Bachelor of Education (Elementary)
Unit Plan Template EDSC 3200 – Winter 2022

Unit Title: Solutions and Solubility **Number of Lessons:** 8 **Days:** 8

Your Name: Jennilee Fraser & Samantha N.Sipos **Subject(s):** Science **Grade:** 4/5

Rationale

Our goal is to introduce our grade 4/5 students to the concept of solutions and solubilities in an 8 lesson unit. We have incorporated First Peoples Principles through concepts of communication and collaboration (coyote), thinking and reasoning (salmon) and perseverance and courage while learning (salmon/bear), as well as experimentation with Indigenous tea mixtures. It is important that we have simplified and separated each concept into its own lesson to help guide students through these concepts in slow and manageable chunks. We are incorporating concepts of baking and beverage preparation as a way to make real world connections with the content, and integrate music and songwriting as a mnemonic device.

Overview

Jennilee Fraser
Lesson 1: What is a solution - perfect cup of lemonade
Lesson 2: Solutions separated through evaporation, separation, crystallization - Kool Aid rock candy
Lesson 3: Homogenous and heterogenous solutions - making heterogeneous solutions/Lava lamps
Lesson 4: What is a solvent and solute/solubility? - dissolving different items in water
Samantha N. Sipos
Lesson 5: What are insoluble substances? - raised salt painting
Lesson 6: What is a saturated solution? - salt water buoyancy
Lesson 7: First Peoples - organic fabric dye
Lesson 8: First Peoples - tea brewing

Indigenous Connections/ First Peoples Principles of Learning

Learning recognizes the role of Indigenous knowledge → In this unit we hope to incorporate Indigenous knowledge on solutions, solubility, and extraction. For many years, Indigenous peoples used these techniques to extract medicinal properties from plants and roots, used mixtures and solutions whilst brewing teas, and even used extraction and solubility techniques to get oil from fish and syrup from trees.

Learning involves patience and time → In this unit we may be introducing ideas and concepts that are new to students, where they may need to push themselves out of their comfort zones to hypothesize, predict, and reflect. Students will be practicing refining their skills of patience and persistence.

Indigenous Resources:

- http://www.fnesc.ca/wp/wp-content/uploads/2015/08/PUBLICATION-61496-Science-First-Peoples-2016-Full-F-WEB.pdf

CORE COMPETENCIES

Communication	Thinking	Personal & Social
Connecting to **Seklép (coyote)** who represents our active communicator. Students will listen actively and be encouraged to share ideas with peers. ● Communicating ***Connecting and engaging with others*** *Students engage in informal and structured conversations in which they listen, contribute, develop understanding and relationships, and learn to consider diverse perspectives.* ***Focusing on intent and purpose*** *They understand that communication can influence, entertain, teach, inspire, and help us make sense of the world and our experiences.* ***Acquiring and presenting information***	Connecting to **sqlélten (salmon)** who represents creativity, adaptability, persistence, and resilience. Students will aim to incorporate creativity in what they do. They will be faced with difficult tasks and persevere to accomplish them. ● Creative thinking ***Creating and innovating*** ***Generating and incubating*** *The capacity for creative thinking expands as individuals increase their range of ideas and concepts to recombine them into new ideas.* ***Evaluating and developing*** ● Critical and reflective thinking ***Analyzing and critiquing*** *They reflect to consider purpose and perspectives, pinpoint evidence, use*	Connecting to **kenkéknem (bear)** who represents courage and self-awareness, and **speqmíc (swan)** who represents collaboration and respectfulness. Students will aim to be strong and courageous learners and put effort into effectively working as a team. ● Personal awareness and responsibility ***Self-advocating*** *They are able to express their needs and seek help when needed, find purpose and motivation, act on decisions, and advocate for themselves.* ***Self-regulating*** *They can persevere in difficult situations, and to understand how their actions affect themselves and others.* ***Well-being***

