UNBC UNIVERSITY OF NORTHERN BRITISH COLUMBIA

UNIT PLAN – MIXTURES

Unit Topic & Guiding Questions:

Science Grade 5 (Chemistry) - Solutions are homogeneous mixtures.

- How are solutions homogeneous?
- What are their uses?

Science Grade 6 (Chemistry) - Everyday materials are often mixtures.

- What is a heterogeneous mixture? How are heterogeneous mixtures different from homogeneous mixtures (i.e. solutions)?
- How can mixtures be separated?

Rationale:

In this unit, students will learn about, and receive explicit instruction on, mixtures—both homogeneous mixtures (i.e. solutions) and heterogeneous mixtures. Mixtures are important because they are highly relevant to our lives; they are everywhere and we encounter and interact with them every single day. Throughout the unit, students will have the opportunity to hone several scientific skills, including questioning and predicting, planning and conducting, processing and analyzing data and information, evaluating, applying and innovating, and communicating.

Student learning and class discussions will focus on:

(1) ***solutions and solubility*** (i.e., solutions can be separated through distillation, evaporation, and crystallization; solubility of solids, liquids, and gases; properties of solutions; dissolving [i.e., the process of forming a solution]); and

(2) ***heterogeneous mixtures*** (i.e. suspensions and colloids) and how they can be separated using a difference in component properties.

STAGE 1: Desired Results

UNDERSTAND

Big Ideas →	Essential Questions
Solutions are homogeneous mixtures. Everyday materials are often mixtures.	• How are solutions homogeneous? • What are their uses? • What is a heterogeneous mixture? • How are heterogeneous mixtures different from homogeneous mixtures (i.e. solutions)? • How can mixtures be separated?

DO

Core Competencies:

Communication

☐ Communicating

I can communicate purposefully, using forms and strategies I have practiced. I can share my ideas and try to connect them with others' ideas.

Students will be active listeners, make connections, and ask clarifying and extending questions when appropriate. Students will share their ideas and try to connect them to others' ideas. Students will show their understanding of scientific ideas and concepts orally, in graphs, and in writing.

☐ Collaborating

I can contribute during group activities with peers and share roles and responsibilities to achieve goals.

Students will contribute and express their ideas and help others feel comfortable to share theirs so that all voices are included. Students will collaborate with others to achieve common goals and further their understanding of mixtures.

Thinking

☐ Critical and Reflective Thinking

I can use evidence to make simple judgments. I can ask questions and consider options. I can use my observations, experience, and imagination to draw conclusions and make judgements.

Students will make predictions, ask questions, use their senses to gather information, and make judgments based on the evidence they receive in lessons, discussions, and activities. Students will engage in scientific inquiry, identifying and investigating mixtures and how they can be separated. Students will explore with purpose. Students will plan and conduct scientific investigations, process and analyze data and information, evaluate, and apply and innovate their ideas.

Students will apply critical, metacognitive, and reflective thinking, and will relate this thinking to other experiences, using this process to identify ways to improve or adapt their approach to learning.

Students will reflect on their learning of mixtures, and assess their experiences, thinking, learning process, work, and progress.

Personal & Social

☐ Social Awareness and Responsibility

I can interact with others and the environment respectfully and thoughtfully.

Students will contribute to group activities and endeavor to make the classroom a positive space to learn.

Students will identify different perspectives, clarify problems, consider alternatives, and evaluate strategies.

Students will demonstrate respectful and inclusive behaviour with people they know.

