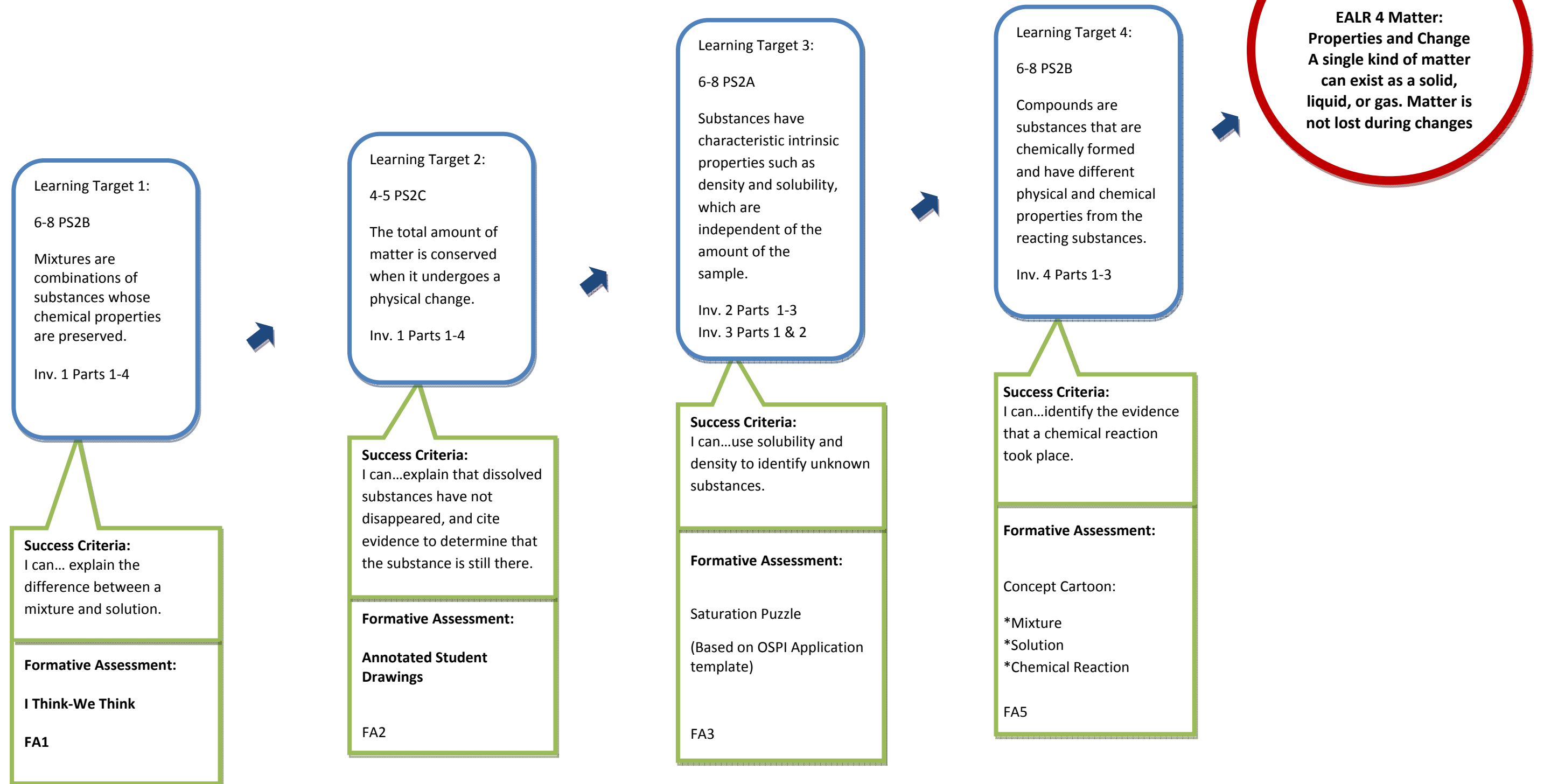
ms-application 1 SW3

Test Solution/Results: Describe what evidence you will collect to solve the problem.

the red dye water was 4 grams, the green dye was 6 grams, the blue dye was 0 grams

Learning Progression

FOSS Mixtures and Solutions Investigations 1-4



MIXTURES AND SOLUTIONS

Big Idea: A single kind of matter can exist as a solid, liquid, or gas. Matter is not lost during changes of state.