Students communicate by receiving and presenting information. *They inquire into topics of interest and topics related to their studies.* ● Collaborating ***Working collectively*** *Students combine their efforts with those of others to effectively accomplish learning and tasks.* *As members of a group, they appreciate interdependence and cooperation, commit to needed roles and responsibilities, and are conscientious about contributing.* ***Supporting group interactions*** *Students engage with others in ways that build and sustain trusting relationships and contribute to collective approaches.*	*explicit or implicit criteria, make defensible judgments or assessments, and draw conclusions.* *Students have opportunities for analysis and critique through engagement in formal tasks, informal tasks, and ongoing activities.* ***Questioning and investigating*** *They develop and refine questions; create and carry out plans; gather, interpret, and synthesize information and evidence; and reflect to draw reasoned conclusions.* ***Designing and developing*** ***Reflecting and assessing*** *They reflect on and assess their experiences, thinking, learning processes, work, and progress in relation to their purposes.*	● Positive personal and cultural identity ● Social awareness and responsibility ***Building relationships*** *They are aware and respectful of others' needs and feelings and share their own in appropriate ways.* ***Contributing to community and caring for the environment*** ***Resolving problems*** *They show empathy, disagree respectfully, and create space for others to use their voices.* ***Valuing diversity*** *They are inclusive in their language and behaviour and recognize that everyone has something to contribute.*

BIG IDEAS

Subject Name: **Science**	Subject Name: **Arts Education**	Subject Name:
• Solutions are homogeneous • Everyday materials are often mixtures	• Artists experiment in a variety of ways to discover new possibilities and perspectives.	

LEARNING STANDARDS & ASSESSMENT

Curricular Competencies	Content	Assessment
Science •Consider ethical responsibilities when deciding how to conduct an experiment	***Science*** • Solutions and solubility • Local First Peoples knowledge of separation and extraction methods	***Formative*** *Lesson 1-8: Observation and reviewing learning log entries and doing a check in*

• Safely use appropriate tools to make observations and measurements, using formal measurements and digital technology as appropriate • 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 • Demonstrate a sustained curiosity about a scientific topic or problem of personal interest •Make observations in familiar or unfamiliar contexts •Make predictions about the findings of their inquiry. • Make simple inferences based on their results and prior knowledge • Reflect on whether an investigation was a fair test • Communicate ideas, explanations, and processes in a variety of ways • Express and reflect on personal, shared, or others' experiences of place ***Arts Education*** • Create artistic works collaboratively and as an individual using ideas inspired by imagination, inquiry, experimentation, and purposeful play	***Arts Education*** • Processes, materials, technologies, tools and techniques to support arts activities	*with students who may be struggling with concepts.* *Exit tickets to help create our class song* ***Summative*** *A learning log with entries after each lesson will be collected at the end of the unit.*

• Reflect on creative processes as an individual and as a group, and make connections to other experiences • Connect knowledge and skills from other areas of learning in planning, creating, interpreting, and analyzing works for art • Adapt learned skills, understandings, and processes for use in new contexts and for different purposes and audiences		

Prerequisite Concepts and Skills

Students should have a basic knowledge of journal writing, visual representation of learning or verbal communication of learning. Basic understanding of states of matter (solid, liquid, gas).

Teacher Preparation Required

Lesson 1	Learning logs, cups, lemon juice, sugar, salt, spoon, mixing stick.
Lesson 2	Learning logs, glasses, powdered drink mix, wooden skewers, water, sugar, mixing bowl, spoon, kettle
Lesson 3	Learning logs, bottles, water, cooking oil, food colouring, alkaseltzer tablets
Lesson 4	Learning logs, Kool Aid packets, salt, oatmeal, dirt, clear cups
Lesson 5	Learning logs, glue, water colour paint, salt
Lesson 6	Learning logs, salt, water, cups, object to float
Lesson 7	Learning logs, white/beige cotton fabric, organic material (onion skins, beetroot), water, elastic bands
Lesson 8	Learning logs, loose leaf tea, tea bags, water, cups, kettle, paintbrushes, paper, local Kamloops pictures

Cross-Curricular Connections

Connects with visual arts, language arts, social studies.

