

# **LOESS INTEGRATED LEARNING SCENARIO TEMPLATE**

## **Introduction**

In [LOESS](#), the acquisition of soil health knowledge is facilitated using integrated STEM teaching and learning, which is carried out via the [Biology Science Curriculum Study \(BSCS\) 5E Instructional Model](#) by Bybee and colleagues (Bybee et al. 2006) as well as the application of innovative [pedagogical approaches](#) (PBL, IBL, etc).

## **Keywords**

*Soil fertility, soil permeability, cultivation, map navigation*

## **Title**

***Which soil tastes better?***

## **Authors**

*Ana Pasqualicchio*

## **Summary**

*This learning scenario motivates students to engage in active learning by collecting soil samples, observing its colour and testing its permeability, planting Swiss chard, observing its growth, hypothesizing, concluding, comparing and recording observed changes. After the Swiss chard reaches the height of 10 cm, children will mark the place that they collected soil samples from. They will mark it on the printed part of the LOESS Soil Map of our town. For an assessment of activities, an evaluation poster will be used. On the poster children will put yes or no stickers on the corresponding column.*

## **Licenses**



**[Attribution ShareAlike 4.0 International \(CC BY-SA 4.0\)](#)**. This license lets others copy and redistribute the material in any medium or format for any purpose, even commercially; it also allows to remix, transform, and build upon the material for any purpose, even commercially. The licensor cannot revoke these freedoms as long as the license terms are followed.

## **Subjects**

***Geography, Biology, Mathematics***

## **Real-life questions**

- *What is soil?*
- *Is soil needed by living beings?*
- *How do I plant Swiss chard?*
- *Does Swiss chard grow evenly in different soils?*
- *How do I find my house on the city map*



## Learning objectives

Students will be able to:

- test soil permeability, and to collect and record data.
- plant and tend for seeds, such as Swiss chard.
- measure, collect and record data on plant growth.
- explain that all soils are not equally fertile.
- explain how soil supports plant growth and the importance of soil.

## Link to curriculum

This learning scenario fosters students' curiosity, engaging them to use their cognitive skills to conduct research and to interpret and analyse collected data. It also fosters **SDG 15 (Life on Land)** and **SDG 4 (Quality education)**.

## Age of students

*Between 5 and 8 years old.*

## Time

**Preparation time:** 2h

**Teaching time (integrated teaching):**

- **Lesson 1:** 45 minutes
- **Lesson 2:** 60 minutes
- **Lesson 3:** 60 minutes
- **Lesson 4:** 45 minutes
- Plant watering activity: 10 min daily for 15 days

## Teaching resources (materials & online tools)

### Materials for Lesson 1

- Jar
- soil samples from the yard
- water

### Material for Lesson 2

- Three pictures taken in three different parts of the kindergarten yard.
- Latex gloves
- plastic transparent cups
- small spatulas.
- Print-out of [Annex 1](#) – Data sheet and soil colour template, plastic cups, coffee filters, measuring tape and measuring cups.
- Swiss chard seeds (lettuce salad seeds can be used as alternative)

### Materials for Lesson 3

- Latex gloves
- plastic transparent cups
- small spatulas.
- Print-out of [Annex 2](#) – Data sheet and soil colour template, plastic cups, coffee filters, measuring tape and measuring cups.



- Swiss chard seeds (lettuce salad seeds can be used as an alternative).

**Materials for Lesson 4**

- Printed part of LOESS Soil Map (our town - in compliance with the students GDPR, map is not included as an annex)

**Materials for Lesson 5**

- Poster with question columns or writing board with written question columns, markers or stickers

**Online tools:**

**Lesson 1**

- Video about soil vitality and importance.  
"Why soil is one of the most amazing things on Earth "(BBC video)  
<https://www.youtube.com/watch?v=OILITHMVcRw>
- A short video about soil importance that can be used as an alternative to the video above  
<https://www.youtube.com/watch?v=OILITHMVcRw>

**Lesson 2**

- Story book or video which explains germination and growth of plants in a fun, simple way.  
[https://www.goodreads.com/book/show/57676079-kako-sjemenka-klija?from\\_search=true&from\\_srp=true&qid=xoAXQWSEi4&rank=1](https://www.goodreads.com/book/show/57676079-kako-sjemenka-klija?from_search=true&from_srp=true&qid=xoAXQWSEi4&rank=1)  
<https://www.youtube.com/watch?v=TLEns2oCd6U>  
<https://www.amazon.com/Seed-Grows-Lets-Read-Find-Out-Science/dp/0062381881>
- Soil sound bank contains curated collection of recordings of various soil sounds  
<https://curiosoil.eu/curiosity-kit/soil-sound-bank/>

