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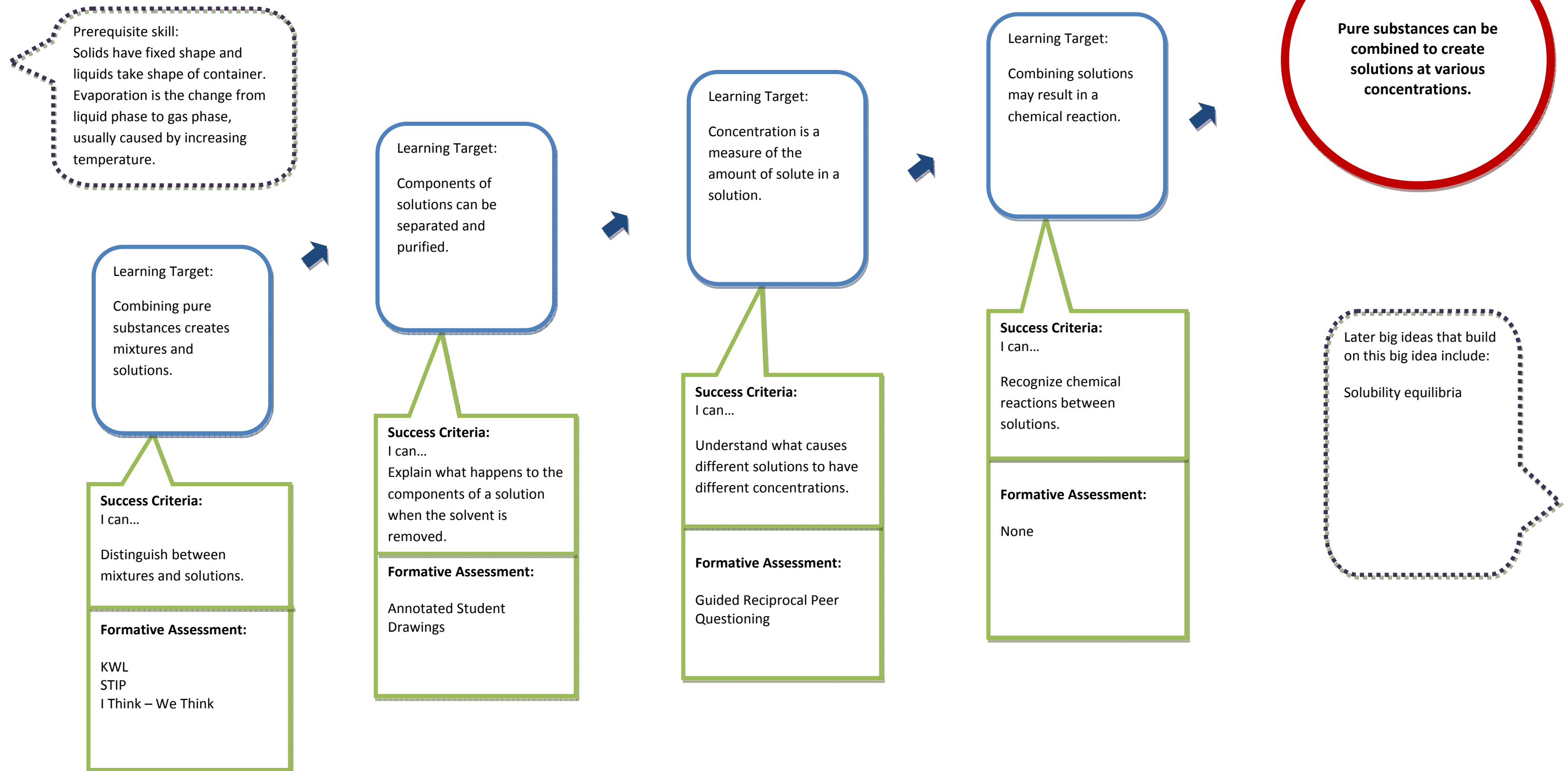
Assessing with
Learning
Progressions in
Science