Universal Design for Learning (UDL)

1. MULTIPLE MEANS OF REPRESENTATION – We provide for multiple means of representation in this unit in the following ways: We're using music throughout this unit as a way to connect students with material by creating a class song. We are pre teaching vocabulary before experimentation and having them connect to material through the creation of music and mnemonic devices, and using physical experiments for kinesthetic learners. Experiments contain multiple colours, taste tests, and arts applications.

2. MULTIPLE MEANS OF ACTION AND EXPRESSION – We provide multiple means of action and expression in this unit in the following ways: All lessons use a variety of manipulatives within experiments and offer journal entry engagements in either illustration or written means. Multimedia engagement through music and visual arts as part of the arts integration.

3. MULTIPLE MEANS OF ENGAGEMENT – We provide multiple means of engagement in this unit in the following ways: Students are encouraged to make predictions, and note observations in their learning logs (either through illustrations or written language) and record their findings throughout the experiments. Students are asked to reflect on their predictions and experiments within the reflection side of their learning logs. Lesson activities contain authentic and purposeful scenarios with real world connections (mixing drinks, making candy, dying clothing, making painting, music etc). Incorporation of Indigenous knowledge for students to connect to culturally relevant material.

Differentiated Instruction (DI)

Visual → Lots of experimentation with visual results.
Auditory → Making a song out of the lessons as a mnemonic device.
Reading/Writing → Recording learning, questions etc. in learning logs
Kinesthetic → Hands on experimentation individually or in small groups

Overview of Lessons:
Lesson 1

Lesson Name & Time (Minutes Allotted):	What is a solution? 40-45 mins
Learning Standards: Curricular Competencies	Questioning and Predicting: Demonstrate a sustained curiosity about a scientific topic or problem of personal interest, make observations in familiar or unfamiliar contexts, make predictions about the findings of their inquiry. Planning and Conducting: Decide which variable should be changed and measured for a fair test

Learning Standards: Content	Solutions and solubility
Instructional Objectives (SWBAT…):	SWBAT: Understand what a solution is and make connections with solutions within their everyday lives.
Assessment:	Formative: reporting observations and predictions within their learning logs, exit ticket
Teaching Strategies:	Guiding students through the step-by-step process of creating a glass of lemonade. Leading a class discussion on what solutions are and taking examples of other solutions they can name.
Materials:	Cups, water, lemon juice, spoon, sugar, salt, mixing stick.
LESSON ACTIVITIES	
Introduction/Hook:	Introduce to the students that today we are going to be making the perfect glass of lemonade. Explain that they have three cups, some lemon juice, sugar, salt and water and they are going to spend some time mixing ingredients together until we find what tastes the best. I will then write the question "what do you think is the perfect mixture?" and have them write their predictions down on the learning log provided.
Body:	Students will then begin experimenting with their mixtures. After about 10-15 minutes of experimentation. I'll ask students to tell me about their observations, what ratio made the perfect glass (how many spoonfuls of sugar/lemon juice/salt). Afterward, I'll explain to students that the mixture they created is called a solution and elaborate on that meaning. Students will spend some time writing down some of their thoughts about the experiment, observations, or impressions.
Closure:	After their journal entries, I will introduce them to the chorus of a song Sam and I wrote about solutions and solubility. Students will then write down on an exit ticket what the definition of a solution is, which we will incorporate into the lyrics of our class solution song.

Lesson 2

Lesson Name & Time (Minutes Allotted):	Rock Candy Crystallization (solubility & crystallization) - 40 minutes
Learning Standards: Curricular Competencies	• Safely use appropriate tools to make observations and measurements, using formal measurements and digital technology as appropriate •Make observations in familiar or unfamiliar contexts •Make predictions about the findings of their inquiry.