Formative Assessment Task Cover Sheet

Learning Target #1, Assessment Task	
Assessment Task Details	Teacher Background
<p>Brief Description of the Assessment Task: I Think-We Think template</p>	<p>Administration Tips: Investigation 1 Part 1 Students complete the I Think column independently, then discuss in small groups and complete the We Think column. Finally, the sheet is discussed as a whole class. There is a lot of gray area and the goal is that students need to be able to defend their answer, based on the definition of mixtures and solutions. Keep bringing them back to the definitions.</p>
<p>Learning Target: Mixtures are combinations of substances whose chemical properties are preserved</p>	
<p>Success Criteria: I can... explain the difference between a mixture and solution.</p>	
<p>Student Task Sheet Included: yes Student Work Samples Included: no</p>	

Learning Target #2, Assessment Task	
Assessment Task Details	Teacher Background
<p>Brief Description of the Assessment Task: Annotated Student Drawings Students are asked to draw the steps of a salt water solution transforming from a solution into crystals.</p>	<p>Administration Tips: Investigation 1 Part 1-4 Before the kids begin call the kids attention to the directions that state the salt and water must be labeled in each picture</p> <p>Suggestions for Instructional Adjustments: Do a class lesson using the modified OSPI application template for Investigation1 Part 4, Separating a Dry Mixture. See learning target 3.</p>
<p>Learning Target: The total amount of matter is conserved when it undergoes a physical change</p>	
<p>Success Criteria: I can...explain that dissolved substances have not disappeared, and cite evidence to determine that the substance is still there</p>	
<p>Student Task Sheet Included: yes Student Work Samples Included: yes</p>	

MIXTURES AND SOLUTIONS

Big Idea: A single kind of matter can exist as a solid, liquid, or gas. Matter is not lost during changes of state.

Learning Target #3, Assessment Task	
Assessment Task Details	Teacher Background
Brief Description of the Assessment Task: Saturation Puzzle Use the modified OSPI application template.	Administration Tips: Investigation 2 Parts 1-3 and Investigation 3 Parts 1-2
Learning Target : Substances have characteristic intrinsic properties such as density and solubility, which are independent of the amount of the sample	
Success Criteria: I can...use solubility and density to identify unknown substances.	
Student Task Sheet Included: yes Student Work Samples Included: no	

Learning Target #4, Assessment Task	
Assessment Task Details	Teacher Background
Brief Description of the Assessment Task: Concept Cartoon: Students will identify which zipbag shows a chemical reaction.	Administration Tips: Investigation 4 Parts 1-3
Learning Target: Compounds are substances that are chemically formed and have different physical and chemical properties from the reacting substances.	
Success Criteria: I can...identify the evidence that a chemical reaction took place.	
Student Task Sheet Included: yes Student Work Samples Included: no	

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Mixtures & Solutions

Learning Progression #1

Classify the following substances as “**mixtures**” or “**solutions**”. Complete your classification in the “I THINK” column. Share your classifications with a partner and note any changes in the “WE THINK” column.

	I THINK	WE THINK
Tap water		
Salsa		
Chocolate chip cookie		
Gasoline		
Soapy water		
Orange juice		
Soda pop		
Air		
Glass		
Iced tea		

Name _____

Date _____

Mixtures & Solutions Learning Progression #1

ANNOTATED STUDENT DRAWINGS

Draw a picture to represent the various stages of creating and evaporating a salt solution.

In each picture you **MUST** label the salt and water.

<p>Before Making the Solution</p>	<p>Solution</p>
<p>During Evaporation</p>	<p>After Evaporation</p>

MIXTURES AND SOLUTIONS

Big Idea: A single kind of matter can exist as a solid, liquid, or gas. Matter is not lost during changes of state.

Target #2, Assessment: Annotated Student Drawing

Formative Assessment Student Work Cover Sheet

Student Work Description

Sample 1: Student understood the various stages of creating and evaporating salt solution.

