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October 2026

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Instruction e-booklet: Enhancing Education on Sustainable Energy through Vocational Training

Reference number VET – 101183327

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ABOUT THIS PUBLICATION

This Instruction E-Booklet has been developed within the VET ECO LUME project, an Erasmus+ Capacity Building in Vocational Education and Training initiative connecting organisations from Europe and Latin America to strengthen vocational education, promote sustainable lighting practices and address the environmental and social challenges associated with artificial light pollution.

The publication accompanies the project's digital learning platform and the Light Pollution Mitigation Specialist Curriculum, offering comprehensive guidance to VET educators, trainers, learners, educational institutions and other interested stakeholders.

Its primary objective is to facilitate the effective use of the VET ECO LUME online educational resources. It provides practical instructions for accessing and navigating the e-learning platform, understanding its five digital modules, completing educational activities and integrating the acquired knowledge into vocational training and professional practice.

Beyond technical instructions, the booklet introduces learner-centred educational approaches, examples of practical activities, assessment recommendations, accessibility considerations and methods for transferring learning outcomes into real-world environments. The publication is intended to function both as an independent reference resource and as a supporting guide for classroom-based, blended and fully online vocational education.

It complements the project's comprehensive vocational curriculum and its separate instructional manual for educators. While those resources focus on the broader educational content and its delivery, this booklet concentrates specifically on making the digital learning experience accessible, meaningful and applicable. The guide encourages readers to engage actively with the educational content, examine lighting-related challenges in their environments and develop informed approaches to sustainable lighting.

The long-term ambition is to support the development of environmentally responsible vocational competences and contribute to improved lighting practices across Europe, Latin America and beyond.

VET – 101183327 — Eco Lumen: Empowering Sustainable Energy Education Through Vocational Training
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1. INTRODUCTION TO VET ECOLUME AND THE INSTRUCTION E-BOOKLET

1.1 Project background and rationale

Artificial lighting is an essential component of modern society. It supports economic activities, extends opportunities for education and recreation, facilitates mobility and contributes to the safe functioning of buildings, infrastructure and public spaces. Over recent decades, technological improvements have significantly expanded the availability and efficiency of artificial lighting. However, the increasing use of artificial light has also generated environmental, economic and social challenges. In many urban and rural environments, lighting installations are designed or operated without sufficient consideration of their broader impacts. Excessive illumination, inappropriate positioning of light sources, unsuitable operating schedules and poorly directed lighting can contribute to light pollution. This phenomenon affects the visibility of the night sky, influences natural ecosystems, creates unwanted illumination and may interfere with human wellbeing.

Light pollution is generally understood as the inappropriate or excessive use of artificial light, particularly during night-time hours. It includes several distinct phenomena, such as skyglow, glare, light trespass and lighting clutter. Its consequences are not limited to astronomy. Artificial light at night can affect wildlife behaviour, disturb natural ecological processes, contribute to unwanted exposure in residential environments and generate avoidable energy consumption. These challenges are increasingly relevant in the context of urbanisation, infrastructure development, environmental sustainability and the transition towards more responsible energy systems.

Technological improvements, including energy-efficient light-emitting diode (LED) systems, provide important opportunities for sustainable lighting. Nevertheless, replacing older equipment with more efficient alternatives does not automatically eliminate light pollution. A lighting installation may consume less electricity while continuing to create environmental problems if it is unnecessarily bright, poorly directed, operates for excessive periods or emits light with unsuitable characteristics. Consequently, sustainable lighting requires a comprehensive approach that considers the purpose, amount, direction, timing and characteristics of artificial illumination.

Vocational Education and Training institutions can play an important role in promoting this approach. VET providers prepare future professionals in fields connected with electrical installations, construction, architecture, urban infrastructure, environmental protection and technical maintenance. Their educational programmes can therefore influence how lighting

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systems are designed, installed, operated and improved. However, light pollution mitigation remains an emerging educational field in many vocational contexts. Educators and learners may have limited access to specialised curricula, digital resources, practical learning methodologies and locally relevant examples.

The VET ECO LUME project responds to these challenges by bringing together expertise from European and Latin American organisations to develop educational resources focused on sustainable lighting and light pollution mitigation. Through research, curriculum development, digital learning, international cooperation and community engagement, the project aims to strengthen vocational competences and contribute to environmentally responsible lighting practices.

1.2 Objectives and educational approach

VET ECO LUME promotes an interdisciplinary approach to vocational education, connecting technical knowledge, environmental awareness, practical problem-solving and stakeholder cooperation. The project recognises that sustainable lighting cannot be addressed exclusively through technical measures. Effective mitigation also requires understanding environmental impacts, interpreting evidence, considering local conditions and communicating recommendations to relevant decision-makers. Its educational approach is therefore built around several complementary objectives.