Learning Standards – Curricular Competencies:

During this unit, students will engage in scientific inquiry and experimentation, participate in large and small group discussions and activities, as well perform independent work. Students will hone the following curricular competencies:

1. **Questioning and predicting**
   - Demonstrate a sustained curiosity about a scientific topic or problem of personal interest
   - Make observations in familiar and unfamiliar contexts
   - Make predictions about the findings of their inquiry

2. **Planning and conducting**
   - With support, plan appropriate investigations to answer their questions or solve problems they have identified
   - Decide which variable should be changed and measured for a fair test
   - Choose appropriate data to collect to answer their questions
   - Observe, measure, and record data using appropriate tools
   - Use equipment and materials safely, identifying potential risks

		3. Processing and analyzing data and information ● Experience and interpret the local environment ● Identify First Peoples perspectives and knowledge as sources of information ● Compare data with predictions and develop explanations for results ● Demonstrate an openness to new ideas and consideration of alternatives **4. Evaluating** ● Demonstrate an understanding and appreciation of evidence **5. Applying and innovating** ● Transfer and apply learning to new situations **6. Communicating** ● Communicate ideas, explanations, and processes in a variety of ways ● Express and reflect on personal, shared, and others' experiences of place
	KNOW	**Learning Standards - Content:** Before starting this unit, students will know about matter and phases of matter (i.e., liquids, solids, and gases). After this unit, students are expected to know: ● Solutions and solubility ○ Solutions (e.g., apple juice, coffee) that can be separated through distillation, evaporation, and crystallization ○ Solubility of solids, liquids, & gases (e.g., salt [solid], honey [liquid], carbon dioxide [gas in water makes pop]) ○ Properties of solutions: concentration, pH, etc. ○ Dissolving: process of forming a solution ● Heterogeneous Mixtures ○ Suspensions (e.g., salad dressing) ○ Emulsions (e.g., milk) ○ Colloids (e.g., aerosols) ● Mixtures ○ Separated using a difference in component properties ■ Density (e.g., centrifuge or settling, silt deposits in a river delta, tailings ponds) ■ Particle size (e.g., sieves, filters) ○ Local First Peoples knowledge of separation and extraction methods ■ Historical and current (e.g., eulachon oil, extraction of medicines from plants, pigments, etc.)

	First Peoples Principles of Learning	☐ *Learning ultimately supports the well-being of the self, the family, the community, the land, the spirits, and the ancestors.* ☐ *Learning is holistic, reflexive, reflective, experiential, and relational (focused on connectedness, on reciprocal relationships, and a sense of place).* ☐ *Learning involves recognizing the consequences of one's actions.* ☐ *Learning involves generational roles and responsibilities.* ☐ *Learning recognizes the role of indigenous knowledge.* ☐ *Learning is embedded in memory, history, and story.* ☐ *Learning involves patience and time.* ☐ *Learning requires exploration of one's identity.* ☐ *Learning involves recognizing that some knowledge is sacred and only shared with permission and/or in certain situations.*	**Addressing the FPPL:** During lessons, students are encouraged to be patient and kind to themselves and each other as they learn new concepts. Lessons will be delivered via open, non-judgmental group discussions, built upon positive teacher/student and student/student relationships and connections. Ideas and concepts will be learned experientially, through a mixture of explicit instruction, modeling, scaffolded support, practice, and student-doing. Learning will include local First Peoples knowledge of separation and extraction methods (i.e., eulachon oil, extraction of medicines from plants, pigments).

STAGE 2: Assessment Plan

	Formative Assessment (Assessment as Learning and Assessment for Learning):
	During the formative learning stage in this unit, students will demonstrate their learning and understanding of mixtures several ways: 1. By engaging with, and participating in, classroom discussions, explanatory videos, a slideshow, and a fill-in-the blank activity. 2. By working collaboratively to conduct and complete scientific experiments and investigations. 3. By completing written tasks independently and/or in a small group. Throughout the unit, students will have ample opportunity to practice, gain formative feedback, and receive extra support as they work toward mastery of mixtures.
	Summative Assessment (Assessment of Learning):
	At the end of the unit, students will complete a quiz intended to assess their individual understanding of mixtures. This quiz will serve as the final evidence of learning in the unit and will be utilized for summative assessment purposes. The teacher will mark the quiz and provide feedback to students on where they are in their learning. Instruction can then be adjusted, with the teacher reviewing and/or re-teaching when necessary, to whomever necessary. Students are expected to complete their quiz corrections prior to moving on.

