# Science Lesson Plan

**Title:** Separating Mixtures Challenge
**Topic/Strand:** Mixtures and Solutions
**Grade Level:** 5th Grade
**Teacher:** Adelyn Lyon
**Curriculum:** FOSS Mixtures and Solutions
**Estimated Time:** Two 45 minute lessons

## 1. Overview

This lesson synthesizes the need for 5th grade students to understand how to separate different mixtures with the also important need for 5th graders to be able to conceptualize how to design an effective and well ordered lab procedure to achieve a specific result. This lesson helps students synthesize their previous learning about mixtures and solutions by applying their understanding of these concepts to a novel task where previously known dry substances are mixed together and must then be separated. Students will work in small lab groups and will be given structured language supports when discussing and creating a lab plan and then again when critiquing and rewriting their plan for a hypothetical future group's use.

Students begin by recalling what they have already learned about separating different kinds of mixtures and separating solutions. Then, they design a method that will separate a dry mixture containing gravel, diatomaceous earth, and sodium chloride – the three materials they have worked with before. After discussing and writing a plan in small groups, the students test their plan and then analyze their steps in light of their success or failure in the challenge. They finally will create a revised detailed plan. After this culminating activity, we discuss the more global implications of separating mixtures.

## 2. Learning Goals and Standards

Science Learning Goals:

1. Students will come to know and understand that mixtures are an intermingling of two or more materials, and that some mixtures can be separated using filters. (S2) (Standards: PS 1f, PS 1i, I&E 6a, 6h, 6i)
2. Students will come to know and understand substances can sometimes be separated out of a mixture by the physical characteristics of matter such as particle size
3. Students will come to know and understand that filters work by letting particles that are smaller than the holes in the filter pass through
4. Students will be able to design and implement a procedure that can separate out the gravel and diatomaceous earth from a mixture containing those two substances using filters

Language Learning Goals:

1. Students will be able to communicate effectively with classmates and the teacher about the study of mixtures (ELD1)
2. Students will be able to use concepts and academic vocabulary to complete a coherent action plan to separate their mixture (ELD2)
3. Students will be able to analyze and revise their plan and produce a better lab plan, using transition words (ELD3)

## Assessment strategy

Student artifacts: mixtures worksheets and science notebooks
Teacher artifact: formative assessment note sheet

| Learning goals | Data sources |
|---|---|
| S1 | • Mixtures worksheets<br>• Student verbal responses and talk |
| S2 | • Mixtures worksheets<br>• Science notebooks<br>• Student verbal responses and talk |
| ELD1 | • Mixtures worksheets<br>• Science notebooks<br>• Student verbal responses and talk |
| ELD2 | • Mixtures worksheets<br>• Science notebooks<br>• Student verbal responses and talk |
| ELD3 | • Mixtures worksheets<br>• Science notebooks<br>• Student verbal responses and talk |

A formative assessment note sheet will be used to record data about students who are English learners and/or have learning/language disabilities.

## Standards Addressed

**California Grade 5 Physical Sciences Standards**
1. Elements and their combinations account for all the varied types of matter in the world. As a basis for understanding this concept:
f. Students know differences in chemical and physical properties of substances are used to separate mixtures and identify compounds.

Standard 1f is the focus of this lesson. Standards 1i will be touched upon.
1i. Students know the common properties of salts, such as sodium chloride (NaCl).

These California Grade 5 Investigation and Experimentation Standards will also be addressed to some extent:
6. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:
i. Write a report of an investigation that includes conducting tests, collecting data or examining evidence, and drawing conclusions.

**English Language Arts Standards (5th Grade)**

 

Reading

- Vocabulary & Concept Development 1.4: know abstract, derived roots and affixes from Greek and Latin and use this knowledge to analyze the meaning of complex words.

Listening and Speaking

- Comprehension 1.1: Ask questions that seek information not already discussed.
- Organization & Oral Communication 1.5: Clarify and support spoken ideas with evidence and examples.

**English Language Development (ELD) standards, 3rd -5th Grade.**

Writing

- Organization & Focus (Early Advanced): Use more complex vocabulary and sentences appropriate for language arts and other content areas (e.g., math, science, history–social science).
- Language Conventions (Early Advanced): Produce independent writing with consistent use of correct capitalization, punctuation, and spelling.

Reading

- Word Analysis (advanced): Apply knowledge of word relationships, such as roots and affixes, to derive meaning from literature and texts in content areas.
- Comprehension (Intermediate): Understand and follow some multiple- step directions for classroom-related activities.