Strengthening vocational competences

The project develops specialised educational content that enables VET learners and educators to understand light pollution, identify its potential impacts and explore appropriate mitigation approaches. The curriculum combines theoretical knowledge with opportunities for practical application, supporting the development of competences relevant to technical and environmental professions.

Supporting VET educators

The project provides instructional resources and guidance to strengthen educators' capacity to introduce sustainable lighting into vocational education. These resources support the selection of teaching methodologies, adaptation of learning activities and assessment of acquired competences.

Promoting digital transformation

VET ECO LUME converts educational content into interactive online learning modules, increasing opportunities for flexible and independent learning. The digital learning environment enables participants to engage with educational content according to their availability, interests and previous knowledge.

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Encouraging international cooperation

The project connects institutions and stakeholders from Europe and Latin America, recognising that lighting-related challenges differ across geographical, ecological and institutional contexts. This cooperation supports the exchange of practices and the adaptation of educational solutions to different regional needs.

Promoting practical environmental action

The project encourages learners and stakeholders to move beyond awareness and identify opportunities for improving lighting practices in their professional and community environments.

Together, these objectives contribute to the wider development of green and digital competences within vocational education.

1.3 Target groups and expected benefits

The VET ECO LUME educational resources are relevant to several target groups with different learning needs and professional interests.

VET educators and trainers

Educators are among the primary users of the Instruction E-Booklet. They can use the digital modules to strengthen their understanding of sustainable lighting and introduce relevant content into their educational activities. The booklet provides guidance on selecting modules, organising training sessions, preparing practical assignments and assessing learning outcomes. It also supports educators who may not have previous experience teaching light pollution mitigation as a specialised subject.

VET learners and students

The online course is designed to support individuals acquiring vocational knowledge and competences relevant to sustainable lighting. Learners may be studying electrical installations, building technologies, environmental management, architecture, infrastructure planning or related fields. Through the platform, they can explore the topic independently, develop theoretical understanding and practise applying acquired knowledge through observations, case studies and educational projects.

Educational institutions and curriculum developers

VET institutions can use the resources to modernise existing programmes and introduce environmental topics connected with the green transition. The digital materials provide an

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accessible starting point for interdisciplinary educational activities and can complement established technical courses.

Technical professionals and businesses

Professionals working with lighting systems, buildings, infrastructure and environmental services may use the resources for introductory professional development. The course can help them recognise the broader implications of lighting decisions and identify areas requiring further specialist investigation.

Municipalities and public authorities

Municipal representatives, urban planners and public infrastructure managers may benefit from increased understanding of sustainable lighting principles. The educational content can support informed discussions about public lighting, environmental protection and community needs.

Environmental organisations and local communities

The resources can also contribute to awareness-raising initiatives and collaborative projects addressing light pollution. By making specialised knowledge more accessible, VET ECO LUME encourages wider participation in discussions about responsible night-time lighting.

1.4 Purpose and objectives of the Instruction E-Booklet

The Instruction E-Booklet has been developed to ensure that the project's digital educational resources can be accessed, understood and used effectively. The availability of an online course does not automatically guarantee a successful learning experience. Users may require assistance with platform navigation, digital activities, learning organisation and practical application.

Similarly, educators may need guidance on connecting online modules with existing curricula, practical assignments and competence assessment. The booklet responds to these needs by combining technical instructions with pedagogical and practical recommendations.

Its specific objectives are to:

- Provide clear instructions for accessing and navigating the VET ECO LUME digital learning platform.
- Explain the structure, purpose and learning outcomes of the five online modules.
- Support VET learners in organising self-paced learning and monitoring personal progress.
- Assist VET educators in integrating digital content into classroom-based, blended and online training.
- Present educational methodologies that promote active participation and practical competence development.

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- Provide activities connecting theoretical knowledge with real lighting-related challenges.
- Support the assessment and recognition of acquired knowledge and skills.
- Encourage accessible and inclusive participation in digital vocational education.
- Offer guidance for addressing common technical difficulties.
- Promote long-term knowledge transfer and the continued use of VET ECO LUME educational resources.

The publication is designed to be consulted throughout the learning process rather than read only once. Learners may return to it when they need technical guidance or help organising their activities. Educators may use it as a reference when preparing sessions, selecting assignments or evaluating training outcomes. The practical templates provided at the end can be adapted for direct educational use.

1.5 Relationship between the curriculum, digital course and instructional resources

VET ECO LUME has developed interconnected educational resources that serve different purposes within the learning process.