**Lesson 4**

- LOESS Soil Map is a platform where users can collaboratively by leveraging interactive maps and geolocation tools build a database by adding information about soil conditions in their local areas.  
<https://www.loess-soil-map.eu/map>

**STEM Strategy Criteria**

Developing the LOESS learning scenario will help you and your school comply with the [STEM School Label criteria](#). Please find below the STEM School Label criteria this learning scenario fulfils.

Elements and criteria	How is this criterion addressed in the learning scenario?
<b>Instruction</b>	
<b>Personalisation of learning</b>	Students will analyse the soil from their gardens or neighbourhoods. They will plant and collect data of their own Swiss chard seeds.
<b>Inquiry-Based Science Education (IBSE)</b>	Students will analyse soil colour and permeability for soil fertility. .They will investigate and conclude on the status of the soils collected in their locations.
<b>Curriculum implementation</b>	In this learning scenario key competencies of STEM subjects (Mathematics and Biology) together with Geography and the SDGs are worked on together.



Elements and criteria	How is this criterion addressed in the learning scenario?
<b>Emphasis on STEM topics and competencies</b>	
<b>Interdisciplinary instruction</b>	In this Learning Scenario, we will examine and implement a variety of activities by connecting Geography with Biology and Mathematics.
<b>Contextualisation of STEM teaching</b>	Science is conducted while analysing soil colour and permeability, planting and taking care of Swiss chard. Mathematics is carried out by measuring and comparing measurements. Technology and Engineering is carried out by personalizing LOESS Soil Map.
<b>Assessment</b>	
<b>Continuous assessment</b>	Throughout the learning scenario students' activity and engagement will be valued.
<b>Connections</b>	
<b>With parents/guardians</b>	Inform them about soil sample collecting from their neighbourhood. Ask them to provide assistance to students if they need it.
<b>School infrastructure</b>	
<b>Access to technology and equipment</b>	The materials needed for this learning scenario are cheap and easy to ensure. The use of technological resources is easy to understand.

## Description of activities

Name of activity	Procedure	Time
<b>1<sup>st</sup> Lesson</b>		
<b>5E Phase</b>	<i>Engage</i>	
<b>Brainstorming and discussion</b>	The video <a href="#">Why soil is one of the most amazing things on Earth   BBC Ideas</a> will be shown as an introduction of soil importance in our lives. After watching the video, the teacher will fill the jar up to half with water and add soil. The teacher will interest children by drawing their attention to changes inside the jar. Brainstorming will be supported by following questions: <ul style="list-style-type: none"> <li>• Can plants grow equally in every soil?</li> <li>• What do plants need to grow?</li> <li>• What do plants eat?</li> </ul>	20' minutes
<b>Discussion and preparation for the next lesson</b>	Students will collect soil samples from parts of the kindergarten yard. To be able to collect samples first they will have to match the photographed part of the yard with the real one. After collecting samples students will observe them and compare during the next lesson	25 minutes
<b>2<sup>nd</sup> Lesson</b>		
<b>5E Phase</b>	<i>Explore, Explain</i>	
<b>Subject</b>	Integrated Biology and Mathematics	
<b>Find me!</b>	Students will match provided pictures with real parts of the yard. They will collect different types of soil from the default places. Collected samples will be observed and compared by colour and permeability ( <a href="#">Annex 1</a> ). Students will put the same amount of soil in the same sized	60 minutes