Sample 2: Student understood the various stages of creating and evaporating a salt solution. However, in the saltwater solution the salt was still visible which can be a sign of a misunderstanding about the salt needed to be completely dissolved for it to be a solution.

Sample 3: Student understood the various stages of creating and evaporating a salt solution.

Name _____

Date _____

Mixtures & Solutions

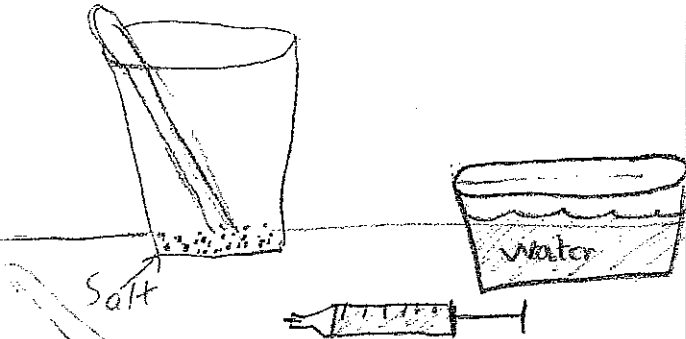
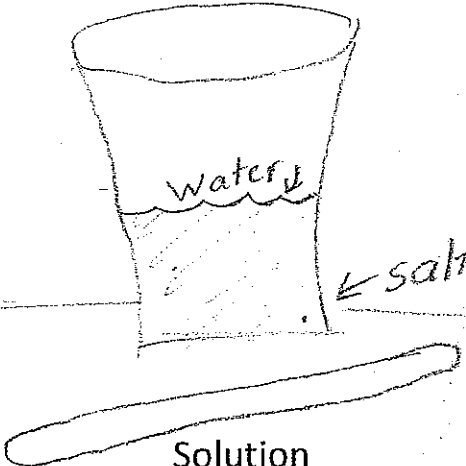
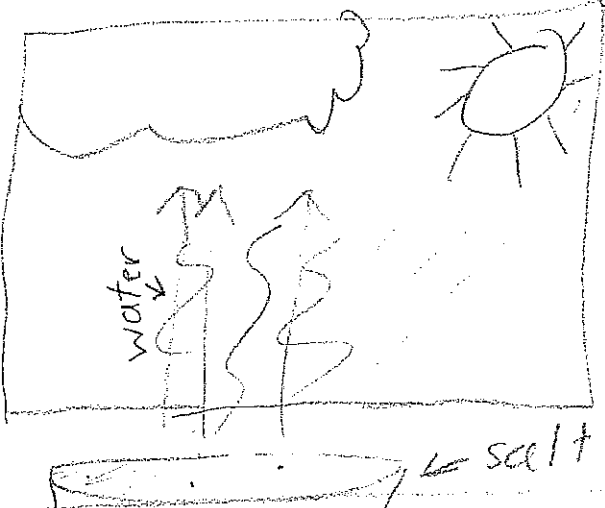
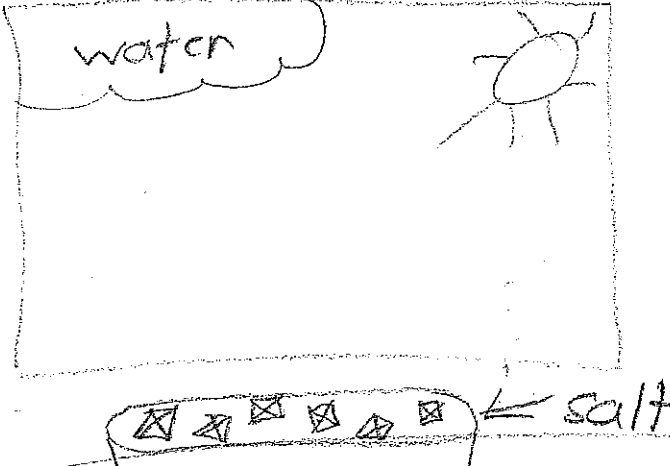
Learning Progression #1

Sample 1

ANNOTATED STUDENT DRAWINGS

Draw a picture to represent the various stages of creating and evaporating a salt solution.