The **Light Pollution Mitigation Specialist Curriculum** provides the broader educational foundation. The project presents it as a 29-hour vocational curriculum covering theoretical and practical competences relevant to sustainable lighting.

The **online learning course** converts selected curriculum content into five self-paced digital modules. Each module takes approximately 45 minutes to complete, resulting in around three hours and 45 minutes of core digital learning. The online course therefore provides an accessible introduction and structured digital pathway rather than replacing the entire 29-hour vocational curriculum.

The project's **Instruction Manual for VET Educators and Learners**, developed within the curriculum-focused work package, supports the broader organisation and delivery of vocational education on light pollution mitigation.

Finally, the **Instruction E-Booklet** focuses on the effective use of the digital learning environment, including platform navigation, self-directed learning, teaching integration and practical application.

These resources are complementary. A learner may begin with the online course and use the booklet to guide participation. An educator may combine selected digital modules with the complete vocational curriculum and its instructional manual to design a longer training

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programme. This flexible relationship makes the resources relevant to introductory learning, specialised vocational education, professional development and community training.

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2. GETTING STARTED WITH THE VET ECO LUME DIGITAL PLATFORM

2.1 Understanding the digital learning ecosystem

The VET ECO LUME digital learning ecosystem has been developed to make specialised knowledge about sustainable lighting accessible through online education. Its central component is a web-based learning course that presents educational material through five interconnected modules. The modules follow a progressive learning sequence, beginning with an introduction to light and light pollution and advancing towards diagnosis, impact assessment, technical solutions and community action.

The platform supports self-paced learning, allowing users to engage with the educational material according to their individual schedules and learning needs. Interactive elements and short knowledge checks help participants review concepts and consolidate their understanding.

The digital environment can be used independently or integrated into educator-led programmes.

For learners, it provides flexible access to structured educational content. For educators, it offers a resource that can be incorporated into vocational lessons, practical workshops and blended training activities. The platform is particularly valuable for international educational cooperation because it enables users from different locations to explore a common body of knowledge while adapting practical activities to their local environments.

2.2 Technical requirements and preparation

Before beginning the online course, learners should ensure that they have appropriate access to digital technology. The course is accessed through the VET ECO LUME website, and a device capable of displaying interactive web content is required.

A desktop computer or laptop is recommended when working with detailed diagrams, technical explanations or assignments requiring extensive documentation. Tablets and smartphones may also be suitable for accessing learning materials, although certain interactive elements may be easier to use on larger screens.

Users should preferably access the platform through an updated web browser, such as Google Chrome, Mozilla Firefox, Microsoft Edge or Safari. A stable internet connection is recommended, particularly when accessing multimedia or interactive course content.

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No specialised technical software is required for ordinary introductory learning. However, practical activities introduced by educators may involve additional tools, such as spreadsheets, presentation software, mapping applications or appropriate lighting measurement equipment.

Before beginning, learners should prepare a suitable learning environment. This includes choosing a comfortable location, minimising unnecessary distractions and ensuring that the device is adequately charged or connected to a power source. A notebook or digital document can be useful for recording definitions, observations and questions.

Educators organising group sessions should test the selected modules in advance, particularly when using institutional computers, shared devices or classroom projection equipment.

2.3 Accessing the online course

The online learning resources are available through the official project website.

Step 1 - Open the official website

Launch an internet browser and visit:

https://vet-ecolume.eu/

The homepage provides access to general project information, educational resources, project documents and other activities.

Step 2 - Locate the Online Learning section

Use the website navigation menu to find the section titled "Online Learning".

This section introduces the digital educational resources developed within the project.

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Step 3 - Open the e-learning platform page

Select the page titled:

E-Learning Platform: Empowering Sustainable Learning

The course can also be accessed directly through:

https://vet-ecolume.eu/online-learning/e-learning-platform-empowering-sustainable-learning/

Step 4 - Review the course introduction

Before opening a module, read the introductory description explaining the purpose and structure of the digital course.

The overview presents the five modules and their educational focus.

Step 5 - Select a module

Choose the module corresponding to your learning objectives. For learners without previous knowledge of the topic, beginning with Module 1 is recommended.

Step 6 - Open the learning content

Select the available module link and follow the instructions presented within the interactive learning environment. If a module is listed without an active link, consult the latest course page or request guidance from the project team.

Step 7 - Complete the educational activities

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Progress through the module, engage with its content and complete the knowledge check where available.

Step 8 - Reflect on the acquired knowledge

After completing the module, record the most important concepts and consider how they relate to your professional or local environment. Users are encouraged to bookmark the course overview page for future access.