Learning Standards: Content	• Solutions and solubility Processes, materials, technologies, tools and techniques to support arts activities
Instructional Objectives (SWBAT…):	SWBAT safely dissolve and mix solution SWBAT start first steps of an over-time experiment SWBAT hypothesize and make predictions about what will happen
Assessment:	Observation, conversation, learning log entry, exit ticket for song lyric
Teaching Strategies:	T will assist and monitor ss using hot water T will guide ss through process if they are confused or needing assistance
Materials:	Learning logs, glasses, powdered drink mix, wooden skewers, water, sugar, mixing bowl, spoon, kettle
LESSON ACTIVITIES	
Introduction/Hook:	Ss log predictions about what will happen
Body:	Ss will roll wooden sticks in sugar and then have T assists in small groups to create hot water/sugar/drink mix solution Solution will be poured into cups and dried sugar sticks will be placed in the solution and left to sit for up to one week Ss will journal about the solubility of the solution, how the sugar dissolved, what would have happened if the water was not hot etc. Ss will journal about predictions and hypothesize about what will happen over time as the sticks are left in the solution
Closure:	Ss will review “solutions song” and work together to add a new line to the song

Lesson 3

Lesson Name & Time (Minutes Allotted):	Homogeneous/Heterogeneous Solutions 40-45 mins
Learning Standards: Curricular Competencies	Applying and Innovating: •Cooperatively design projects, transfer and apply learning to new situations Communicating: •Communicate ideas, explanations, and processes in a variety of ways, express and reflect on personal, shared, or others’ experiences of place Connect knowledge and skills from other areas of learning in planning, creating, interpreting, and analyzing works for art

	Adapt learned skills, understandings, and processes for use in new contexts and for different purposes and audiences
Learning Standards: Content	Solutions and Solubility Processes, materials, technologies, tools and techniques to support arts activities
Instructional Objectives (SWBAT…):	Understand the difference between a homogenous and heterogenous solution. Can identify different solutions as either homogeneous or heterogeneous by their appearance. Have an understanding of how lava lamps work in regard to heterogeneous solutions.
Assessment:	Learning log entries, conversation, exit ticket for song lyric
Teaching Strategies:	Instruction on definitions, guided instruction on lava lamp creation.
Materials:	Learning logs, bottles, cooking oil, water, food colouring, alkaseltzer tabs.
LESSON ACTIVITIES	
Introduction/Hook:	Go over the song lyric from the previous lesson about solubility and crystalization. Class will participate in singing the created lyrics and chorus of the song created to this point. Learning logs are passed out.
Body:	Will explain what a homogenous solution is and what a heterogeneous solution is. I will explain to students that they are going to make a heterogenous solution using two homogenous solutions. I will then have them document what predictions they have in their learning log. After materials are passed out I will demonstrate how to make their lava lamps. I will walk around and assist students as they create their colourful lava lamps.
Closure:	Once students are finished I will have them write down any observations or interests they had in their learning logs reflection section. I will ask students to share any thoughts they had or things they found interesting. I will then ask them to create their exit ticket defining a homogenous or heterogenous solutions for song lyric creation.

Lesson 4

Lesson Name & Time (Minutes Allotted):	Solvents and Solutes - 40-45mins
Learning Standards: Curricular Competencies	Planning and Conducting: •With support, plan appropriate investigations to answer their questions or solve problems they have identified