Stage 3: Learning Plan

Lesson/ Date	Learning Intentions	Instructional Activities (brief description here – lesson plans will be used to flesh out each lesson)

Lesson 1
 	
March 13
	Introduction to Mixtures
	
	• What are Mixtures?
	• Types of Mixtures
	  ○ Heterogeneous Mixtures
	  ○ Homogeneous Mixtures
	  ▪ i.e. Solutions
		First, hand each table group a "Mixtures" mind map (template in "Mixtures Full Unit - BC Grade 6 Science" resource) and tell students that they have 3-5 minutes to write down anything they know about mixtures.
		
		Second, watch the following video, "mixtures" by Rebecca Paver, at https://www.youtube.com/watch?v=7dLeJvJyIuU
		
		Third, ask students to return to their mind map and add anything new they learned from the video in a different colour. Explain that, as the unit progresses, they will return to their mind to add in any new understandings or details. Each time they return to the mind map, they will add information in a new colour to see how their understanding has grown from each new experience. Ask students to keep their mind map somewhere safe where they won't lose it.
		
		Fourth, ask students to take out a piece of lined paper and draw a line down the middle of the page. On one side of the page, they should write "Homogeneous Mixtures"; on the other side "Heterogenous Mixtures" (teacher can model on board). Explain to students that they will be watching a video and that they should take notes on the differences between the two mixtures. Play the following video, "What are Mixtures?" by Cookies and Chemists, at https://www.youtube.com/watch?v=7n3q3eHzkrU. After the video, ask for student volunteers to share what they wrote. Then, they can add anything new to their mind maps in a diff. colour.
		
		Fifth, hand out the "Identifying Homogeneous and Heterogeneous Mixtures in the Classroom" activity and have students complete it in groups of 2-3. Tell them they have 5 minutes to write down as many mixtures as they can before returning to their seats (set visual timer).
		
		Finally, as a class, discuss and perform the "Try This! – Make Mixtures" experiment on page 65 of the Nelson Science 6 – Biology and Chemistry textbook. Students to take note of their observations and use their results to explain how they can tell heterogeneous mixtures from homogeneous mixtures.

Lesson 2 March 14	Types of Mixtures/Identifying Mixtures • Mechanical Mixtures • Suspensions • Solutions • Colloids	First, hand out the "Types of Mixtures" handout ("Mixtures Full Unit - BC Grade 6 Science") and display it on the Smartboard. Review together, students follow along (welcome volunteers to read, recap as needed). Second (OPTIONAL), bring up the Google Slide show, "Intro to Mixtures": https://docs.google.com/presentation/d/1_m1_6dSup3wwYW14rdtYYArr5sd-JcIPv8IyxIROKgI/edit#slide=id.p and hand each student a copy of the "Mixtures" fill-in-the-blank activity ("Mixtures Full Unit - BC Grade 6 Science"). Students to follow and fill in. Third, perform the "Try This! – Use Light to Identify Heterogeneous Mixtures" experiment on page 67 of the Nelson Science 6 textbook; here, we will mix substances with water, predict which mixtures will be heterogenous, make a table to record predictions and observations, shine light through the mixture, and compare our observations to our predications. Fourth, perform the "Try This! - Identifying Suspensions" experiment on page 71, and the "Try This! – Mix Oil and Water" experiment on page 72-73 of the Nelson Science 6 textbook. Fifth, we will make Jell-O and discuss how it is a gel, which is a colloid of a liquid in a solid. Students will have the chance to eat the Jell-O later, once it has had time to set in the fridge ☺
Lesson 3 March 15	Classifying Mixtures • Qualitative Properties • Observation	First, bring up and go over the "Classifying Mixtures" scientific investigation on the Smartboard (from "Mixtures Full Unit - BC Grade 6 Science"). Ensure students understand the task and go over expectations. Students to work in groups of 2-3 to complete the activity. Second, hand out copies of the investigation and allow time for completion; teacher to circulate and support. Third, as groups finish, give them an early finishers activity: • "Sort it Out" activity; • "Mixtures and Solutions" word search; and/or • "Mixtures and Solutions Vocabulary Match" *The above early-finisher activities are included in the "Mixtures and Solutions Pack: Solubility, Solvent, Solute, Physical Change, etc." from *The Discovery Apple*.