2.4 Knowledge checks, progress and learning records

Each ECO LUME module concludes with a short knowledge check. These activities provide an opportunity to review important concepts and consider whether the intended learning outcomes have been achieved. Learners should read the questions carefully, consider the available information and respond based on their understanding. Where feedback is provided, it should be used to identify topics requiring further review.

Educators may use knowledge checks as formative assessment tools, helping learners identify strengths and areas for improvement. However, online knowledge checks should not be treated as sufficient evidence of advanced professional competence. Practical skills such as conducting lighting measurements, interpreting technical findings or designing interventions require additional assessment. The public course access route does not currently establish an automatic system for tracking individual progress across all modules.

Consequently, learners are encouraged to maintain a personal learning record. This record can include completed modules, dates, key concepts, questions and practical assignments. The Module Completion and Reflection Record included in the Practical Toolkit provides a suitable example.

2.5 Recommended learning pathways

The digital curriculum can be approached in several ways depending on user needs.

Complete introductory pathway

Learners progress through all five modules, beginning with scientific foundations and concluding with community engagement. This pathway is recommended for participants seeking a broad introduction to sustainable lighting and light pollution mitigation.

Topic-specific pathway

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Users select individual modules relevant to their professional responsibilities or interests. For example, a learner working in environmental management may prioritise impact assessment, while a technical professional may focus on diagnosis and lighting solutions.

Educator-guided pathway

A VET educator selects relevant modules and combines them with classroom discussions, practical exercises and assessment activities. This approach allows digital learning to support existing vocational programmes.

Project-based pathway

Learners identify a real or simulated lighting-related challenge and use the modules as educational resources while investigating the problem and preparing recommendations. This approach is particularly suitable for applying knowledge across multiple competence areas.

Regardless of the chosen pathway, learners should be encouraged to establish objectives and reflect on their progress.

2.6 Digital accessibility and responsible platform use

Digital learning should provide equitable opportunities for participants with different abilities, learning preferences and technological circumstances.

The VET ECO LUME website includes an accessibility toolbar offering options such as increasing or decreasing text size, adjusting contrast, displaying underlined links and selecting a readable font. These features may improve the user experience for some participants.

However, accessibility depends on the compatibility and usability of all course components, not only the website interface. Users who experience barriers should communicate their needs to their educator or the relevant project representative. Where necessary, educators should provide alternative formats or equivalent activities that allow participants to demonstrate the same learning outcomes.

Responsible platform use also includes respecting copyright, protecting personal information and maintaining appropriate digital security. Users should access the course through official links and avoid sharing passwords or sensitive personal information. When completing practical activities involving photographs or observations of public spaces, learners should respect privacy, property restrictions and applicable safety requirements. Digital accessibility and responsible participation should be considered throughout the learning process.

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Accessibility Tools

- Increase Text
- Decrease Text
- Grayscale
- High Contrast
- Negative Contrast
- Light Background
- Links Underline
- Readable Font
- Reset

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3. ONLINE COURSE STRUCTURE AND EDUCATIONAL CONTENT

3.1 Structure and progression of the Digital Curriculum

The VET ECO LUME online course is organised into five self-paced modules designed to support progressive competence development. Each module introduces a particular dimension of sustainable lighting and light pollution mitigation. Together, they move from foundational knowledge towards observation, analysis, technical problem-solving and stakeholder engagement.

The digital course comprises approximately 225 minutes of core learning content. This duration does not include additional classroom discussions, field observations, practical assignments or independent research. For more comprehensive vocational training, educators are encouraged to use the digital modules alongside the broader VET ECO LUME curriculum and other supporting resources.

The five modules are:

MODULE	EDUCATIONAL FOCUS	APPROXIMATE DURATION
1. Introduction to Light and Light Pollution	Foundations of artificial lighting and sustainable lighting principles	45 minutes
2. Diagnosis and Monitoring of Light Pollution	Observation, documentation, measurement and diagnosis	45 minutes
3. Environmental and Health Impact Assessment	Ecological and human consequences of artificial light at night	45 minutes
4. Technical Solutions and Sustainable Night-Time Spaces	Lighting planning and technical mitigation approaches	45 minutes
5. Community Action and Multi-Level Governance	Stakeholder engagement, communication and advocacy	45 minutes

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The following sections explain the purpose of each module and recommend ways to extend the digital learning experience through practical vocational activities.

3.2 Module 1 - Introduction to Light and Light Pollution

The first module establishes the conceptual foundation for the entire course. It introduces light as a physical phenomenon and explores the historical evolution of artificial lighting technologies. Learners examine how artificial light has transformed human activities and contributed to the development of modern infrastructure. At the same time, they are introduced to the environmental challenges associated with inappropriate illumination. A central component of the module is understanding the main forms of light pollution.