Name of activity	Procedure	Time
	plastic cups, each of them will have two punched holes on the bottom. Cups will be put on plates. Same amount of water will be poured in cups. After 2 hours the water that leaked out will be poured into the measuring cups. Then the students will collect data on the data sheet.	
<b>Planting</b>	In each cup children will plant three Swiss chard seeds. They will water them and collect data on the plant growth until it reaches a height of 10 cm.	10 minutes daily for 15 days
<b>Learning products</b>	Students will cut out the plants drawn according to their collected measurements (data sheet Annex 1). They will then arrange them by height and stick them on the poster. At the base of each plant, students will stick the cut out soil colour along with the collected corresponding information about soil permeability. This will enable students to <b>compare</b> collected data and observed changes. They will <b>discuss</b> them and <b>conclude</b> which soil is more fertile (is there any difference) based on the speed of growth and the size of Swiss chard.	
<b>3<sup>rd</sup> Lesson</b>		
<b>5E Phase</b>	Explore, explain, elaborate	
<b>Subject</b>	Integrated Biology and Mathematics	
<b>Collecting soil samples</b>	Students will be provided by plastic cups and small spatulas. they will be asked to collect soil samples from their gardens or neighbourhoods. Each student will be given a data sheet to fulfil ( <a href="#">Annex 2</a> ). Collected samples will be observed and compared by colour and permeability. Students will put the same amount of soil in the same sized plastic cup, each of them will have two punched holes on the bottom. Cups will be put on plates. Same amount of water will be poured in cups. After 2 hours the water that leaked out will be poured into the measuring cups. Then the students will collect data on the data sheet. (same as in second lesson but in this lesson the activity is personalized)	60 minutes
<b>Planting</b>	In their own cups (from previous activities) students will plant three Swiss chard seeds. They will water them and collect data on the plant growth until it reaches a height of 10 cm.	10 minutes daily for 15 days
<b>Learning products</b>	Students will cut out their plants drawn according to their collected measurements (data sheet <a href="#">Annex 2</a> ). They will then arrange them by height and stick them on the poster. At the base of each plant, students will stick the cut out soil colour along with the collected corresponding information about soil permeability This will enable students to <b>compare</b> collected data and observed changes. They will <b>discuss</b> them and <b>conclude</b> which soil is more fertile (is there any difference in fertility) based on the speed of growth and the size of Swiss chard.	
<b>4<sup>th</sup> Lesson</b>		
<b>5E Phase</b>	Elaborate, evaluate	
<b>Subject</b>	Geography	
<b>LOESS Soil Map</b>	Introduce students to the LOESS Soil Map. Show them the webpage explaining: - How recording data in maps helps us interpret data in a spatial	15 minutes



Name of activity	Procedure	Time
	context - How to record a point on the map - What kinds of information can be recorded	
<b>Mark your home</b>	Students will mark their home or place in their neighbourhood from which they collected soil samples.	30 minutes
<b>Learning products</b>	Students will learn <b>how to use maps</b> . They will <b>observe</b> if there is a difference in soil fertility in the town they all live in. They will be encouraged to use critical thinking.	

### Initial assessment

- *Class discussion on students' prior experiences with outdoor soil-based activities.*

### Formative evaluation

- *Interactive quiz. ([Annex 3](#))*

### Final assessment

- *A poster with yes and no answers. Students put stickers on the corresponding columns.*

### Student feedback

- *Oral comments. ([Annex 4](#) – example guiding questions)*

### Teacher feedback

*Combined method of reflection and planning for better understanding of how students experienced the research process, what they learned and how their approach to work changed during the implementation of this LS.*

*For reflection: "What did I learn and what did I change in the way I worked?" (for example student can answer that he did not know how to measure plant, but now he uses a ruler).*

*For planning: "What would I do differently next time?" (for example student can say that next time he would water plants with same amount of water for better comparison)*