In each picture you **MUST** label the salt and water.

 <p>Labels: Salt, water</p> <p>Before Making the Solution</p>	 <p>Labels: water, salt</p> <p>Solution</p>
 <p>Labels: water, salt</p> <p>During Evaporation</p>	 <p>Labels: water, salt</p> <p>After Evaporation</p>

Name _____

Date _____

Mixtures & Solutions


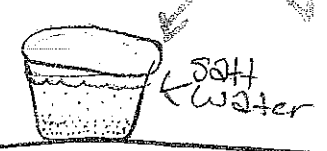
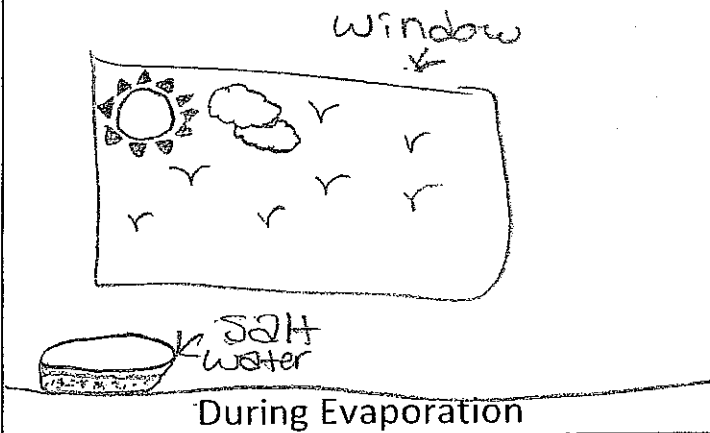
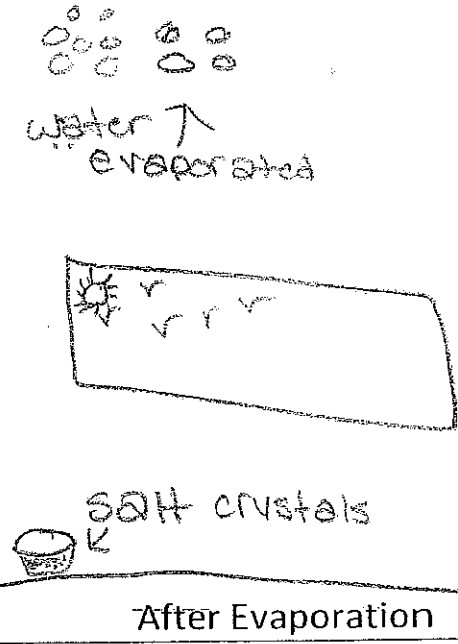
Learning Progression #1

Sample 2

ANNOTATED STUDENT DRAWINGS

Draw a picture to represent the various stages of creating and evaporating a salt solution.

In each picture you **MUST** label the salt and water.

 <p>water →</p> <p>salt</p>	 <p>salt water</p> <p>salt visible?</p>
<p>Before Making the Solution</p>	<p>Solution</p>
 <p>Window</p> <p>salt water</p>	 <p>water ↑ evaporated</p> <p>salt crystals</p>
<p>During Evaporation</p>	<p>After Evaporation</p>

Name _____

Date _____

Mixtures & Solutions

Learning Progression #1

Sample 3

ANNOTATED STUDENT DRAWINGS

Draw a picture to represent the various stages of creating and evaporating a ~~sugar~~ ^{salt} solution.

Each picture **MUST** include: ~~*Glass jar~~ ~~*Water~~ ~~*Sugar~~
* Dish * Water * Salt

Before Making the Solution

Mixing dish
stick

Salt

Water

cup

Solution

Solution

Mixing stick

Pour water in with salt and stir.

During Evaporation

Let sit for multiple days and let water evaporate.

Sun

Water Evaporating

Solution

After Evaporation

When water is done evaporating you should have salt crystals.

Cool!

Hand lens

Salt Crystals

Dish

Name _____

Date _____

Mixtures & Solutions Learning Progression #1

Problem: This chemical was in the kit with the salt and citric acid, but there was no label on the container. It might be some salt or some citric acid, or it might be something else. I'd like to figure out what kind of chemical it is. What should we do?