Skyglow refers to the brightening of the night sky associated with artificial light, reducing the visibility of celestial objects and altering natural night-time conditions.

Glare occurs when lighting creates excessive visual brightness or contrast that may cause discomfort or reduce visibility.

Light trespass describes artificial illumination reaching areas where it is unwanted or unnecessary.

Lighting clutter involves excessive or confusing concentrations of light sources, often associated with commercial or urban environments.

The module introduces sustainable lighting as an approach that considers the purpose, direction, intensity, duration and environmental implications of artificial illumination.

Expected learning outcomes

After completing this module, learners should be able to:

- Explain the basic purpose and characteristics of artificial lighting.

- Identify the main forms of light pollution.

- Recognise examples of inappropriate illumination.

- Describe principles of sustainable lighting.

- Explain why energy efficiency alone does not necessarily eliminate light pollution.

Recommended practical application

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Learners can conduct an introductory observation of artificial lighting in their school, workplace or neighbourhood. They should select several lighting installations and consider whether the illumination appears appropriate for its intended function. For each example, learners can identify the possible type of light pollution and record their reasoning. The results may be presented through photographs, drawings, diagrams or short written descriptions.

Reflection questions

- What types of artificial lighting are most common in your environment?

- Which installations appear to create unnecessary illumination?

- Can a highly energy-efficient lighting system still contribute to light pollution?

- Which professional decisions influence the environmental performance of lighting systems?

The expected educational outcome is an improved ability to recognise light pollution and explain the importance of responsible lighting practices.

3.3 Module 2 - Diagnosis and Monitoring of Light Pollution

The second module focuses on methods for identifying, documenting and evaluating light pollution. It introduces the importance of systematic observation and reliable information when assessing lighting conditions. Learners explore methods involving direct observation, physical measurement instruments and digital tools. These methods can help identify potential problems and support more informed technical decisions. The module also introduces the preparation of a lighting diagnosis sheet. A structured diagnosis records the characteristics of an installation, its purpose, surrounding conditions and potential sources of unwanted illumination.

Illuminance, expressed in lux, describes the amount of light falling on a surface.

Luminance, generally expressed in candelas per square metre, describes the light emitted or reflected from a surface in a particular direction.

Measurements of night-sky brightness may use specialised instruments such as Sky Quality Meters, with results expressed in units such as magnitudes per square arcsecond. Satellite observations can provide valuable information about patterns of night-time radiance, but they do not directly capture every relevant aspect of light pollution at ground level.

Learners should understand that no single instrument provides a complete description of all lighting impacts. The choice of measurement method depends on the question being investigated.

Expected learning outcomes

After completing this module, learners should be able to:

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- Describe basic approaches to observing and documenting light pollution.

- Identify relevant information required for a lighting diagnosis.

- Recognise the purpose and limitations of selected measurement tools.

- Prepare an introductory observation or diagnosis sheet.

- Distinguish between documented findings and assumptions requiring further investigation.

Recommended practical application

Learners select a suitable lighting installation and record its location, purpose, operating conditions and apparent light distribution. Where appropriate equipment is available, supervised measurements can be undertaken. The resulting observations should be organised into a structured diagnosis sheet. Participants should document relevant contextual conditions, including the time of observation, weather, instrument type and measurement position. The activity should conclude with a discussion about the reliability and limitations of the collected information.

Reflection questions

- Why is a structured diagnosis necessary before recommending improvements?

- Which factors can influence lighting measurements?

- How can different observations support one another?

- What information would be required before making a professional recommendation?

The expected outcome is the ability to perform and document an introductory lighting assessment.

3.4 Module 3 - Environmental and Health Impact Assessment

The third module explores the consequences of artificial light at night for ecosystems, biodiversity and human wellbeing. It introduces the biological importance of natural light-dark cycles and examines how artificial illumination may influence organisms and environments. Different species respond to artificial light in different ways. Night-time lighting may influence animal orientation, feeding activity, reproductive behaviour and other ecological processes. The significance of these effects depends on the species involved, environmental conditions and characteristics of exposure.

The module also introduces the relationship between artificial lighting and human circadian rhythms. Light exposure can influence biological processes associated with sleep and daily activity patterns. However, potential health impacts should be considered carefully, recognising that exposure duration, timing, intensity and spectral characteristics are relevant factors. A central educational component involves basic impact assessment. Learners are encouraged to identify a

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source of artificial lighting, determine potentially affected receptors and examine possible consequences.

Expected learning outcomes

After completing this module, learners should be able to:

- Identify potential environmental and health-related consequences of inappropriate lighting.

