ACTIVITY 2

Understanding the Night – Types of Light Pollution and Night Diary

Duration	45 minutes
Age group	15–19 yo.
Aim and objectives	**Aim and objectives** **Aim:** To help Learners recognise what a natural night environment looks like, understand the main types of light pollution, and begin observing their own local night-time conditions using a simple Night Diary. **Objectives:** Learners will: • Describe the difference between a natural dark night sky and a light-polluted sky. • Identify and define four main types of light pollution: **skyglow, glare, light trespass, clutter**. • Locate their region on a light pollution map and relate it to their own experience of the night sky. • Learn how to use a **Night Diary** to record the presence of artificial lights, visible stars and their own feelings at night.
Learning Outcomes in Line with Curriculum	**Natural Sciences / Physics / Environmental Science** Learners will be able to: • Describe basic features of a night sky with low and high light pollution (number of visible stars, brightness of sky background). • Explain that artificial light at night changes natural levels of darkness and can affect living organisms and the observation of the sky. **Geography / Environmental Studies** Learners will be able to: • Interpret a simple light pollution map (e.g. colour scale showing brightness of night sky) and locate their approximate area. • Identify common local sources of artificial light (streetlights, shops, advertising, houses, traffic). **Civic Education / Sustainable Development** Learners will be able to: • Recognise that light can be a form of pollution, not only a useful resource.

Co-funded by the European Union

	• Start reflecting on how individual and community choices influence night-time environments. **Cross-Curricular Skills (Key Competences for Lifelong Learning – European Reference Framework):** • **Scientific literacy:** interpreting maps and images, using observation tools (Night Diary). • **Digital competence (optional):** using online maps or apps to explore light pollution. • **Personal, social and learning competence:** reflecting on personal experiences of night, comfort and sleep.
Teaching Methods	• Whole-class brainstorming and guided discussion • Short Educator presentation using images and/or slides • Pair / small-group matching task (terms and pictures) • Individual planning of Night Diary observation

Materials Needed

- ☐ Projector or printed images showing:
  - a **pristine dark night sky** with many stars (attachment 1);
  - a **light-polluted sky** above a town or city (attachment 9).
- ☐ Simple diagram of a **day–night cycle** and human "body clock" (optional slide or hand-drawn on board).
- ☐ Images or diagrams illustrating the four types of light pollution (one or more examples for each: skyglow, glare, light trespass, clutter).
- ☐ A **regional or global light pollution map** (printed large or projected).
- ☐ "Understanding the Night – Night Diary Worksheet" (one per Learner).
  - Page 1: definitions and matching exercise for the four types of light pollution.
  - Page 2: Night Diary table.
- ☐ Board and markers.

Workshop/Lesson Plan

Duration	Description	Notes
5 minutes	**Opening – When did you last see the stars?** Educator asks: "When was the last time you clearly saw the Milky Way or a sky full of stars?" Learners raise hands or	This sets a personal context and shows how common (or rare) dark skies are for the group.

Co-funded by the European Union

	share brief answers. Quick class impression: many, few or almost no Learners have seen a very starry sky.	
10 minutes	**Mini-presentation – Natural night and our body clock** Educator shows two contrasting images: a natural dark sky vs. a bright, light-polluted sky. Short guided questions: "What differences do you notice?" "Which sky have you seen more often?" Educator then shows a simple diagram of the 24-hour day–night cycle and explains that many processes in nature follow a daily rhythm (body temperature, hormones, sleep–wake patterns, animal activity). Darkness is an important signal telling living beings that it is time to rest or change behaviour. Link briefly to human **sleep** and "body clock" (circadian rhythm), without going into too much technical detail.	For younger or less experienced groups use "body clock" and "sleep hormone"; for older Learners you may name **melatonin** and **circadia n rhythm**.
10 minutes	**Types of light pollution – input** Educator introduces four basic types of light pollution, one by one, using simple images: 1) **Skyglow** – bright dome over cities that hides stars; 2) **Glare** – light that is too bright or badly aimed, making it hard to see; 3) **Light trespass** – light going where it is not wanted (e.g. into bedroom windows); 4) **Clutter** – groups of too many bright lights close together (e.g. advertising, junctions). Short, clear definition for each is written on the board.	Keep examples concrete: streetlights, car headlights, shop signs, sports fields. Ask Learners for local examples they have seen.
10 minutes	**Pair task – Matching terms and pictures** Learners work in pairs with the worksheet (Page 1). They see the four terms and four short descriptions or photos. Their task: match each term to the correct description and picture (skyglow, glare, light trespass, clutter). Educator checks answers with the class and clarifies any confusion, using real or local examples where possible (e.g. a lamp shining directly into a flat at night = light trespass).	This step helps fix vocabulary and concepts before they go out to observe their own environment with the Night Diary.

Co-funded by the European Union

10 minutes	**Our region on the light pollution map** Educator shows a regional or global light pollution map (colour-coded). Learners try to find their country and approximate area. Guiding questions: “What colour is our area?” “What does that colour mean in terms of brightness?” “Does that match your experience – do you see many stars or only a few?” Together they name typical local light sources (shops, streetlights, car parks, houses, roads) and write a short list on the board.	If digital access is available, Learners can briefly explore an online light pollution map. Otherwise use printed material and Educator guidance.
10 minutes	**Introducing the Night Diary (home observation)** Educator explains that each Learner will complete a **Night Diary** on one evening before the next lesson. It is a simple observation of their local night environment, from a safe place (home, balcony, garden, window, school yard if supervised). Learners look at Page 2 of the worksheet, which contains a table with columns such as: time, place (room, street, garden), artificial lights visible, brightness level, number of visible stars (many / some / none), and how they feel (comfortable, awake, sleepy, irritated, etc.). Together, Educator and class fill in the **first row** as an example (e.g. “Last night at 21:00 from my window – streetlights, neighbours’ windows, brightness medium, no stars visible, I felt quite awake.”). Educator gives clear expectations: number of entries (e.g. 3–4 short observations in one evening), observing from safe locations, and bringing the completed diary to the next relevant lesson.	Remind Learners that this is not about staying up very late; they can use early evening observations. Emphasise safety: observe from safe, familiar places, no walking alone in dark streets just for the diary.

Reflection Questions
About the Night Sky

Co-funded by the European Union

- How would you describe a **natural** night sky? What can you see, and how does it feel?
- How would you describe the night sky where you live? Is it closer to the natural sky or to a brightly lit city sky?

Types of Light Pollution

- In your own words, what is **skyglow**? Where do you think it comes from?
- Which type of light pollution (glare, light trespass, clutter) do you find most disturbing, and why?
- Think of a place you know (a road junction, sports field, shopping street). Which types of light pollution can you see there?

Night Diary Reflection

(After Learners complete the diary.)

- Was there **more or less light** at night than you expected before doing the diary?
- Could you see any stars? If yes, where was the darkest and most comfortable place to be?
- What was the most annoying or unnecessary light you noticed?

Link to Health and Environment

- Do you think the amount of light at night around you helps you sleep better or makes it harder? Why?
- How might the types of light pollution you observed affect animals (insects, birds, bats) living in your area?

Towards Solutions

- Choose one example of light you recorded in your Night Diary. How could it be improved using the principles of responsible lighting (only when needed, only where needed, minimum brightness, warm colour, good shielding)?
- Who could you talk to about this (family, neighbours, school staff, local council)? What could you ask them to change?

Co-funded by
the European Union

Worksheets/Attachments

PAGE 1 – Types of light pollution

Name: _____ Date: _____

1. Match the terms with the correct description

Write the correct letter (A–D) next to each term.

1. **Skyglow** _____
2. **Glare** _____
3. **Light trespass** _____
4. **Clutter** _____

Descriptions:

A. Light that is so bright or badly aimed that it hurts your eyes or makes it difficult to see properly.

B. A bright dome of light above towns and cities that hides the stars.

C. Groups of many bright lights placed close together, which can be confusing or distracting.

D. Light shining where it is not wanted or needed, for example into bedroom windows.

2. Look at the pictures your Educator shows

For each picture, write which type of light pollution you think it shows.

- Picture 1: _____
- Picture 2: _____
- Picture 3: _____
- Picture 4: _____

(If a picture shows more than one type, you can write two.)

3. Your experience

Answer in 1–2 sentences each.

a) Which type of light pollution do you find **most annoying** where you live? Why?

b) Think of a place you know (for example a road junction, sports field or shopping street). Which types of light pollution can you see there?

Co-funded by the European Union

PAGE 2 – Night Diary

Name: _____ Date of observation: _____

You will use this page on **one evening** to observe the night where you live.
Choose a **safe place** (for example your home, balcony, garden, or a supervised school area).
Make **3–4 short observations** at different times in the evening.

Instructions

For each observation:

1. Choose a time (for example 19:30, 20:15, 21:00...).
2. Note **where you are**.
3. List the **artificial lights** you can see.
4. Decide how **bright** it is.
5. Note if you can see any **stars**.
6. Write how you **feel** in that place at that moment.

Time	Where am I? (room, street, garden…)	Artificial lights I can see (type, number if possible)	How bright is it? (very bright / medium / dim / almost dark)	Can I see the starts? (many / some / none)	How do I feel? (awake / sleepy / relaxed / irritated / other)

Co-funded by
the European Union

4. Reflection on your Night Diary

Answer after you complete the table.

a) Was there **more or less artificial light** than you expected before doing this diary? Explain in one or two sentences.

b) Where was the **most comfortable place** to be during your observations? Why?

c) Which light did you find the **most unnecessary or disturbing**?
What could be changed to make it better (for people and for nature)?

Co-funded by
the European Union

Title of activity

Duration	45 minutes
Age group	15–19 yo.
Aim and objectives	**Aim:** To support Learners in transforming their knowledge about light pollution and ALAN into a simple, concrete action idea or awareness campaign for their school or community. **Objectives:** Learners will: • Recall key ecological and health impacts of artificial light at night from previous activities. • Apply the **five principles of responsible lighting** to a real place (school, street, home, village). • Work in small groups to design a simple product (poster, event, social media idea, or proposal) promoting more responsible lighting. • Present their idea clearly and give/receive constructive feedback.
Learning Outcomes in Line with Curriculum	**Natural Sciences / Environmental Science** Learners will be able to: • Link specific responsible lighting measures (timing, direction, colour, brightness) to reduced impacts on biodiversity and human health. **Geography / Environmental Studies** Learners will be able to: • Analyse a local place from the perspective of light pollution (sources, types, affected species and people). • Suggest practical improvements that respect both safety and environmental needs. **Civic Education / Sustainable Development** Learners will be able to: • Plan a simple awareness-raising action or advocacy step for their school or community. • Reflect on their own role as active citizens in environmental protection. **Cross-Curricular Skills (Key Competences for Lifelong Learning – European Reference Framework):** • **Citizenship competence:** engaging with local issues and suggesting solutions.

Co-funded by the European Union

	• **Entrepreneurship competence:** designing and communicating a small "project" or campaign. • **Personal, social and learning competence:** collaborating, negotiating roles, giving peer feedback. • **Digital competence (optional):** planning use of digital media for awareness (social media posts, short videos).
Teaching Methods	• Short recap and whole-class discussion • Group design work (project / campaign planning) • Gallery walk or mini-presentations • Peer feedback and individual reflection

Materials Needed

- Large sheets of paper (A3 or flipchart) for posters / planning.
- Coloured pens, markers, pencils.
- Sticky notes (for peer feedback).
- "Design for the Dark – Group Planning Worksheet" (one per group).
- Board and markers.
- Optional: printed reminder of the **five principles of responsible lighting**.

Workshop/Lesson Plan

Duration	Description	Notes
5 minutes	**Recap – Why does light at night matter?** Educator asks: "What do you remember from our previous activities about how light pollution affects animals, plants and humans?" Learners quickly share examples (e.g. bats avoiding bright areas, moths at lamps instead of flowers, sleep problems, plants under constant light). Educator writes key words on the board and briefly reminds the class of the **five principles of responsible lighting** (only when needed, only where needed, minimum brightness, warm colour, shielding).	Keep recap fast and focused. This links Activities 1–2 (and plant lab, if already done) to this more action-oriented session.
10 minutes	**Choosing a place and defining the problem** Learners form small groups (3–5). Each	Educator circulates, helping groups choose manageable, concrete places. Encourage

	group chooses **one real place** to focus on: e.g. school entrance or car park, playground, street, path to school, a local square, or even a part of their village/town seen in the Night Diaries. They briefly discuss: What lights are there now? When are they on? Who or what might be affected (people, animals, plants)? Using Section 1 of the group worksheet, they write a short description of their chosen place, main audience (e.g. pupils, parents, neighbours) and the main light pollution issue (e.g. skyglow from a sports field, light trespass into homes, glare from car park lights).	them to pick somewhere they know well.
15 minutes	**Group design work – Planning the campaign / action** Each group chooses **one format** for their "Design for the Dark" idea, for example: • Poster or infographic for school corridors. • Plan for a "Switch Off the Light" event (e.g. one evening of reduced lighting + stargazing / night walk). • Short written proposal or letter to the school or local council about changing specific lights. • Simple social media campaign idea (series of posts, short video concept). Using the worksheet, groups write their **main message** (what they want people to understand), **call to action** (what they want people to do), and check their idea against the five lighting principles. If they have time, they start sketching the actual poster/plan on A3 paper.	Emphasise that the idea should be **realistic** for your context. It is fine if the product is a clear draft rather than a perfect final design.
10 minutes	**Gallery walk and feedback** Groups display their work (poster drafts, event plans, proposal outlines) around the room. Learners walk around and look at other groups' ideas. Each Learner leaves at least **one sticky note** of feedback on two other projects, using the simple structure: "I liked…" and "One suggestion…".	If space is limited, groups can present from their desks and classmates rotate or you do quick mini-presentations instead of a gallery walk.
5 minutes	**Individual reflection and wrap-up** Learners return to their seats. On their own (in notebooks or at the bottom of the	You can collect group worksheets if you want to choose one or two projects

Co-funded by the European Union

	worksheet), they answer two short questions: “Which idea from today do you think is most realistic to try this year?” and “What is one action about light pollution that *you personally* would support?” Educator invites a few Learners to share, then closes by suggesting that some ideas could be developed further in future lessons or projects.	to develop (e.g. a real school switch-off evening).

Reflection Questions

Understanding the problem

- What is the main light pollution issue in the place your group chose?
- Who or what is most affected there (people, animals, plants)?

Quality of your design

- How does your idea use one or more of the five responsible lighting principles?
- Is your proposal realistic in terms of cost, time and who needs to agree? Why/why not?

Citizenship and personal role

- Who would you need to talk to in order to make your idea happen (e.g. school management, neighbours, local council, family)?
- What could be a first small step towards trying this idea in real life?

Looking ahead

- Which part of your group work today went best (teamwork, creativity, planning, facts)?
- What would you change or improve in your design if you had another lesson to work on it?

Co-funded by the European Union

Worksheets/Attachments

Activity 3 – Learner Worksheet

Design for the Dark – Group Planning Sheet

Group members: _____

Activity 3 – Design for the Dark

Class: _____ Date: _____

SECTION 1 – Our place and our audience

1. **Our place**
   Which place are we focusing on? (For example: school entrance, car park, playground, street, path to school, local square…)

2. **Who is our main audience?**
   (For example: pupils, Educators, parents, neighbours, local council, shop owners…)

3. **What is the main light pollution problem there?**
   Tick all that apply and add details.

☐ Skyglow (bright sky hiding stars)

☐ Glare (too bright / badly aimed lights, hard to see)

☐ Light trespass (light shining into homes or places where it is not wanted)

☐ Clutter (too many lights close together)

Describe it in 1–2 sentences:

Co-funded by the European Union

SECTION 2 – Our message and call to action

4. **Our main message (one sentence)**

What do we want people to understand or remember?

“We want people to understand that…

_____

_____

_____”

5. **Our call to action (one clear request)**

What do we want people to do differently?

“We want people to…

_____

_____

_____”

(Examples: “switch off outside lights after 23:00”, “use warm-coloured bulbs”, “talk to the school about changing car park lights”, “reduce screen use at night”.)

Co-funded by
the European Union

SECTION 3 – Using responsible lighting principles

The **five principles of responsible lighting** are:

1. Only light **when** needed.
2. Only light **where** needed.
3. Use the **minimum brightness** needed.
4. Use **warm-coloured** light.
5. **Shield** lights so they shine downwards, not into the sky or windows.
6. For your idea, write one or two notes for each principle that applies:

- When:

_____
_____

- Where:

_____
_____

- How bright:

_____
_____

- Colour:

_____
_____

- Shielding / direction:

_____
_____

(If a principle does not really apply to your idea, you can write “not relevant”.)

Co-funded by
the European Union

SECTION 4 – Our product
Tick your chosen format:

☐ Poster or infographic

☐ "Switch Off the Light" event

☐ Proposal / letter to school / council

☐ Social media campaign (posts, short video, etc.)

☐ Other: _____

7. **If it is a poster / infographic:**

- Title / slogan:

_____

- 3–5 key points or facts we will include:
    1.
    2.
    3.
    4.
    5.
- Visual ideas (drawings, symbols, photos):

_____
_____
_____
_____

8. **If it is an event ("Switch Off the Light" etc.):**

- Name of the event:

_____

- When and where will it happen?

_____

- Short programme (3–4 steps or activities):
    1.
    2.
    3.
    4.

9. **If it is a proposal / letter:**

- Who will receive it? (school head, caretaker, council, etc.)

Co-funded by
the European Union

- What concrete change are you asking for?

- Why is this change useful?
  (Think of wildlife, people's sleep, safety, energy saving.)

10. **If it is a social media campaign:**

- Which platform(s)?

- Main hashtag or title:

- 2–3 post or video ideas:
  1.
  2.
  3.

Co-funded by
the European Union

ACTIVITY 4

Plant Growth Under Different Light – Part 1: Set-Up & Hypothesis

Duration	45 minutes
Age group	15–19 yo.
Aim and objectives	**Aim:** To set up a simple experiment comparing plant growth under constant artificial light and a natural light–dark cycle, and to formulate hypotheses about the effects of artificial light at night (ALAN) on plants. **Objectives:** Learners will: • Understand that plants, like animals and humans, have internal "clocks" influenced by light and darkness. • Identify the **independent**, **dependent** and **controlled** variables in a basic plant experiment. • Set up two comparable plant groups where the only planned difference is **light at night**. • Formulate a clear hypothesis about how constant artificial light at night will affect germination and growth.
Learning Outcomes in Line with Curriculum	**Natural Sciences / Biology / Environmental Science** Learners will be able to: • Describe how plants respond to changes in light–dark cycles (germination, growth, timing of flowering). • Explain that artificial light at night can interfere with natural signals used by plants. • Recognise the importance of controlled experiments to study environmental impacts on living organisms. **Geography / Environmental Studies** Learners will be able to: • Relate plant responses in the experiment to real environments (trees near streetlights, illuminated parks, road verges). • Identify ALAN as a factor that modifies local ecosystems. **Civic Education / Sustainable Development** Learners will be able to: • Recognise that responsible lighting in towns and cities can help protect plants and ecosystems.

Co-funded by the European Union

	• Reflect on how everyday lighting choices contribute to or reduce environmental pressures. **Cross-Curricular Skills (Key Competences for Lifelong Learning – European Reference Framework):** • **Scientific literacy:** designing and setting up a simple controlled experiment. • **Mathematical competence:** planning measurements (counts, heights, simple percentages). • **Personal, social and learning competence:** working in small groups, sharing responsibilities for an ongoing experiment.
Teaching Methods	• Guided class discussion • Small-group planning • Hands-on practical work (sowing seeds, organising light conditions) • Worksheet-based reflection

Materials Needed
For the whole class (adapt numbers to group size):

- Fast-growing seeds (e.g. broccoli, radish, peas, mustard).
- Small pots or recycled containers with drainage holes.
- Soil or other suitable growing medium.
- Waterproof labels and permanent markers.
- Rulers or measuring tapes.
- Two separate growing locations:
    - **Natural light–dark cycle group:** near a window / outdoor area that becomes dark at night.
    - **Constant light group:** safe place where a lamp can remain on for many hours at night.
- Lamps with safe, low-heat bulbs (e.g. LED desk lamps) for the constant-light group.
- Photocopies of **Activity 4 Learner worksheet – Plant Growth Lab: Set-Up & Hypothesis** (one per group).

Co-funded by the European Union

Duration	Description	Notes
10 Minutes	**Introduction: Plants and darkness** • Educator asks: "Do you think plants know when it is day or night? How?" Learners share ideas (light, temperature, opening/closing leaves, etc.). • Educator explains that plants, like animals and humans, have internal "clocks" and respond to light–dark cycles for germination, growth and flowering. • Short link to artificial light at night: many plants in towns and cities receive light all night, which can confuse their timing.	Keep language simple ("body clock", "day–night rhythm") and connect quickly to previous activities about ALAN (e.g. ecosystems, Night Diary), so Learners see the continuity.
10 minutes	**Research question and variables** • Educator writes the class research question on the board, for example: "How does constant artificial light at night affect the germination and growth of [chosen plant] compared to a natural light–dark cycle?" • In small groups, Learners complete Parts A–C of the worksheet: they rewrite the question in their own words, formulate a hypothesis, and identify the independent, dependent and controlled variables.	Educator may model one example of variables on the board (independent = light at night; dependent = germination/height/colour; controlled = soil, seeds, water, pot size, temperature) before Learners work in groups.
15 minutes	**Setting up the experiment** • Learners complete Part D of the worksheet: choose plant species, decide how many seeds per pot/tray. • Each group prepares two pots or trays, fills them with soil, and labels them clearly as "Natural cycle – Group X" and "Constant light – Group X". • Learners sow the same number of seeds in each pot. • Educator and Learners place pots in their two locations: near a window/dark area for the natural cycle group, and under/near a lamp for the constant light group. • Together they agree when the lamp will be switched on and off (for example, from late afternoon until early morning).	Emphasise fairness: the **only planned difference** should be light at night. Educator checks that lamps are safe (stable, not overheating, away from flammable materials). If space is limited, groups can share pots (e.g. 3–4 groups per treatment) rather than each group having both treatments.
10 minutes	**Observation plan and prediction** • As a class, they decide how often to observe the plants (e.g. every school day or every second day) and what to note	Educator makes sure at least one person in each group is responsible for checking plants on agreed

Co-funded by the European Union

	(number of seedlings, height, colour, general appearance). • Learners complete Part E of the worksheet: an observation table with dates/times and what will be measured. • Finally, Learners answer Part F: a short prediction about what might happen to trees or plants growing for years next to a bright streetlight, based on their hypothesis.	days (or the Educator records data for the whole class). Remind Learners that this experiment continues between lessons and will be used in Activity 5.

- What is the **one main difference** between the two plant groups in your experiment?
- Why must other conditions (soil, pot size, seed number, watering) be kept as similar as possible?

Hypothesis and expectations

- What do you expect plants under constant artificial light at night to look like after several days?
- Which signs will you look for to decide if plants are healthy or stressed (colour, strength, growth, germination)?

Link to real environments

- Where in your town or village might plants or trees receive artificial light all night?
- Based on your hypothesis, what might happen to those plants over months or years?

ACTIVITY 5

Plant Growth Under Different Light – Part 2: Results & Reflection

Duration	45 minutes
Age group	15–19 yo.
Aim and objectives	**Aim:** To analyse and interpret the results of the plant growth experiment and connect them to the wider impact of artificial light at night on plants and ecosystems. **Objectives:** Learners will: • Summarise data from their plant experiment (germination, height, appearance). • Compare plant growth under constant artificial light and under a natural light–dark cycle.

Co-funded by the European Union

	• Decide whether their original hypothesis was supported, partly supported or not supported. • Use their results to explain why ALAN can disturb plants and species that depend on them. • Suggest realistic lighting changes that would reduce negative impacts on plants.
Learning Outcomes in Line with Curriculum	**Natural Sciences / Biology / Environmental Science** Learners will be able to: • Interpret observational data on plant growth and relate it to different environmental conditions. • Describe possible plant responses to constant light (stretching, colour changes, altered timing). • Explain that changes in plant timing and health can influence wider ecosystems. **Geography / Environmental Studies** Learners will be able to: • Relate experimental findings to real-world locations (street trees, illuminated parks, roadside vegetation). • Identify artificial light at night as a factor that may alter local biodiversity. **Civic Education / Sustainable Development** Learners will be able to: • Propose simple lighting changes that support plant health and ecosystem balance. • Reflect on the balance between safety, comfort and environmental protection in lighting decisions. **Cross-Curricular Skills (Key Competences for Lifelong Learning – European Reference Framework):** • **Scientific literacy:** drawing conclusions from experimental evidence and recognising limitations. • **Mathematical competence:** calculating simple averages and percentages and comparing values. • **Citizenship competence:** linking small-scale experimental results to local environmental choices.
Teaching Methods	• Practical: final measurements and observations. • Problem-solving: data summary and evaluation of hypotheses.

Co-funded by the European Union

	• Interactive: group sharing and class discussion. • Reflective: individual written reflection on real-world implications.

Materials Needed

- ☐ Plant pots from Activity 4 (both natural cycle and constant light groups).
- ☐ Rulers or measuring tapes.
- ☐ Board and markers.
- ☐ Printed **Learner worksheet: Plant Growth Lab – Results & Reflection** (Activity 5 worksheet).
- ☐ Optional: camera/phones for taking pictures of final results.

Workshop/Lesson Plan

Duration	Description	Notes
10 minutes	**Final observations** • In their groups, Learners visit both plant groups (natural cycle and constant light). • They record final data in the observation table: number of seeds germinated, height of the tallest plant, leaf colour and general appearance for each group.	Encourage careful but simple measurement (cm is fine). If some groups missed earlier observations, they can still work with the final data as a snapshot comparison.
15 minutes	**Data summary and hypothesis check** • Groups complete Part B of the worksheet: they calculate or estimate germination percentages and average heights, and describe the appearance and health of plants in each group. • In Part C, they rewrite or summarise their original hypothesis from Activity 4 and decide whether it is fully supported, partly supported or not supported, using at least one piece of evidence from their data.	Educator circulates to support basic calculations. Emphasise that "partly supported" is normal in real experiments and that unexpected results are still valuable.
10 minutes	**Whole-class comparison and evaluation** • Each group briefly shares one or two key findings: Which group had better germination? Which group had taller plants? Which group looked healthier? • Educator notes main patterns on the board (e.g. "constant light: taller but paler", "little difference", "natural cycle: stronger plants"). • Short discussion of possible reasons	If different groups see different patterns, use this to discuss experimental variation, small sample sizes and why scientists repeat experiments. Highlight that the class is looking for overall trends, not "perfect" results.

Co-funded by the European Union

	(plant hormones, lack of dark period, stress) and other factors that may have influenced results (watering, temperature, daylight).	
10 minutes	**Linking to ALAN, ecosystems and action** • Learners complete Parts E and F of the worksheet: they imagine a tree growing next to a bright streetlight and describe possible changes in growth, leaf/flower timing and health, then explain how this could affect insects, birds or other animals that use the tree. • They suggest one realistic local lighting change (e.g. timers, dimming, shielding near trees) that would help plants while keeping people safe, and think about who they could share their results with (Educator, caretaker, council, etc.). • Short plenary wrap-up: the Educator reinforces that the experiment is a small model of how ALAN influences vegetation and, through it, whole ecosystems.	Educator can collect a few ideas and, if appropriate, choose one or two that could realistically be discussed with the school management or local community as a follow-up action.

Reflection Questions

Interpreting the experiment

- In your own words, what did this experiment show about the effects of constant artificial light at night on plants?
- Did your results match your expectations from Activity 4? Why or why not?
- If you repeated this experiment, what would you change or improve (more pots, different plants, different light intensity, longer duration)?

Real-world implications

- Where in your community do you see plants or trees under artificial light at night?
- Based on your experiment, what concerns might you have about those plants in the long term?
- How could better lighting design reduce these problems for plants and the species that depend on them?

Citizenship and communication

- Who could you share your experiment and results with (Educators, caretakers, gardeners, local council, families)?
- What is the main message you would like them to hear in one sentence?

Co-funded by the European Union