FOSS MIXTURES AND SOLUTIONS

Content Professional Development Tools | Contributor: Roxi Hulet

Learning Progression

Mixtures & Solutions



Part 1

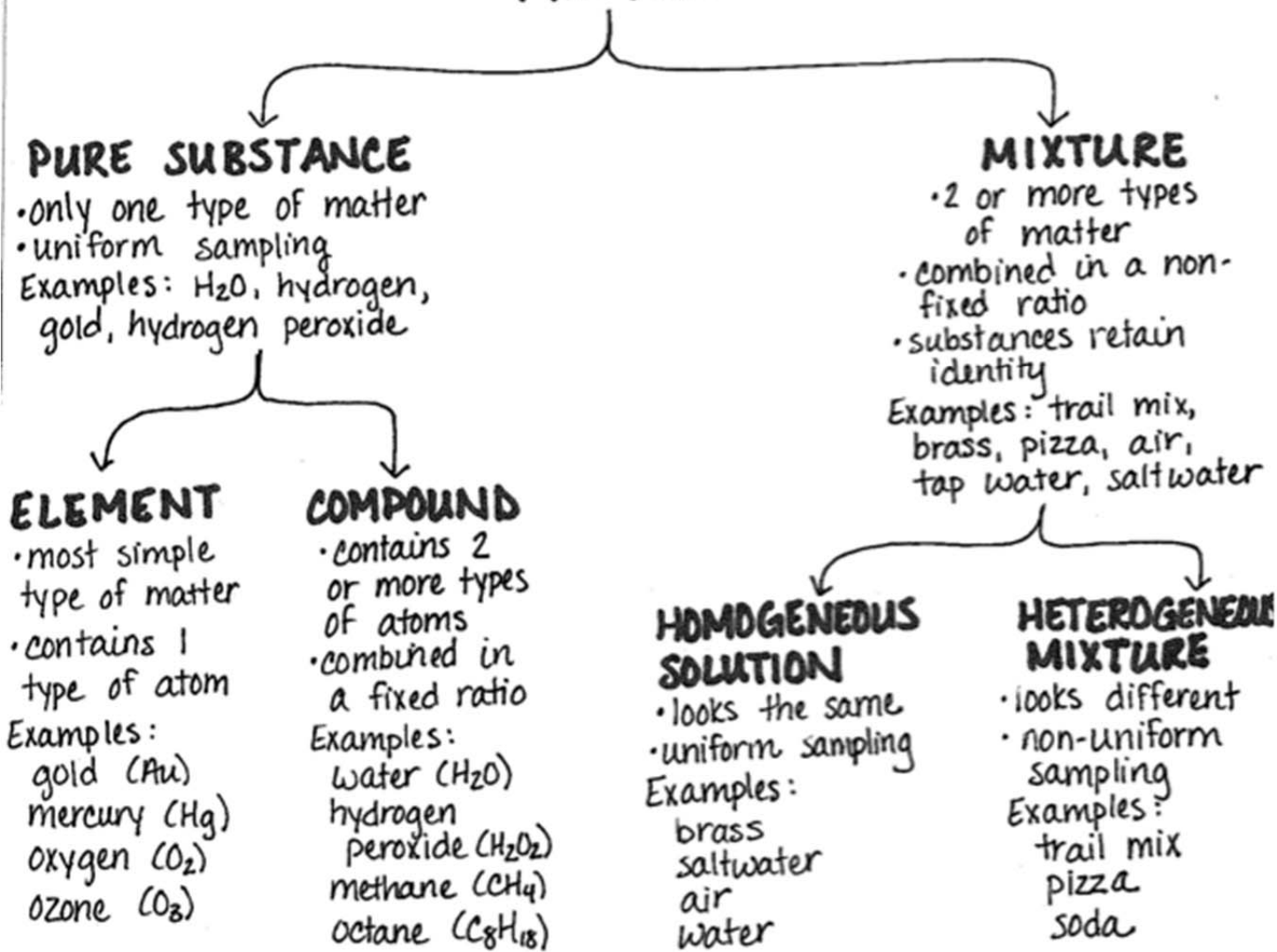
“Combining pure substances creates mixtures and solutions.”