Listening and Speaking

- Comprehension, Organization, & Delivery of Oral Communication (Early Advanced):
    - Make oneself understood when speaking by using consistent standard English grammatical forms, sounds, intonation, pitch, and modulation but may make random errors.
    - Recognize appropriate ways of speaking that vary according to the purpose, audience, and subject matter.
    - Ask and answer instructional questions with more extensive supporting elements.

| Lesson Activities | ELLISA Practice | Vocab |
|---|---|---|
| **1. Lesson Launch (~15 minutes) (Day 1)**<br>Question of the day: How can we apply what we know about mixtures to design a method to separate a mixture containing three solid materials?<br>What do learners know about the subject already? (review)<br>• Review the concept of mixture versus solution and the concept of separation<br>• Review ways students have already learned to separate mixtures (screen and filter) and solutions using worksheet<br>Lesson preview<br>• During today's lesson, you will design a method to separate your mixture<br>• During our next lab, you will get to implement your method to see if it works. Then, you'll revise (or look at again) your plan and decide what you think should be changed to help a future 5th grade class separate this mixture effectively.<br>*Have students make a mixture of gravel, diatomaceous earth, and sodium chloride in equal parts – one per group.* | VOCAB | Gravel<br>Diatomaceous earth<br>Sodium chloride<br>Method<br>Mixture<br>Separate<br>revise<br>Mixture<br>solution |
| **2. Designing the Method (~30 minutes)**<br>*Pose three leading questions for students as they design lab*<br>• How will you remove the gravel? How will you remove the diatomaceous earth? How will you remove the sodium chloride?<br>*Brainstorming*<br>• Ask students to use what they already know about the properties of their substances and how to separate mixtures to think about how to remove each of the materials from the mixture.<br>• Circulate around the room, engage in instructional conversations, collect formative assessment data<br>*Lab Design*<br>• Notebook setup for lab design<br>• Provide students with language scaffolding to discuss and then write a plan that will allow them to separate the three materials into different cups.<br>• Circulate around the room, engage in instructional conversations, collect formative assessment data. Guide students towards the idea of adding water if it doesn't come about organically.<br>(Possible Breakpoint) | SDAIE<br>IC<br>IC<br>LS<br>LIT<br>IC | Properties<br>Substances<br>Agree/disagree academic language |

| | | |
|---|---|---|
| **3. Lab Investigation and Analysis (~30 minutes) (Day 2)**<br>*Review from Yesterday, and preview today's activities*<br>• Remind students of lab goal, to separate the three mixtures, so that they can show what they have learned about mixtures and solutions.<br>Question of the day: How can we apply what we know about mixtures to design a method to separate a mixture containing three solid materials?<br><br>*Lab Implementation*<br>• Tell students that as they are following their steps for the lab, they should be thinking about whether or not their steps are working the way they want them to.<br>• Circulate around the room, engage in instructional conversations, collect formative assessment data. Ask guiding questions for groups that are struggling with their implementation (if it is not achieving their desired results) to get them to think about how they would change their design to make it better.<br>*Informal Analysis*<br>• As groups are finishing, have the students brainstorm about what worked in their lab design and what did not. Encourage the continued use of the agree/disagree frames.<br>*Formal Analysis*<br>• Once all groups complete their labs and have some time to brainstorm, guide them through formal analysis by asking them to critique each step, either saying why it was effective or why it was not effective and what they would have changed.<br>*Lesson Rewrite*<br>• Model and then guide students to use their formal analysis to rewrite their lab steps so that their lab would could more successfully. Encourage the use of transition words in each step to make them more clear.<br>• Circulate around the room, engage in instructional conversations, collect formative assessment data. Ask guiding questions for groups to help them take their experiences in their lab and rewrite a lab that reflects their experiences<br>• When a group finishes their rewrite, have them exchange it with another group to check for clarity of steps and grammatical/spelling issues. | IC<br><br>LIT<br><br>IC<br><br>VOCAB<br>IC<br>LIT<br>SDAIE<br><br>LIT<br>VOCAB<br>IC | Analysis<br><br>Revise Transition words |
| **4. Sense making and lesson closure**<br>Whole class discussion<br>• What is a mixture?<br>• How do you separate mixtures?<br>• Why is particle size important?<br>• Did the mesh filter allow you separate out the diatomaceous earth? Why?<br>• Why is the order of filtering important?<br>• What did you learn about separate mixtures this week? [What's your evidence?]<br>*Review Key Science Concepts (verbally)*<br>• Substances can sometimes be separated out of a mixture by the physical characteristics of matter such as particle size<br>• Filters work by letting particles that are smaller than the holes in the filter pass through<br>Contextualize importance for students in terms of the necessity of clean water<br>• How nature filters water as it travels to underground aquifers<br>• How water treatment plants filter water to make it safe (focus on local water treatment plant)<br>Science notebook activity – have student write about:<br>• Why is particle size important when separating out mixtures?<br>• What did you learn about separate mixtures this week?<br>• What would you be interested in learning more about mixtures and solutions? | VOCAB<br>IC<br><br>CX<br><br>CX<br><br>LIT | mixture<br>separate<br>particle<br>filter |