- Explain the importance of natural darkness for selected ecological processes.

- Recognise the relevance of circadian rhythms.

- Identify potentially affected human and ecological receptors.

- Apply a basic environmental impact assessment approach.

- Distinguish potential risks from impacts supported by evidence.

Recommended practical application

Learners select a lighting-related situation identified during Module 2. They then examine who or what may be affected. Possible receptors include nearby residents, pedestrians, nocturnal animals, vegetation or sensitive habitats. For each receptor, learners should describe the possible exposure pathway and identify additional information necessary to evaluate the impact. The activity can be documented in a simple impact assessment matrix.

Reflection questions

- Why might lighting near a natural habitat require different considerations from lighting in a commercial area?

- How do exposure conditions influence potential impacts?

- What evidence is necessary before concluding that an installation causes environmental harm?

- How can technical professionals cooperate with ecological or health specialists?

The expected outcome is improved competence in recognising and evaluating potential environmental and human impacts.

3.5 Module 4 - Technical Solutions and Sustainable Night-Time Spaces

The fourth module focuses on translating observations and assessments into appropriate lighting improvements. Learners explore principles of urban lighting planning, including Urban Lighting Plans and Light Urbanism. The module examines different types of urban lighting and how their

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functions influence planning and technical decisions. A key principle is that sustainable lighting should provide appropriate illumination while minimising unnecessary environmental impacts. Technical options may include improved shielding, appropriate placement and orientation of luminaires, suitable light output, carefully selected spectral characteristics and operating controls.

The module also introduces the importance of considering the actual use of a space. For example, an area with limited night-time activity may require a different lighting strategy from a busy pedestrian crossing. However, reductions in lighting should never be proposed without considering accessibility, visibility, safety and applicable technical requirements.

Expected learning outcomes

After completing the module, learners should be able to:

- Describe principles of responsible lighting design.

- Identify technical options for reducing unnecessary illumination.

- Recognise the importance of appropriate lighting controls.

- Explain how lighting requirements vary between environments.

- Develop a preliminary intervention proposal.

- Consider technical feasibility, environmental implications and user needs.

Recommended practical application

Using findings from earlier modules, learners develop an improvement proposal for a selected location. The proposal should describe the existing lighting arrangement and identify the problem to be addressed. Participants then compare possible interventions and explain why their preferred solution may be appropriate. Recommendations can include changes to operating schedules, luminaire orientation, shielding or other relevant characteristics. The final output should be presented as a preliminary concept, with any technical implementation subject to specialist verification and approval.

Reflection questions

- How can lighting systems meet functional needs while reducing environmental impacts?

- Which factors should influence the selection of a luminaire?

- Why is the timing of artificial lighting important?

- How can proposed interventions be evaluated before and after implementation?

The expected outcome is the ability to develop and justify a basic sustainable lighting improvement proposal.

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3.6 Module 5 - Community Action and Multi-Level Governance

The final module addresses the social and institutional dimensions of light pollution mitigation. It recognises that improvements to lighting systems often require cooperation among stakeholders with different responsibilities and priorities. The module introduces stakeholder mapping, governance arrangements, communication planning and advocacy. Learners explore how decisions about lighting may involve municipalities, technical professionals, businesses, property owners, residents and environmental organisations. An important learning component concerns the preparation of a persuasive proposal using the Public Narrative framework. This approach encourages participants to connect personal motivation, shared challenges and a proposed course of action. A clear and well-supported proposal can help stakeholders understand why a lighting-related issue deserves attention and how improvements could be implemented.

Expected learning outcomes

After completing this module, learners should be able to:

- Identify relevant stakeholders in a lighting-related issue.

- Explain different responsibilities in decision-making.

- Develop a basic communication and engagement strategy.

- Present technical and environmental information in accessible language.

- Structure a practical proposal.

- Prepare a persuasive pitch supporting sustainable lighting improvements.

Recommended practical application

Learners prepare a short presentation based on the intervention proposal developed in Module 4. The presentation should explain the problem, provide supporting observations, introduce the recommended intervention and identify its potential benefits. Participants then adapt their message to a specific audience, such as a municipal representative, school administration or local community group. Educators may organise a stakeholder simulation in which participants discuss the proposal from different perspectives.

Reflection questions

- Who has responsibility for lighting decisions in your local environment?

- How can technical evidence be communicated to non-specialists?

- What concerns might different stakeholders express?

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- How can cooperation support the implementation of sustainable solutions?

The expected outcome is improved competence in communicating and advocating for evidence-based lighting improvements.