Lesson 4 March 16	Separating Mixtures • Picking apart • Filtration • Floating & Settling • Evaporation • Magnetic Separation • Centrifuge/Centrifugation • Distillation • Chromatography	First, ask students what they already know about separating mixtures and what methods there are to separate mixtures. Record their answers on the whiteboard. Second, watch the following video, "How do we separate the seemingly inseparable?" by Iddo-Magen, Ted-Ed: https://www.youtube.com/watch?v=q8Ent5CXhfY&t=252s Third, ask students if there is anything they want to add to the board. If so, add it/discuss it. Fourth, hand out the "Separating Mixtures" handout ("Mixtures Full Unit - BC Grade 6 Science") and display on Smartboard. Review together, students following along (welcome volunteers to read, recap as needed). As a class, review and answer the questions on the final page. Fifth, perform the "Try This! – Separate Mixtures by Floatation and Settling" experiment on page 87, and the "Try This! – Separate Chocolate Milk by Centrifuge" experiment on page 93 of the Nelson Science 6 textbook. If time, showcase how a magnet can be used to separate a mixture of paperclips, rice, plastic cubs, and pebbles.
Lesson 5 March 17	Brief Review & Summative Assessment • Slideshow Review • Quiz	First, we will work our way through the "Mixtures and Solutions" PowerPoint presentation. OPTIONAL - Students follow along & complete "Mixtures and Solutions PowerPoint Review." Students will showcase their understanding of mixtures via a quiz included in the resource, "Mixtures Full Unit - BC Grade 6 Science", which we have been using throughout this unit.
	Resources needed/Required Preparation:	
	Obtain a classroom set of "Nelson Science 6 - Biology and Chemistry" textbooks (signed out from DAO). Purchase and download the following supplemental resources: • "Mixtures Full Unit – BC Grade 6 Science" from *One Teacher's Adventures*, at https://www.teacherspayteachers.com/Product/Mixtures-Full-Unit-BC-Grade-6-Science-7926763?st=74e4928fca6173c61116b7d722153755 • "Mixtures and Solutions Pack: Solubility, Solvent, Solute, Physical Change, etc." from *The Discovery Apple*, at https://www.teacherspayteachers.com/Product/Mixtures-and-Solutions-Pack-Solubility-Solvent-Solute-Physical-Change-etc-5358813?st=e8690b990b4108c7ea6ab7ed043b7052 Prep for each lesson as follows:	

For Lesson 1:

- Open the following videos and have ready to show on the Smartboard:
  - "mixtures" by Rebecca Paver, at https://www.youtube.com/watch?v=7dLeJvJyIuU
  - "What are mixtures?" by Cookies and Chemists, at: https://www.youtube.com/watch?v=7n3q3eHzkrU
- Print 27 copies of "Mixtures" mind map onto 11x17 inch paper (from "Mixtures Full Unit – BC Grade 6 Science" resource)
- Print 27 copies of "Identifying Homogeneous and Heterogeneous Mixtures in the Classroom" (also from "Mixtures Full Unit")
- Obtain and have ready for the experiment: clear cups, spoons, salt, pepper, water, food colouring, sugar, and sand

For Lesson 2:

- Print 27 copies of the "Types of Mixtures" handout (from "Mixtures Full Unit - BC Grade 6 Science" resource) and have ready to display on the Smartboard for class review
- Optional - Bring up the Google Slide show, "Intro to Mixtures": https://docs.google.com/presentation/d/1_m1_6dSup3wwYW14rdtYYArr5sd-JcIPv8IyxIROKgI/edit#slide=id.p
- Optional - Print 27 copies of the "Mixtures" fill-in-the-blank activity ("Mixtures Full Unit - BC Grade 6 Science") so that students can follow along to the slideshow, paying attention to filing in the blanks
- Obtain and have ready for the experiments: 9 clear cups, water, eye dropper, milk, soil, sugar, pinpoint LED flashlight, food colouring, milk of magnesia, cinnamon, oil, 6 spoons, clear jar with lid, measuring cup, measuring spoons, vegetable oil, dish soap, kettle, and Jell-O (2 packs)

For Lesson 3:

- Print 27 copies of "Classifying Mixtures" scientific investigation (from "Mixtures Full Unit - BC Grade 6 Science") and have ready to display on the Smartboard
- Obtain and have ready and labelled, in clear cups, the following: soda, toothpaste, muddy/dirty water, salt water, steel wool, cereal, oil-based salad dressing, skittles, rocks/dirt, shaving cream, mouthwash, vinegar, chalk dust and water, cotton ball, rice and beans, paint, and air
- Gather 14-15 magnifying glasses (one per pair of students)
- Print 27 copies of each of the early-finisher activities (i.e., the sort, word search, and vocabulary match, each of which is included in the "Mixtures and Solutions Pack: Solubility, Solvent, Solute, Physical Change, etc." from *The Discovery Apple*).
- Print answer keys for the early-finisher activities and have ready for marking

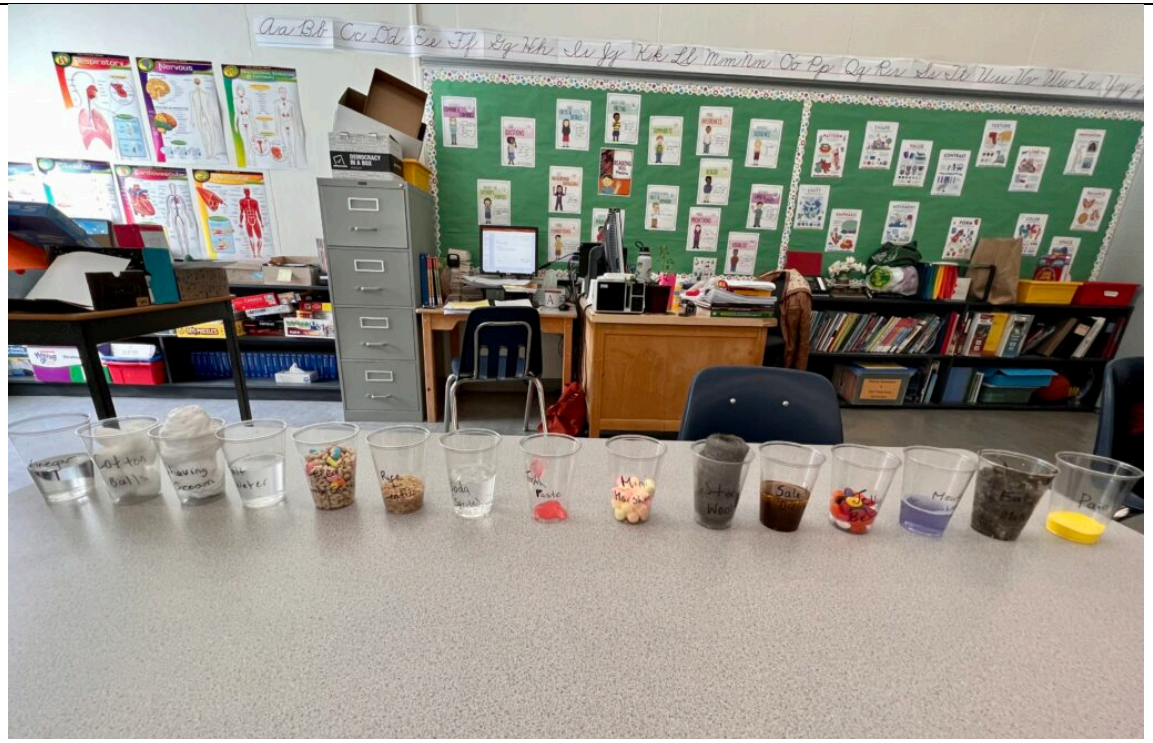
For Lesson 4:

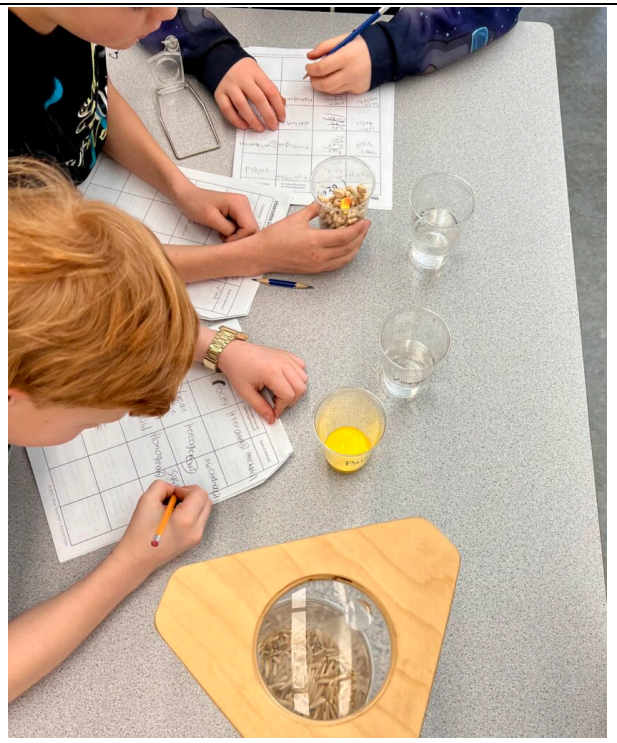
- Open the following video and have ready to show on the Smartboard:
  - "How do we separate the seemingly inseparable?" by Ted-Ed: https://www.youtube.com/watch?v=q8Ent5CXhfY&t=252s
- Print 27 copies of the "Separating Mixtures" handout ("Mixtures Full Unit - BC Grade 6 Science") and have ready to display on the Smartboard for class review
- Obtain and have ready for the experiments: sand, sawdust, salt, 2 clear containers or cups, salad spinner, chocolate milk, 4 clear plastic container with lids, modeling clay, elastic bands, magnet, paper clips, beans, rice, pebbles, and plastic cubes

For Lesson 5:

- Open the "Mixtures and Solutions" PowerPoint presentation (included with the "Mixtures and Solutions Pack") and have ready to show on the Smartboard
- Optional - Print 27 copies of the "Mixtures and Solutions PowerPoint Review"
- Print 27 copies of the quiz that is included with "Mixtures Full Unit - BC Grade 6 Science" (plus 1 answer key for marking)

