inTruST Learning Scenario

Title: Can plants survive without light?

Picture:









Link to YouTube video:

https://youtu.be/hWojJVb53Xk

Research Questions/Tasks

Main question: Do plants need light to survive and grow? What happens to a plant kept in darkness compared with a similar plant receiving natural light?

Supporting inquiry prompts: What changes can we see? What can we measure? What must be kept the same? Does greater height always mean better health? How confident can we be in our conclusion?

Pupils express prior ideas, write a hypothesis, organise teams and tasks, identify two locations, compare two plants, record repeated observations of height, colour and leaves, illustrate what they see and discuss a conclusion in relation to their original prediction.

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Short Description

This learning scenario invites pupils aged 9–10 to become young scientists and investigate an important question: Can plants survive without light?

Through a hands-on experiment, pupils explore the importance of sunlight for plant growth and development. Working in cooperative teams, they compare two plants placed in different conditions: one exposed to natural light and the other kept in darkness. Both plants receive the same amount of water and care, allowing pupils to investigate how the absence of light may affect their growth and appearance.

Before starting the experiment, pupils share their previous knowledge, ask questions and formulate hypotheses about what they think will happen. Each team member takes on a specific scientific role, encouraging responsibility, teamwork and active participation.

Over several days, pupils observe both plants, measure their height, examine changes in colour and leaves, and record their findings in a scientific worksheet. Throughout the investigation, they are encouraged to question their observations, compare results and consider possible explanations.

Finally, pupils analyse the evidence collected, compare their initial hypotheses with the results and share their conclusions with their classmates.

The main goal is not simply to discover whether plants need light, but to develop scientific and critical thinking.Pupils learn to ask meaningful questions, make predictions, conduct a fair experiment, observe carefully and use evidence to support their ideas. They also discover that unexpected results are an important part of scientific learning.

Information about the Implementation

Students' age: 9-10 Students' language: English

Number of lessons: 6 Duration of one lesson: 45 minutes

For which subject(s) is the activity usable?

Physics ☐ Chemistry ☐ Biology ☒ Science ☒ Maths ☒

Art ☐ Technology & Design ☐ Other:

Level of Inquiry (see information in the Appendix):

0- Confirmatory ☐ 1- Structured ☐ 2- Guided ☒ 3- Open ☐

Select the Science and Engineering Practices that are the focus of the designed unit:
(Detailed information on the practices can be found here (Next Generation Science Standards).)

1		Asking questions and defining problems	☒
2		Developing and using models	☐
3		Planning and carrying out investigations	☒

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4		Analysing and interpreting data	☐
5		Using mathematics and computational thinking	☒
6		Constructing explanations and designing solutions	☐
7		Engaging in argument from evidence	☒
8		Obtaining, evaluating and communicating information	☒

Information about the Learning Scenario

Plant needs, growth and development; light and the introductory concept of photosynthesis; observation and measurement; fair comparisons; interpreting data; oral and written scientific communication; responsibility towards living things.

Objectives:

1. Ask a testable question and write a hypothesis that includes a reason.

2. Explain which factor is changed (light) and identify conditions that should be similar for both plants (plant type, starting size, pot/soil, water, observation time and room temperature).

3. Work in a cooperative team using the actual six classroom role cards: Seed Planner, Sunlight Observer, Water Guardian, Growth Measurer and two Science Reporters. Record each learner's assigned role and three specific tasks in the MY GROUP area of the worksheet.

4. Identify the two plants, their light/dark condition and placement; observe at regular intervals and record plant height, colour, leaves and factual notes.

5. Compare measurements and visible features, using examples from the observation log to support a conclusion.

6. Distinguish what was observed from what is only a possible explanation; acknowledge limitations and revisit the original hypothesis.