3.7 Connecting the modules into an integrated learning experience

The five modules are most effective when understood as parts of one learning process. A learner may begin by identifying potentially inappropriate lighting around a vocational school.

Module 1 provides the knowledge needed to recognise and describe the problem.

Module 2 introduces methods for documenting the installation and preparing an initial diagnosis.

Module 3 supports consideration of potentially affected people and ecosystems.

Module 4 provides the foundation for developing a suitable technical improvement concept.

Module 5 enables the learner to prepare a proposal and communicate it to relevant stakeholders.

This progression connects theoretical knowledge with observation, evidence, technical decision-making and social action.

For educators, the same sequence can form the basis of an interdisciplinary project involving several vocational competence areas.

For learners, it demonstrates how the knowledge acquired through digital education can contribute to addressing practical challenges.

4. EFFECTIVE DIGITAL LEARNING AND INTEGRATION INTO VOCATIONAL EDUCATION

4.1 Advantages and principles of self-paced learning

Self-paced learning provides participants with flexibility to organise educational activities according to their schedules, previous knowledge and individual needs. This flexibility is

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particularly important for vocational learners who may combine education with employment, apprenticeships or other responsibilities. Digital learning also enables users to revisit educational content and spend additional time on unfamiliar topics.

For example, learners with previous technical experience may progress quickly through introductory concepts while dedicating more attention to environmental assessment or community engagement. Other participants may benefit from reviewing foundational explanations before proceeding to advanced material.

Self-paced learning can support geographical accessibility by reducing the need for travel and enabling access to specialised knowledge from different locations. Nevertheless, flexibility also requires organisation and personal responsibility. Without clear learning objectives and realistic schedules, participants may struggle to maintain motivation or complete educational activities.

For this reason, structured learning plans and periodic reflection are recommended.

Independent learners should begin by identifying why they wish to complete the VET ECO LUME course. A clear learning objective can help determine which modules are most relevant and how the acquired knowledge might be used. For example, a learner may want to improve their understanding of outdoor lighting installations or develop skills for identifying environmental concerns. After establishing objectives, participants should create a realistic study schedule. The five modules can be completed over several sessions, allowing time for reflection and practical observation. Learners should avoid rushing through educational content simply to complete all modules. Instead, they should take notes, revisit complex explanations and consider examples from familiar environments.

A useful approach is to record three points after each module:

- **What did I learn?** Identify the most important new concept or skill.

- **How can I apply it?** Describe a realistic professional or community application.

- **What do I need to explore further?** Identify remaining questions or areas requiring additional support.

Keeping these reflections creates a record of learning and helps participants recognise their progress. Learners should also consider preparing a small portfolio containing observations, worksheets, diagrams and intervention proposals. This portfolio can serve as evidence of acquired competences and support further vocational development.

4.2 The role of educators in digital vocational education

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Digital technologies are transforming the responsibilities of VET educators. Instead of functioning exclusively as providers of information, educators increasingly act as facilitators who support learning, encourage practical application and guide competence development.

Within VET ECO LUME, educators can use the digital modules to introduce theoretical concepts while dedicating additional teaching time to practical exercises. Their responsibilities may include assessing learner needs, establishing learning outcomes, selecting relevant modules and facilitating discussions. Educators also support learners in interpreting technical information and recognising the limitations of introductory assessments. For example, a learner may correctly identify apparent light trespass but require guidance before recommending a specific technical intervention. The educator can help distinguish between preliminary observations and conclusions requiring further measurements or specialist expertise. Educators should also encourage critical thinking by presenting realistic situations in which environmental concerns must be balanced with functional lighting requirements.

This approach promotes responsible decision-making rather than simplified assumptions.

The VET ECO LUME modules can be incorporated into different vocational education programmes without requiring every institution to establish a separate qualification. In electrical installation courses, they may support learning about lighting technologies, energy efficiency and responsible installation practices. In construction and architecture, they can complement discussions about exterior lighting, building design and environmental performance. Environmental management programmes can use the modules to explore the ecological consequences of artificial lighting and introductory assessment methods. Urban planning and infrastructure-related training can use the content to examine public lighting, stakeholder responsibilities and sustainable city development.

The integration process should begin with identifying relevant learning outcomes in the existing curriculum. Educators can then select ECO LUME modules that support those outcomes and design appropriate complementary activities.

Three implementation models are particularly suitable.

Supplementary digital learning

Selected modules are assigned as additional educational resources within an existing course. This model is appropriate when teaching time is limited or when ECO LUME content supports a specific vocational topic.

Blended learning

Learners complete digital modules independently and participate in face-to-face activities focused on discussion, demonstration and practical application. This model provides a balance between flexibility and direct educator support.