	Interdisciplinary connections: (e.g. How did you weave ELA, Social Studies, Science, Math, Fine Arts, and/or ADST together in this instructional sequence?)
	Throughout this lesson, there is a heavy focus on scientific vocabulary, comprehension, and written output, which draws upon English Language Arts skills. There are also aspects of Mathematics, requiring students to measure ingredients and think about density, mass, weight, and proportion (solute vs. solvent). Students will have to think about how these mathematical concepts play into properties of mixture and separating mixtures. Lastly, Applied Design, Skills, and Technology is weaved throughout as students will need to think about how scientific investigations are designed and carried out.
	Reflection:
	<u>How did the unit go? How do I know?</u> This unit was short but *sweet* ☺…more on the sweet part later! Due to how my practicum teacher (and most intermediate classroom teachers) accommodate the teaching/learning of science and social studies, this unit was planned for after I completed my in-depth S.S. study of discrimination and inequality in Canada. As such, I was left with one full week before Spring Break to cover mixtures. This was less time than I would have liked, but I made it work by borrowing 10 minutes from silent reading each day and shaving small amounts of time off of other subjects that I had devoted extensive amounts of time to during my practicum (i.e. ELA and Math). This allowed me to lengthen my science blocks and avoided the scenario of covering part of the unit before Spring Break, only to have to come back after two weeks off and deal with jogging every student's memory while also trying to finish the material in the three remaining days of my practicum. As educators, we all know how it is during the first few days back to school after an extended break; I didn't want to put myself (or my students) through that pain, lol!! Time constraints aside, the students and I had so much fun during this unit. In five action-packed lessons, we covered types of mixtures, classifying mixtures, and separating mixtures! Students received explicit instruction on different homogeneous mixtures (solutions) and heterogeneous mixtures (suspensions and colloids) and had opportunities to engage in experiential learning (investigations and labs) wherein they observed several different mixtures and attempted to classify them based on their physical properties. Using magnifying glasses and practicing investigative skills was definitely a big hit 👄🔍👄 Students also liked the part where they got to make & eat Jell-O!! Yes, for those who may have forgot, Jell-O is a colloid (solid emulsion), which is a heterogeneous mixture (liquid dispersed in a solid). It's amazing how easy it was to gain student interest and engagement when I incorporated treats! Who knew that kids liked sugar?!?! Lol. And Jell-O wasn't the only treat! As you can see in the images below, there were many tasty mixtures to be had in this Science unit, including Lucky Charms, jellybeans, and coloured marshmallows 🙂





But students didn't just have fun and eat treats; they also honed several important scientific skills, including questioning and predicting, planning and conducting, processing and analyzing data and information, evaluating, applying and innovating, and communicating–all skills I endeavored to build during this hand-on unit that got kids up and out of their seats!

Overall, I would say that this unit was a great success! For future reference, and for any other teachers wanting to tackle this unit, I will say that there is quite a bit of advance daily planning (i.e. gathering materials for labs and investigations), but it was manageable. And I'm sure it would have been easier if I was better acquainted with the school's science storage room!!

Where to next?

Given that the unit was somewhat rushed, we didn't get to return to our mind maps as much as I would have liked. When we come back from Spring Break, I will have students return to their mind maps and add any new information/knowledge that they didn't get time to add (in a new colour). This is good retrieval practice and will help students recall what they learned in the unit. Furthermore, we will be using the vocabulary from this unit in an upcoming poetry lesson in ELA. I endeavored to front-load students by doing a vocabulary study, complete with a cut and paste word-definition sort activity in ELA this week (alongside the unit). It will be interesting to see how students navigate this cross-curricular activity.

Given that this class alternates between Social Studies and Science, my CT will be transitioning to a S.S. unit on Government after Spring Break (building off of the S.S. unit I completed).

Name: _____

Mixtures Scavenger Hunt

Look around your house (kitchen and bathrooms in particular) for examples of ***homogeneous*** and ***heterogeneous*** mixtures. Please write down the items you find in the correct category in the table below.

A ***mixture*** consists of two or more substances that are not chemically bonded (joined) together and they are not chemically changed by being together. The substances in a mixture can be separated by mechanical means.

A ***homogeneous mixture*** is a mixture where you can't see the different components, and the components are equally or uniformly distributed (like tea, Kool-Aid, salt in water, air).

A ***heterogeneous mixture*** is one in which you can see the different components and physically separate them, and the components are not uniformly distributed (trail mix, pizza, beach sand).

Homogeneous Mixtures	Heterogeneous Mixtures

Optional activity to send home with students – this will hopefully encourage parent & guardian involvement in student learning ☺