	Questioning and Predicting •Make observations in familiar or unfamiliar contexts •Make predictions about the findings of their inquiry.
Learning Standards: Content	Solutions and Solubility Processes, materials, technologies, tools and techniques to support arts activities
Instructional Objectives (SWBAT…):	Understand what the difference is between a solvent and a solute. To identify the solvents and solutes we've used in previous lessons Understand that some things dissolve and some don't.
Assessment:	Learning log entries, observation, exit ticket for song lyrics
Teaching Strategies:	Instruction on what makes something a solute and what makes it a solvent. Walk through the experiment.
Materials:	Cups, water, Kool Aid, salt, oatmeal, dirt
LESSON ACTIVITIES	
Introduction/Hook:	Have class come together and go over the lyric we created from the previous lesson on homogeneous/heterogeneous solutions. Students will participate in the singing of the solution song with the new added lyrics. Learning logs will be passed out.
Body:	I will instruct the class on the difference between solvents and solutes, and begin a conversation on our previous lessons about what some of the solvents and solutes we've seen already. I'll then demonstrate the experiment with the solvents and solutes and have students write down any predictions they have in their learning logs. Students will begin their experiments while I walk around and observe, offering assistance when necessary.
Closure:	Once students have finished their experiments, I'll have them write down any things that surprised them, or if their predictions were correct in the reflections section of their learning log. I'll then have them define what a solvent/solute is in an exit ticket for the creation of the next lyric of our solutions song.

Lesson 5

Lesson Name & Time (Minutes Allotted):	Insoluble Substances 40 mins
Learning Standards: Curricular Competencies	Demonstrate a sustained curiosity about a scientific topic or problem of personal interest

	Make observations in familiar or unfamiliar contexts Create artistic works collaboratively and as an individual using ideas inspired by imagination, inquiry, experimentation, and purposeful play Connect knowledge and skills from other areas of learning in planning, creating, interpreting, and analyzing works for art
Learning Standards: Content	Solutions and Solubilities Processes, materials, technologies, tools and techniques to support arts activities
Instructional Objectives (SWBAT…):	SWBAT recognize that water is a solvent SWBAT recognize that salt is a solute SWBAT recognize that salt normally dissolves in water SWBAT make predictions/hypothesize why the water solution does not dissolve the salt
Assessment:	Learning logs entries
Teaching Strategies:	Review previous vocabulary Demonstrate activity to students Circulate and ask q's to generate deeper thinking/understanding
Materials:	Glue, paper, water colours, salt.
LESSON ACTIVITIES	
Introduction/Hook:	Sing class song "Solutions" Review what is a solvent, solute etc. Show ss demonstration of experiment Disperse learning logs
Body:	Ss will take a piece of paper and create a pattern with the white glue, they will then cover it in salt Once salt is set in the glue, shake off excess Use droppers or paintbrushes to go over salt with food colouring water/watercolour Ss will spend time in groups discussing what happens Ss will record findings/visuals in learning log
Closure:	As a class, discuss/review why the salt does not dissolve when the water mixture is added on top

Lesson 6

Lesson Name & Time (Minutes Allotted):	Saturated Solutions 40-45 mins (salt water buoyancy)
Learning Standards: Curricular Competencies	With support, plan appropriate investigations to answer their questions or solve problems they have identified Make simple inferences based on their results and prior knowledge
Learning Standards: Content	Solutions and Solubilities Processes, materials, technologies, tools and techniques to support arts activities
Instructional Objectives (SWBAT…):	SWBAT define solute, solvent SWBAT dissolve salt into water and explain WHY SWBAT make predictions/hypothesize why or why not in regard to egg floating
Assessment:	Learning logs entries
Teaching Strategies:	Review vocabulary Circulate asking q's to encourage deeper thinking/understanding
Materials:	salt, water, cups, egg
LESSON ACTIVITIES	
Introduction/Hook:	Sing class song "Solutions" Show ss video of an egg floating in water Ask ss in small groups to discuss WHY they think the egg floats Ss share ideas
Body:	T gives ss materials Ss work in small groups with water, salt, egg to make perfect mixture to float egg Ss record findings in learning logs
Closure:	T has ss reflect and discuss why dissolving more salt into the solution allows for the egg to float