### Reflection on the development process

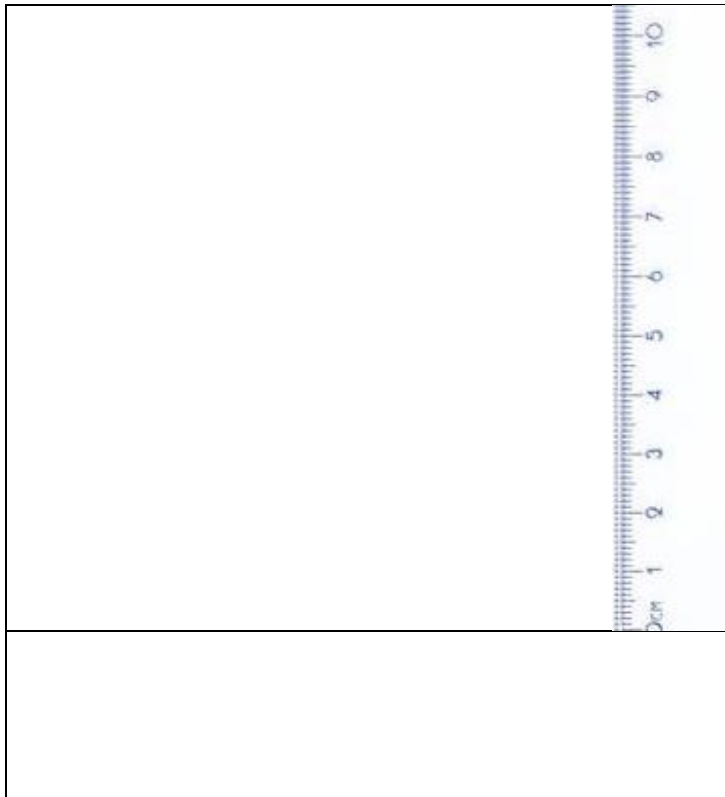
My initial ideas for LS came from understanding soil importance in the context of life existence. I wanted to provide students quality learning from affordable materials. The idea was to create a LS for low budget but at the same time engaging students, providing them with both indoor and outdoor activities, and opportunities to observe differences and changes to collect and interpret data but most importantly to engage students in critical thinking and conducting conclusions.

We were researching if every soil gives equal opportunity to Swiss chard growth. It is simple research, affordable and age appropriate.



## Annex 1 – Data sheet and color tablet

DRAW PLANT



SOIL SAMPLE:

SOIL PERMEABILITY:

SOIL COLOUR:

MAESURE YOUR PLANT:

SOIL COLOUR

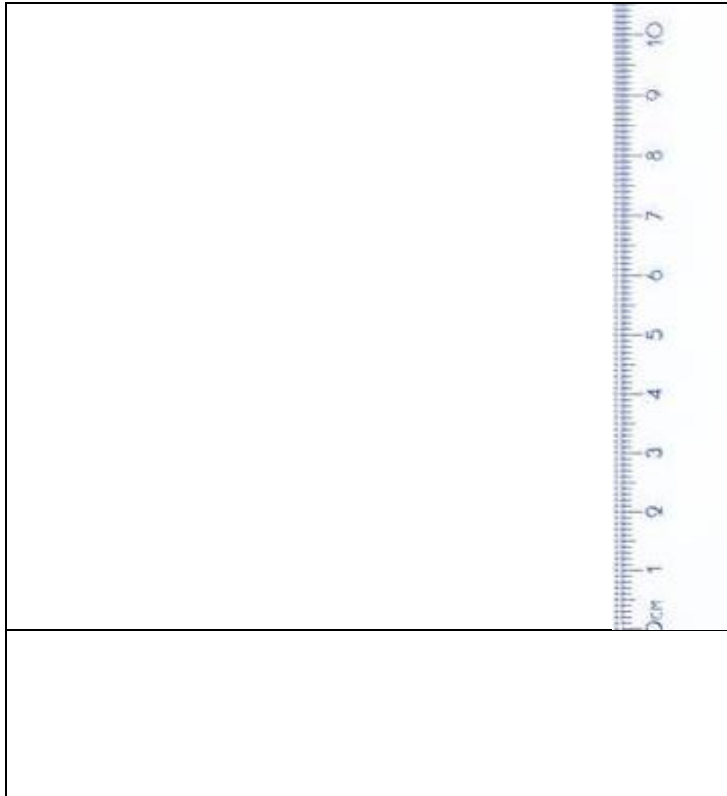
DATE	HIGHT



**Annex 2 – Data sheet and color tablet**

NAME:

DRAW YOUR PLANT



SOIL PERMEABILITY:

SOIL COLOUR:

MEASURE YOUR PLANT:

SOIL COLOUR

DATE	HIGHT



### Annex 3 – Interactive quiz

1. What does plant need to grow?
2. Which soil was the best for plant growth?
3. Does Swiss chard grow equally in every soil?
3. What does a well- grown Swiss chard look like?
4. How did you know that Swiss chard is growing?
5. Which changes did you notice on Swiss chard?
6. Why is soil important for plant?
7. What was your task in this research?
8. What did you learn from this research?

### Annex 4 – Example guiding questions for oral comments

- Which soil is the most fertile?
- What makes you think that? How did you conclude that?
- What does it mean to be fertile?
- What did you learn about soil and plant growth?
- What is the most interesting discovery for you?