Materials and other resources

- For each investigating group: two already-growing plants of the same species and similar initial size (not one seed and one mature plant).
- Identical containers with drainage and comparable soil.
- Water and watering can (ideally a marked jug for amounts).
- A light location and a ventilated dark or covered location
- Wooden sticks/labels.
- Ruler
- Pencil
- Marker
- Printed copy of the school's original two-page worksheet and a set of six printed role cardsfrom "INTRUST PLANTS ROLES.pdf". https://canva.link/qxxypp6qe3944ts
- Optional: a camera, thermometer, timer and graph paper.

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Important logistics: the teacher must prepare a way of keeping the dark plant out of light without sealing it in an airtight container. Prefer similar room temperatures; avoid placing the light plant in a very hot sunny window while the dark plant stays in a cool cupboard. Label pots “Light” and “Dark”. If available, run several pairs to make the comparison more reliable. Do not move the dark plant into light for long periods during observations.

Cooperative roles: use the template https://canva.link/gvzq8ygv8wlb0dw .

Card	What the pupil does	Teacher check
Seed Planner	Helps select comparable plants; plans positions and planting; checks fair treatment at setup.	Can the pupil explain what we keep the same?
Sunlight Observer	Checks which plant is uncovered and which is covered, notes leaks/shadows and describes light-related changes.	Are conditions correctly labelled?
Water Guardian	Keeps watering consistent, records how much water was given and ensures both plants receive appropriate care.	Were quantities and times comparable?
Growth Measurer	Measures height in cm from soil level to the same visible top point, counts leaves and records entries.	Can measures be repeated consistently?
Science Reporter A	Helps record the prediction and the emerging observations; asks how the group knows.	Does the report name actual evidence?
Science Reporter B	Supports the conclusion and the class explanation; invites team contributions.	Does the conclusion acknowledge uncertainty?

For teams smaller than six, one learner may hold two cards; for larger classes make multiple teams. Both Science Reporters should have speaking opportunities. Roles support collaboration but everyone must observe, predict and reflect; do not allow one role to monopolise the worksheet.

Previous knowledge of the students

Pupils should recognise plants as living organisms and have a basic understanding of their needs, including water, light and air. They should be familiar with the idea that plants grow and change over time and that environmental conditions can influence their development.

Students should have some experience observing living things, identifying visible changes and sharing their ideas with classmates. Basic skills such as measuring with a ruler, counting leaves, recording simple observations and working cooperatively may require brief teacher modelling.

They should also be encouraged to ask questions, make simple predictions and explain their ideas, even if they are not yet familiar with scientific investigations. No prior knowledge of photosynthesis or formal experimental procedures is required, as these concepts and skills will be introduced progressively throughout the activities

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Description of the lesson plan (simplified version for teachers)

Lesson 1

The teacher introduces the research question: “Can plants survive without light?” Pupils begin by discussing what plants need to live and grow. The teacher encourages them to share their ideas and explain their reasoning through questions such as: “Why do you think plants need sunlight?”, “What might happen if we put a plant in a dark room?” and “Would a plant without sunlight die immediately?”

Pupils then complete the first section of the worksheet, identifying the basic needs of plants. The teacher explains that scientists do not simply guess answers but investigate questions using observations and evidence.

Working in small groups, pupils discuss their predictions and write a hypothesis using the sentence starter: “We think that the plant without light will… because…”

At the end of the lesson, groups share their hypotheses. The teacher emphasises that different predictions are welcome and that the purpose of the experiment is to discover what actually happens, rather than prove that one prediction is correct.

Lesson 2

The teacher introduces the concept of a fair test, explaining that scientists should change only one condition while keeping the others as similar as possible.

Each group receives two similar plants and the necessary materials. Pupils discuss how they could investigate the effect of light and decide where to place their plants: one in a location with natural light and the other in a dark or covered area.

The teacher guides the discussion with questions such as: “What are we changing in this experiment?”, “Why should both plants receive the same amount of water?” and “What would happen if one plant received more water than the other?”

Each pupil is assigned a responsibility using the original role cards:

- Seed Planner: Helps organise the experiment and checks that both plants receive similar treatment.
- Sunlight Observer: Checks the position of the plants and observes differences related to light.
- Water Guardian: Ensures both plants receive the same amount of water and care.
- Growth Measurer: Measures plant height, counts leaves and records the data.
- Science Reporters (2): Help document the investigation, discuss the findings and communicate the group's conclusions.

Pupils complete the My Group section of their worksheet, recording their group name, members, individual roles and tasks.

Before placing the plants in their assigned locations, pupils observe their initial appearance and identify characteristics they will monitor, including height, leaf colour and number of leaves.

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The lesson finishes with a discussion about why accurate observations and consistent conditions are essential for obtaining reliable scientific results.

Lesson 3

Pupils begin by reviewing their original hypotheses and recalling the conditions established for the two plants.

Each group carefully observes both plants. The Growth Measurer, supported by the other group members, uses a ruler to measure their height in centimetres and counts their leaves. Pupils also examine the colour and general appearance of the plants, looking for visible changes.

They record their findings in the Daily Observations table of the worksheet, using the columns Day, Height, Colour, Leaves and Notes.

The teacher encourages careful observation through questions such as: “Are both plants growing at the same speed?”, “Have you noticed any changes in their leaves?” and “Can a plant become taller without necessarily becoming healthier?”

Pupils are reminded to record what they actually observe, rather than what they expected to happen. The teacher introduces the distinction between an observation and an interpretation using simple examples.

Short daily observations continue between lessons, allowing pupils to monitor changes over several days. These observations can be completed in approximately 5–10 minutes without requiring additional full lessons.

Lesson 4

After several days of observation, pupils bring both plants together temporarily to compare their appearance, returning them to their assigned conditions afterwards.

Working collaboratively, groups review their observation tables and examine differences in plant height, colour, leaf development and general condition.

The teacher asks guiding questions such as: “Which plant looks healthier? What makes you think that?”, “Did both plants change in the same way?” and “What evidence supports your answer?”

Pupils discuss whether a plant growing taller necessarily means that it is developing better. The teacher encourages them to consider several characteristics rather than relying on height alone.

Each group selects the most significant observations and records them in the Notes section or the drawing spaces provided in the worksheet.

The activity finishes with a whole-class discussion in which pupils compare findings and consider why different groups might have obtained slightly different results.

Lesson 5

The teacher asks pupils to revisit the original research question and examine the information collected throughout the experiment.

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In their groups, pupils compare the initial and final measurements of both plants and identify the most important changes.

The teacher introduces a simple explanation of photosynthesis, describing how plants use light to produce the food they need for growth and development. This is explained using age-appropriate language without requiring pupils to understand complex chemical processes.

The teacher encourages critical thinking through questions such as: “What does our experiment tell us about light?”, “Can we be certain that light caused the differences?” and “What could we improve if we repeated the experiment?”

Pupils begin completing the Results section of their worksheet, explaining the differences observed between the two plants. They are encouraged to support their ideas with specific observations or measurements.

The teacher highlights that scientific conclusions must be based on evidence and that an experiment with only two plants has limitations. Pupils consider how testing more plants could make their findings more reliable.

Lesson 5

During the final lesson, pupils work in their groups to complete the Conclusion & Reflection section of the worksheet.

They revisit their initial hypotheses and compare their predictions with the results obtained. Pupils indicate whether their predictions were correct and explain what they learned from the investigation.

The teacher encourages them to construct conclusions supported by evidence, using sentence starters such as: “We observed that…”, “Our results show that…” and “We think this happened because…”

Each group prepares a short oral presentation. The two Science Reporters help organise the information, while the other group members contribute observations related to their responsibilities. Pupils explain how they organised the experiment, what differences they noticed and what conclusions they reached.

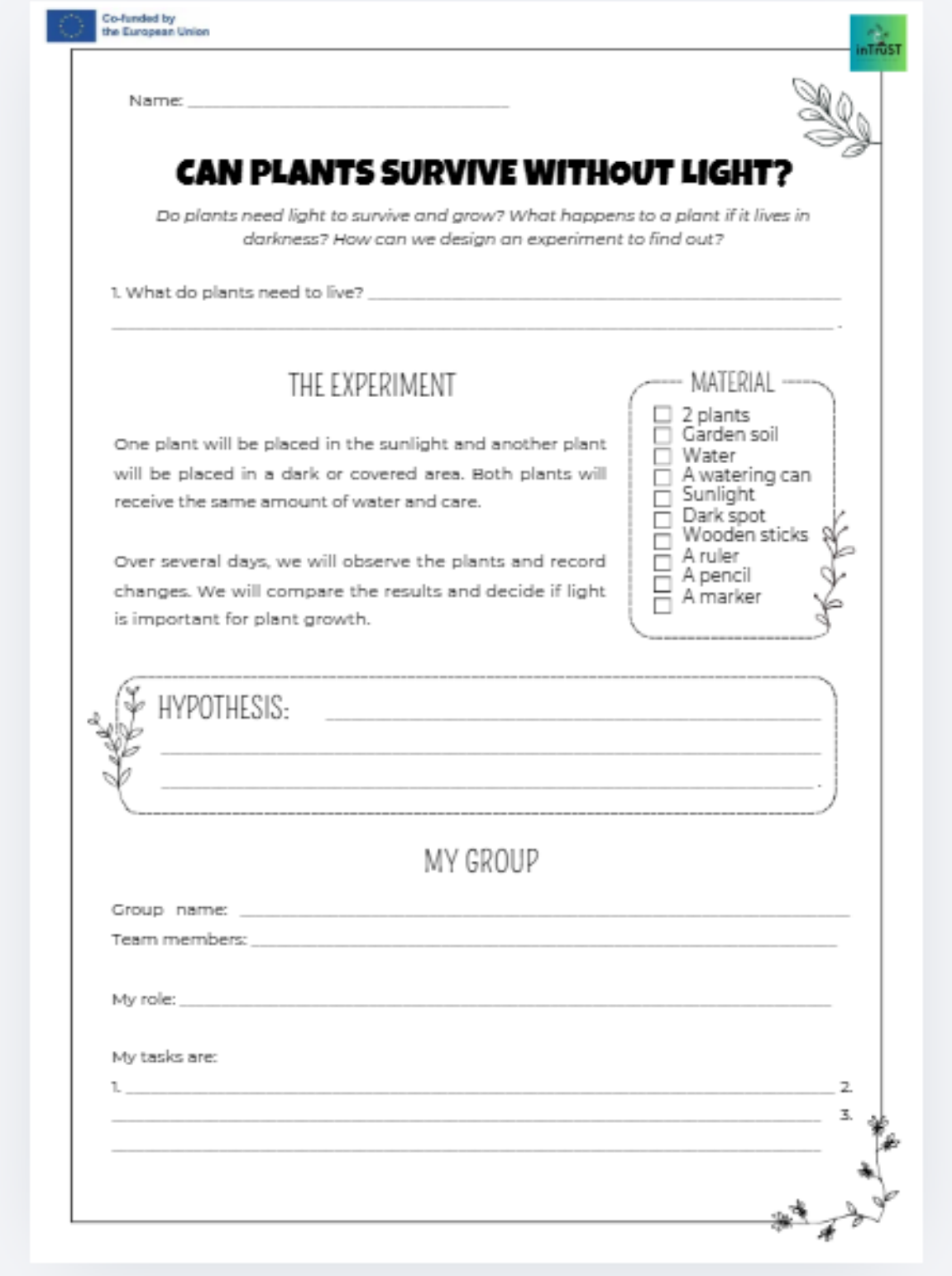
After each presentation, classmates are invited to ask questions, encouraging scientific dialogue and respectful discussion.

The teacher concludes the unit by reflecting on the importance of sunlight for plants and connecting the investigation with everyday situations, such as caring for classroom plants or choosing suitable places for growing plants.

Finally, pupils discuss what they would change if they repeated the experiment, reinforcing the idea that scientific knowledge develops through questioning, testing, observing and improving investigations.

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Worksheets: https://canva.link/qxxypp6qe3944ts and https://canva.link/gvzq8ygv8wlb0dw



Name: _____

CAN PLANTS SURVIVE WITHOUT LIGHT?

Do plants need light to survive and grow? What happens to a plant if it lives in darkness? How can we design an experiment to find out?

1. What do plants need to live? _____

_____.

THE EXPERIMENT

One plant will be placed in the sunlight and another plant will be placed in a dark or covered area. Both plants will receive the same amount of water and care.

Over several days, we will observe the plants and record changes. We will compare the results and decide if light is important for plant growth.

MATERIAL

- ☐ 2 plants
- ☐ Garden soil
- ☐ Water
- ☐ A watering can
- ☐ Sunlight
- ☐ Dark spot
- ☐ Wooden sticks
- ☐ A ruler
- ☐ A pencil
- ☐ A marker

HYPOTHESIS: _____

_____

_____.

MY GROUP

Group name: _____

Team members: _____

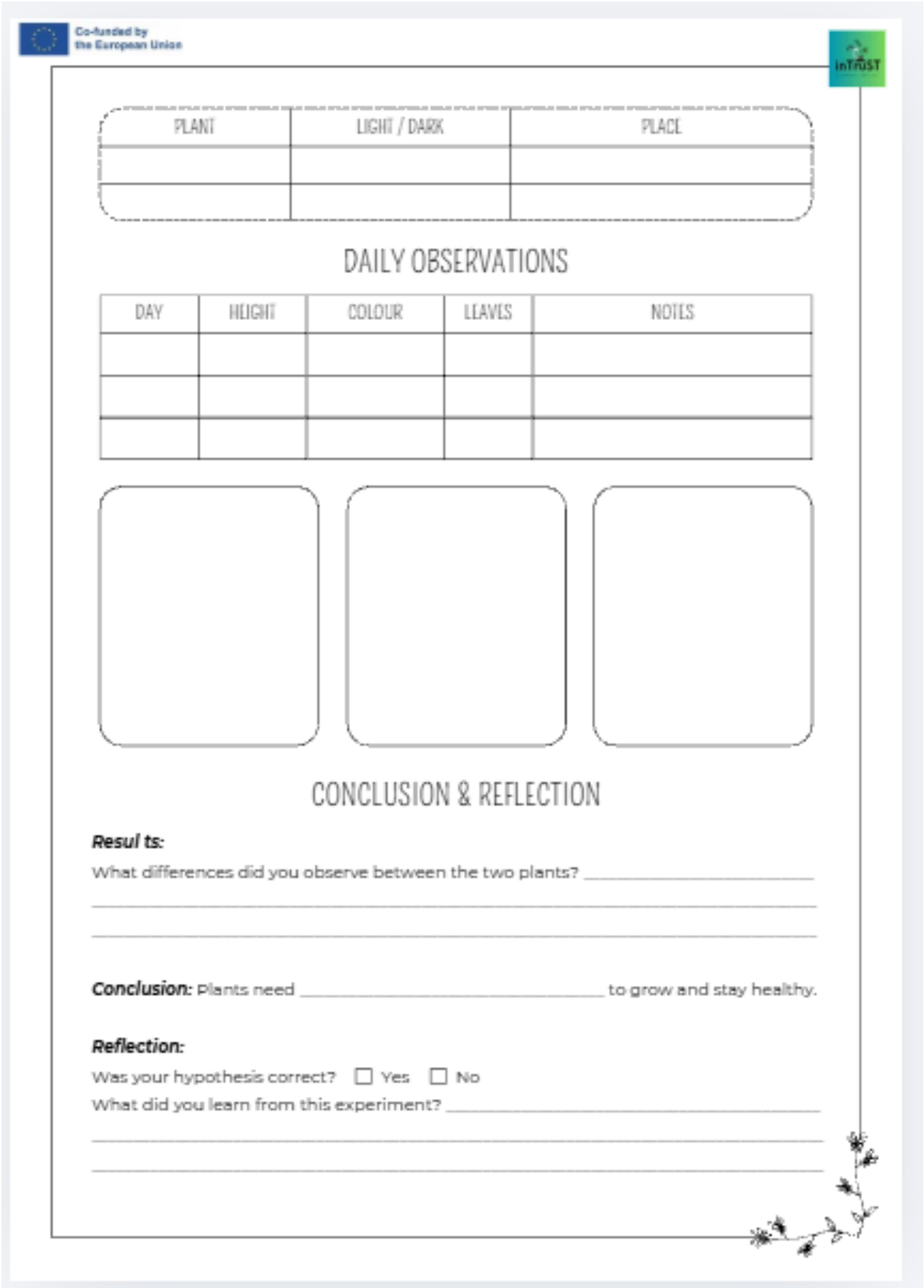
My role: _____

My tasks are:

1. _____ 2. _____

3. _____

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Seed Planner



- Decides where and how the plants will be placed in the garden
- Helps prepare the experiment setup
- Makes sure both plants are treated the same (fair test)

Sunlight Observer



- Checks if the plants are in the correct place (light or dark).
- Observes how light affects the plants
- Reports any changes related to sunlight

Water Guardian



- Makes sure the plants get the right amount of water
- Waters the plants carefully
- Ensures both plants receive the same care

Growth Measurer



- Measures the height of the plants
- Counts the number of leaves
- Writes down the measurements in the observation table

Science Reporter



- Helps write the hypothesis and conclusion
- Explains the results to the class
- Shares what the group has learned

Science Reporter



- Helps write the hypothesis and conclusion
- Explains the results to the class
- Shares what the group has learned

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Appendix

Level of Inquiry

Refer to the table below for information about the level of inquiry according to Orosz et al. (2023). Select the relevant level of inquiry for your unit in your template above. Please note that, as discussed during LTT2, you can adjust the responsibilities assigned to students and teachers at Levels 1 and 2 if you wish.

Level of Inquiry	Problem/ Question	Procedures	Interpretation of Results	Purpose & Requirements
Level 0 – Confirmatory Inquiry	Teacher	Teacher	Teacher	Students reproduce the results
Level 1 – Structured Inquiry	Teacher	Teacher	Students	Practising simple inquiry skills (e.g., observation, measurement, data interpretation, discussion of results, documentation) or introducing students to IBL
Level 2 – Guided Inquiry	Teacher	Students	Students	Opportunity for cooperative learning, room for creativity, development of skills and abilities (above + formulation of hypotheses, designing the experiment)
Level 3 – Open Inquiry	Students	Students	Students	Greatest level of freedom; demands advanced inquiry skills, reasoning ability and creativity, and high level of responsibility

Science and Engineering Practices

As a framework for designing the learning units, this project used the science and engineering practices according to the Next Generation Science Standards (NGSS). Detailed descriptions of each practice can be found in the Appendix F of the NGSS:
https://www.nextgenscience.org/sites/default/files/Appendix%20F%20%20Science%20and%20Engineering%20Practices%20in%20the%20NGSS%20-%20FINAL%20060513.pdf

Literature

NGSS Lead States. (2013). *Next Generation Science Standards: For states, by states. Appendix F: Science and engineering practices in the NGSS.* National Academies Press. https://www.nextgenscience.org/

Orosz, G., Németh, V., Kovács, L., Somogyi, Z., & Korom, E. (2023). Guided inquiry-based learning in secondary-school chemistry classes: A case study. *Chemistry Education Research and Practice*, *24*(1), 50–70. https://doi.org/10.1039/D2RP00110A

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