Plan Summary: Write a summary of a plan. Include a scientific reason for the plan or for selecting one of the materials.

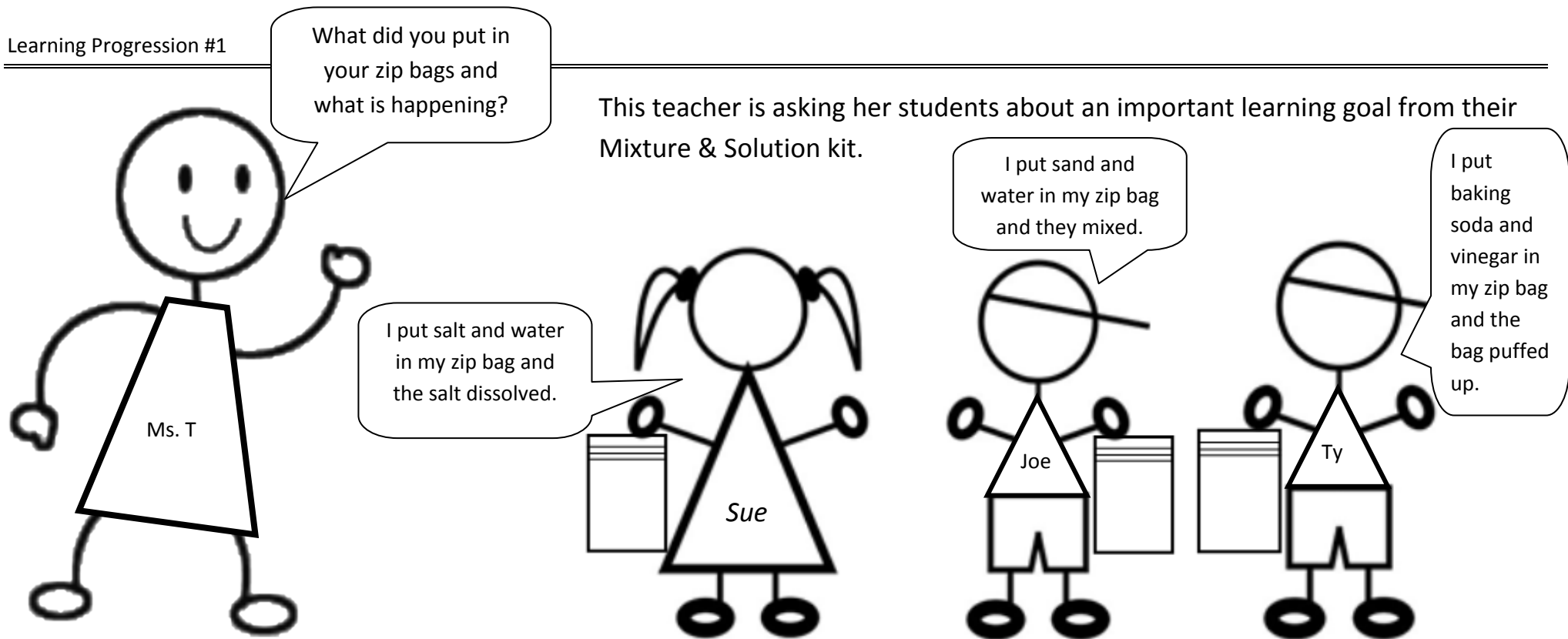
Test Solution/Results: Describe what evidence you will collect or observe to identify the mystery chemical.

Name _____

Date _____

Mixtures & Solutions

Learning Progression #1



Which student's zip bag shows a chemical reaction? How do you know?

MIXTURES AND SOLUTIONS

Additional Information

- Puppy training pads (available at most pet stores and large department stores) are helpful for protecting tables and preventing unwanted spills onto the floor. They are more effective than newspaper. These can be used year after year until soiled.
- Be aware that different brands of clear cups have different weights, this causes false results.
- A suggestion could be using postal scales instead of the unreliable balance scales.

Mixtures and Solutions

Bibliography

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Popham, W. James. *Transformative Assessment*. Alexandria, VA: Association for Supervision and Curriculum Development, 2008. Print.