Lesson 7

Lesson Name & Time (Minutes Allotted):	Indigenous Plant/Organics Dye
Learning Standards: Curricular Competencies	Identify First Peoples perspectives and knowledge as sources of information Consider ethical responsibilities when deciding how to conduct an experiment Create artistic works collaboratively and as an individual using ideas inspired by imagination, inquiry, experimentation, and purposeful play
Learning Standards: Content	Solutions and Solubilities Processes, materials, technologies, tools and techniques to support arts activities

	Local First Peoples knowledge of separation and extraction methods
Instructional Objectives (SWBAT…):	SWBAT make predictions about plants/foods used for dyeing SWBAT make connections to Indigenous knowledge
Assessment:	Learning logs entries
Teaching Strategies:	Encourage students to connect thinking to FPPL Circulate asking q's to encourage deeper thinking/understanding
Materials:	white/beige cotton fabric, organic material (onion skins, avocado skins, beetroot peeling), previously made dye in jugs, elastic bands
LESSON ACTIVITIES	
Introduction/Hook:	T has ss envision they are out in the wilderness, with everything around them, brainstorm what is around them i.e. plants, trees, berries, grass, moss, algae, dirt T has ss think about how they could use these items to create colours/dyes
Body:	T brings out onion skins, avocado skins, beetroot peelings Ss are able to touch, scratch against paper etc. Ss use their learning logs to make predictions about what colour each of these organics would produce T brings out jugs of "dye" for each organic item Ss compare their predictions to colour of the dye in their learning logs Ss tie dye a small square of cotton fabric with dye of choice
Closure:	T poses Q for learning log → "Is making dye a solution?" Ss can reflect on connection between First Peoples techniques and what they have been learning through the unit

Lesson 8

Lesson Name & Time (Minutes Allotted):	Tea Brewing - 45 minutes
Learning Standards: Curricular Competencies	• Identify First Peoples perspectives and knowledge as sources of information • Decide which variable should be changed and measured for a fair test Create artistic works collaboratively and as an individual using ideas inspired by imagination, inquiry, experimentation, and purposeful play
Learning Standards: Content	• Local First Peoples knowledge of separation and extraction methods • Processes, materials, technologies, tools and techniques to support arts activities
Instructional Objectives (SWBAT…):	SWBAT understand and recognize Indigenous knowledge based around this

	SWBAT brew their own tea and make hypotheses about why the tea brewed differently depending on temperature of the water SWBAT see the connection/importance of tea in Indigenous culture and create a piece of art using the tea
Assessment:	Learning logs entries
Teaching Strategies:	Encourage students to connect thinking to FPPL Circulate asking q's to encourage deeper thinking/understanding
Materials:	Loose leaf tea, tea bags, water, cups, kettle, paintbrushes, paper, Secwepmec tea painting examples, local Kamloops pictures
LESSON ACTIVITIES	
Introduction/Hook:	https://www.native-art-in-canada.com/ojibwatea.html T does a small reading on Ojibwa tea and projects an Ojibwa painting of a man drinking tea
Body:	Ss are given loose leaf tea/tea bags and cold water - ss "steep" tea and record what happens Ss are given warm/hot water - ss steep tea and record what happens/if it differs Ss are given some time to record findings/observations in their journals Ss use the tea mixtures to paint a picture (T will display a scenery photo of Kamloops - however ss can paint whatever they would like)
Closure:	T has think about the importance of tea in relation to culture Ss can record in their journals
Extension:	https://moa.ubc.ca/2020/07/knowledge-keepers-a-moa-original-video-series/ T shows ss a video about Indigenous connections to plants T has ss reflect and think about how these plants were used/how did they ingest the medicinal properties?

Resources

https://moa.ubc.ca/2020/07/knowledge-keepers-a-moa-original-video-series/

https://www.native-art-in-canada.com/ojibwatea.html

Extensions to Unit

Unit could segue into a unit about the oceans or dive further into chemistry and chemical compounds. Could be combined with home economics like cooking or baking.

Reflections