1. Give Formative Assessment: Modified KWL (only using the “K” and “W” components)
2. Give Formative Assessment: Scientific Terminology Inventory Probe
3. Give lecture on classification of matter. Provide visual examples of elements (copper metal), compounds (sugar), homogeneous solutions (salt water), and heterogeneous mixtures (trail mix).
4. Give Formative Assessment: I Think – We Think

Classification of Matter

Matter is anything that has mass & occupies space.

MATTER



Part 2

“Components of solutions can be separated and purified.”

1. Give Formative Assessment: Annotated Student Drawings
2. Have students design an experiment to prove that salt (solute) does not evaporate with water (solvent) when a saltwater solution is boiled and evaporated to dryness.
 - a. Students should pre-weigh a beaker with salt, add water, heat the saltwater until the water evaporates, and then re-weigh the beaker and residue. Use deionized water for more accurate results.

Part 3

“Concentration is a measure of the amount of solute in a solution.”

1. Give lecture on solutions.
2. Play with conductivity apparatus to explore electrolytes and non-electrolytes. Test solutions with different concentrations of electrolytes (for example, dilute and concentrated salt solutions) to see the difference in conductivity between the two solutions.
3. Give lecture on solutions part 2.
4. Give Formative Assessment: Guided Reciprocal Peer Questioning

Solutions

Solution: homogeneous mixture

Aqueous solution: solution in which H_2O is the solvent

Solvent: component of a solution present in the greatest quantity

Solutes: other components of a solution; can be electrolytes or non-electrolytes

Electrolytes: solutes that create an aqueous solution that conducts electricity

Non-electrolytes: solutes that create an aqueous solution that does not conduct electricity

Solutions (Part 2)

There are 6 types of solutions:

COMPONENTS	LOOKS LIKE...	EXAMPLE
Solid + Liquid	Liquid	Lemonade
Liquid + Liquid	Liquid	Alcohol
Gas + Liquid	Liquid	Soda
Gas + Gas	Gas	Air
Solid + Solid	Solid	Brass
Gas + Solid	Solid	Pop Rocks Candy

Saturated Solution: maximum amount of solute dissolved in solvent

Unsaturated Solution: less than maximum solute per solvent

Supersaturated Solution: more than maximum solute per solvent

Crystallization / Precipitation: when a solute solidifies & separates from solution

Crystallization: slow separation, results in a crystal

Precipitation: rapid separation, results in a fine powder

Part 4

“Combining solutions may result in a chemical reaction.”

1. Give lecture on precipitation reactions. Demonstrate some of the reactions during the lecture.
2. Provide students with various solutions and allow them to mix and observe precipitation reactions. Use solubility rules to explain why precipitates do or do not form.

What I want to know about mixtures and solutions:

What I already know about mixtures and solutions:

Scientific Terminology Inventory Probe

<p style="text-align: center;">Evaporation</p> <p><input type="checkbox"/> I have never heard of this.</p> <p><input type="checkbox"/> I have heard of this but I'm not sure what it means.</p> <p><input type="checkbox"/> I have some idea what this means.</p> <p><input type="checkbox"/> I clearly know what it means and can describe it.</p>	<p style="text-align: center;">Mixture</p> <p><input type="checkbox"/> I have never heard of this.</p> <p><input type="checkbox"/> I have heard of this but I'm not sure what it means.</p> <p><input type="checkbox"/> I have some idea what this means.</p> <p><input type="checkbox"/> I clearly know what it means and can describe it.</p>	<p style="text-align: center;">Solution</p> <p><input type="checkbox"/> I have never heard of this.</p> <p><input type="checkbox"/> I have heard of this but I'm not sure what it means.</p> <p><input type="checkbox"/> I have some idea what this means.</p> <p><input type="checkbox"/> I clearly know what it means and can describe it.</p>
<p style="text-align: center;">Solvent</p> <p><input type="checkbox"/> I have never heard of this.</p> <p><input type="checkbox"/> I have heard of this but I'm not sure what it means.</p> <p><input type="checkbox"/> I have some idea what this means.</p> <p><input type="checkbox"/> I clearly know what it means and can describe it.</p>	<p style="text-align: center;">Solute</p> <p><input type="checkbox"/> I have never heard of this.</p> <p><input type="checkbox"/> I have heard of this but I'm not sure what it means.</p> <p><input type="checkbox"/> I have some idea what this means.</p> <p><input type="checkbox"/> I clearly know what it means and can describe it.</p>	<p style="text-align: center;">Concentration</p> <p><input type="checkbox"/> I have never heard of this.</p> <p><input type="checkbox"/> I have heard of this but I'm not sure what it means.</p> <p><input type="checkbox"/> I have some idea what this means.</p> <p><input type="checkbox"/> I clearly know what it means and can describe it.</p>
<p style="text-align: center;">Reaction</p> <p><input type="checkbox"/> I have never heard of this.</p> <p><input type="checkbox"/> I have heard of this but I'm not sure what it means.</p> <p><input type="checkbox"/> I have some idea what this means.</p> <p><input type="checkbox"/> I clearly know what it means and can describe it.</p>	<p style="text-align: center;">Precipitation</p> <p><input type="checkbox"/> I have never heard of this.</p> <p><input type="checkbox"/> I have heard of this but I'm not sure what it means.</p> <p><input type="checkbox"/> I have some idea what this means.</p> <p><input type="checkbox"/> I clearly know what it means and can describe it.</p>	<p style="text-align: center;">Solubility</p> <p><input type="checkbox"/> I have never heard of this.</p> <p><input type="checkbox"/> I have heard of this but I'm not sure what it means.</p> <p><input type="checkbox"/> I have some idea what this means.</p> <p><input type="checkbox"/> I clearly know what it means and can describe it.</p>
<p style="text-align: center;">Saturation</p> <p><input type="checkbox"/> I have never heard of this.</p> <p><input type="checkbox"/> I have heard of this but I'm not sure what it means.</p> <p><input type="checkbox"/> I have some idea what this means.</p> <p><input type="checkbox"/> I clearly know what it means and can describe it.</p>	<p style="text-align: center;">Supersaturation</p> <p><input type="checkbox"/> I have never heard of this.</p> <p><input type="checkbox"/> I have heard of this but I'm not sure what it means.</p> <p><input type="checkbox"/> I have some idea what this means.</p> <p><input type="checkbox"/> I clearly know what it means and can describe it.</p>	<p style="text-align: center;">Dilution</p> <p><input type="checkbox"/> I have never heard of this.</p> <p><input type="checkbox"/> I have heard of this but I'm not sure what it means.</p> <p><input type="checkbox"/> I have some idea what this means.</p> <p><input type="checkbox"/> I clearly know what it means and can describe it.</p>

I THINK – WE THINK

Classify the following substances as heterogeneous mixtures (“mixtures”) or homogeneous mixtures (“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		

ANNOTATED STUDENT DRAWINGS

Draw a picture to represent the various stages of creating and evaporating a sugar solution. Each picture MUST include:

- Glass jar
- Water
- Sugar

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

Guided Reciprocal Peer Questioning

You have just learned about mixtures and solutions, their components (solutes and solvents), and their concentrations. Write down three questions to ask your peers that will help you improve your understanding of mixtures and solutions. Use the question stems on the list below to help you create your questions.

- What causes _____?
- How do we know that _____?
- Why does _____ happen when _____?
- What is the evidence that supports _____?
- What if _____?
- What conclusions can I draw about _____?
- How does _____ affect _____?
- What is the difference between _____ and _____?
- How are _____ and _____ similar?
- How can I use _____ to _____?
- How do scientists _____?
- What is an example of _____ that explains _____?
- Why is it important to know _____?
- How do _____ contribute to _____?
- How can I design an investigation to _____?
- What is another way to explain _____ besides _____?
- What would happen if _____?
- What are the implications of _____?
- Why is it important to know _____?
- How does _____ relate to everyday life?
- What kind of data would support _____?
- How does _____ help us understand _____?

Question 1:

Question 2:

Question 3: