Light Pollution and its Impact on Astronomy – Awareness and Action

Duration	45 minutes
Age group	15-19 yo.
Aim and objectives	**Aim:** To raise awareness of the problem of light pollution, its impact on astronomical observations, and to present possible solutions to reduce it. **Objectives**: • Understand what light pollution is and how it affects astronomy. • Learn about the Dark Sky Movement and other initiatives fighting light pollution. • Recognize the differences in night sky quality using the Bortle Scale. • Interpret global light pollution maps. • Compare natural and artificial light spectra and understand their evolution.

	• Identify practical actions to reduce light pollution.
Learning Outcomes in Line with Curriculum	**Natural Sciences / Physics / Astronomy:** • Explain how artificial light affects the observation of celestial bodies. • Understand the physical properties of light and its sources, both natural and artificial. • Recognise the role of technology and human activity in altering environmental conditions. **Geography / Environmental Studies:** • Analyse spatial distribution of light pollution using maps and atlases (*The New World Atlas of Artificial Night Sky Brightness*). • Identify environmental challenges on local, national, and global scales. • Use observational methods to collect and interpret environmental data (Bortle Scale exercise). **Civic Education / Sustainable Development:** • Propose actions to mitigate light pollution at individual, community, and policy levels. • Recognise the importance of international cooperation in environmental protection (e.g., Dark Sky Parks network, EU environmental policies). **Cross-Curricular Skills (Key Competences for Lifelong Learning – European Reference Framework):** • **Scientific literacy:** Apply scientific reasoning to environmental issues.

	• **Digital competence:** Interpret and use digital maps and data visualisation tools. • **Cultural awareness:** Appreciate the value of the natural night sky as cultural and scientific heritage.
Teaching Methods	• **Expository:** Presentation, storytelling. • **Problem-solving:** Questions prompting reflection. • **Practical:** Observation tasks, map analysis. • **Interactive:** Brainstorming, group discussion.

Materials Needed

☐ Photos of night skies: pristine vs. light-polluted (attachment 1)

☐ Song "Turn off the Lights" (attachment 2) with lyrics (attachment 3)

☐ The Bortle Scale animation (attachment 4)

☐ Maps from *The New World Atlas of Artificial Night Sky Brightness* (attachment 5)

☐ Maps of the Ursa Major (the Great Bear) constellation (attachment 6)

☐ Laptop/projector or interactive whiteboard

☐ printed worksheet: *Light Pollution Observation Sheet* (attachment 7)

☐ Maps of the Orion constellation imaged at left from dark skies and in a city (attachment 8)

Workshop/Lesson Plan

Duration	Description	Notes
10 minutes	**Introduction: The Problem of Light Pollution** • Teacher greets students, shows pictures (attachment 1) and asks: *"Can you spot anything unusual in this picture?".* Possible answers: *The Milky Way is visible above a brightly lit city, which is unrealistic because light pollution would usually block the view of so many stars.* *The sky is too bright for a rural-quality view, yet the scene shows an urban environment.* *The picture might be AI-generated or heavily edited, combining incompatible elements.* • Short video showing the light pollution problem ("Losing the Dark"). Teacher ask: *What is light pollution? Have you ever noticed the Milky Way?*	
10 minutes	**Impact on Astronomy & The Dark Sky**	

	Movement
	
	• Discuss how light pollution hinders astronomical research.
	• Show photos of the same constellation taken in a Dark Sky Park vs. a city.
	• Present the Dark Sky Movement, Globe At Night Campaign and examples of Dark Sky Parks.
	• Play the song "Turn off the lights" (attachment 2) and distribute the lyrics (attachment 3). Students listen to the song and follow the lyrics. Afterward, they discuss the meaning:
	
	  • What is the main message of the song?
	  • What emotions or images does it create?
	  • Who might be asking to "turn off the lights"?
	
	Together, they conclude that the song is a call for balance between progress and nature, and for protecting the beauty and peace of the night.	

10 minutes	**Measuring Light Pollution** • Explain the Bortle Scale using the animation (attachment 4) • Practical task: Students imagine from recent memory and try to determine the Bortle class of their location by identifying visible stars/objects (attachment 7).	**Homework note:** Students will observe the night sky in the evening/at night, locate the constellation *Ursa Major* (the Great Bear), and compare the visible sky with the maps (attachment 6) to estimate their local light-pollution level using the Bortle Scale.

10 minutes	**Analyzing Light Pollution Maps** • Show *The New World Atlas of Artificial Night Sky Brightness* (attachment 5). • Students locate their region on the atlas and on **lightpollutionmap.info**, compare the two sources, and discuss the observed patterns in light pollution.	
5 minutes	**Summary** • Strategies: Shielded lighting, warm-colour LEDs, turning off unnecessary lights, motion sensors. • Recap key points. • Students suggest at least one action they can take in their own neighbourhood.	

Reflection Questions

Bortle Scale Assessment

- Which Bortle class did you assign to your observation site?
- What features of the night sky helped you make this decision?

Map Comparison

- How does your observation match the data from *The New World Atlas of Artificial Night Sky Brightness*?
- Were there any differences between what the map suggested and what you actually observed? Why might that be?

Astronomical Impact

- Which celestial objects were easy to see, and which were difficult or impossible due to light pollution?
- How would your results differ if you observed from a Dark Sky Park?

Environmental Awareness

- What are the main sources of artificial light in your observation area?
- How does light pollution in your area affect not only astronomy but also wildlife and human health?

Solutions and Action

- What practical steps could be taken locally to improve night sky visibility?
- Which of these actions could you personally take part in or promote within your community?

Kahoot Quiz

1. What exactly is light pollution?

A. When lights make the night sky too bright to see stars
B. When light bulbs stop working
C. When streetlights use too much electricity
D. When sunlight reflects off buildings

☐ **Correct:** A

2. Why can't we see many stars from big cities?

A. There are fewer stars above cities
B. Clouds stay longer over urban areas
C. City lights make the night sky glow and hide stars
D. Buildings block our view of space

☐ **Correct:** C

3. What does the Bortle Scale help you describe?

A. How dark or bright the night sky is
B. How hot the Sun is
C. How big stars appear
D. How old a galaxy is

☐ **Correct:** A

4. If your sky is Bortle Class 8 or 9, what would you probably see?

A. The Milky Way clearly visible
B. Only a few of the brightest stars
C. Thousands of stars and dark clouds
D. Aurora borealis

☐ **Correct:** B

5. What is the main reason astronomers prefer *Dark Sky Parks*?

A. They are close to big cities
B. They have no artificial light nearby
C. They have free Wi-Fi
D. They are warmer at night

☐ **Correct:** B

6. When you look at the World Atlas of Artificial Night Sky Brightness, what do you notice?

A. Europe and large cities shine the brightest
B. Africa glows the most
C. The oceans are full of lights
D. Antarctica is covered in light

☐ **Correct:** A

7. When the teacher played the song *"Turn off the Lights"*, what message could you hear?

A. We should stop using all light
B. We need to protect nature and the night sky
C. We should buy better LEDs
D. It's about city nightlife

☐ **Correct:** B

8. What changes in light technology make skyglow worse?

A. Lights becoming more energy-efficient
B. Lights using shorter, bluer wavelengths
C. Using yellow and orange streetlights
D. Turning lights off earlier

☐ **Correct:** B

9. When you compared spectra of different lights, what did you notice?

A. Natural sunlight has a smooth spectrum; artificial lights have spikes
B. All lights look the same
C. Artificial lights have no color
D. The Sun emits only red light

☐ **Correct:** A

10. Imagine your town wants to become a Dark Sky Community. What's one thing you could suggest?

A. Turn off unnecessary lights after midnight
B. Replace all lamps with blue LEDs
C. Painting lamps white
D. Build a big observatory downtown

☐ **Correct:** A

Additional materials

https://darksky.org

https://youtu.be/dd82jaztFIo?si=9kO8LIm4TgBaAwWo

https://globeatnight.org/

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