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Project-based learning

The full digital pathway supports a larger assignment involving the identification, assessment and proposed mitigation of a lighting-related problem. This approach creates opportunities to integrate several competences within one educational experience.

4.3 Recommended teaching methodologies

The effectiveness of digital vocational education depends not only on educational content but also on how that content is used. VET ECO LUME is particularly suitable for active and learner-centred methodologies.

Experiential learning

Experiential learning connects practical experience with reflection and conceptual understanding. For example, learners may begin by observing an exterior lighting installation. They then reflect on their observations, connect the findings with VET ECO LUME concepts and develop possible improvement approaches. The process can continue through further observation and revision. This methodology supports vocational competence because participants practise applying knowledge to realistic situations.

Problem-based learning

Problem-based learning begins with a challenge that requires investigation. An educator might present a situation in which new exterior lighting has improved visibility but caused complaints from nearby residents. Learners must identify the information required, examine possible causes and develop recommendations. The VET ECO LUME modules provide knowledge that can support this investigation.

Project-based learning

Project-based learning involves developing a concrete output over a structured sequence of activities. For VET ECO LUME, this might involve preparing a sustainable lighting improvement proposal. Learners define the problem, collect information, assess impacts, compare possible solutions and present recommendations. The final output demonstrates both theoretical understanding and practical application.

Collaborative learning

Group activities enable learners to combine different experiences and perspectives. Participants with technical knowledge may contribute information about lighting systems, while those with environmental backgrounds may provide insight into ecological considerations. Collaborative work also develops communication, teamwork and negotiation competences.

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Flipped classroom

In the flipped classroom approach, learners engage with introductory content before attending an educator-led session. Classroom time can then focus on practical application, complex questions and collaborative activities. For example, learners complete Module 3 independently and subsequently participate in a group impact assessment exercise. This approach can increase the amount of teaching time available for active learning.

Scenario-based learning

Scenario-based activities place learners in realistic professional situations. They may be asked to act as technical advisers, municipal representatives or environmental consultants responding to a lighting-related challenge. Different constraints can be introduced, including limited budgets, environmental sensitivity and safety requirements. Participants must consider the available evidence and justify their decisions.

These methodologies can be combined according to the educational objectives and learner profiles.

4.4 Accessibility, inclusion and learner support

Inclusive digital education requires recognising that learners have different abilities, circumstances and access to technology. Some participants may experience barriers related to disabilities, digital literacy, language or internet availability. Educators should identify these needs during preparation and plan appropriate support.

Universal Design for Learning provides a useful framework for developing flexible educational experiences. It encourages different opportunities for engagement, representation and demonstration of learning. For example, educational explanations may be supported by written material, diagrams and demonstrations.

Where appropriate, learners may demonstrate understanding through written reports, presentations or other accessible formats. Participants using assistive technologies may require accessible headings, meaningful text descriptions and compatible navigation. Videos should be accompanied by captions or transcripts where needed. Learners with limited digital experience may benefit from introductory demonstrations and additional time for interactive activities.

Language accessibility is also relevant because the VET ECO LUME partnership brings together European and Latin American organisations. The project website provides language navigation options for English, Croatian, Estonian, German and Spanish. The availability of individual translated learning modules should be verified before implementation. Educators should also adapt examples and explanations to the cultural, professional and educational contexts of participants.

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An inclusive learning environment should encourage questions, support different learning speeds and provide constructive feedback.

4.5 Adapting learning to European and Latin American contexts

Sustainable lighting challenges vary across geographical and institutional environments. Urban development, ecological sensitivity, energy infrastructure, environmental policies and local lighting practices can influence the relevance of different mitigation approaches. The VET ECO LUME partnership connects European and Latin American organisations to support exchange of knowledge and the development of adaptable educational resources. Educators should therefore encourage learners to examine local circumstances rather than assume that one solution is universally applicable.

For example, a simulated case involving exterior lighting near a coastal environment may require attention to sensitive wildlife. A case involving a densely populated urban street may place greater emphasis on visibility, glare and unwanted light entering residential buildings. A case involving astronomical observation areas may focus on the preservation of dark skies and appropriate lighting controls.

These different examples can help learners understand that sustainable lighting requires both general principles and context-specific decisions. Educators can also encourage comparative activities between partner countries. Learners might investigate how different municipalities manage public lighting or how technical requirements vary across jurisdictions.

5. TECHNICAL SUPPORT, TROUBLESHOOTING AND FREQUENTLY ASKED QUESTIONS

5.1 Preventing common technical difficulties and troubleshooting guide

A positive digital learning experience depends partly on reliable access to educational content. Learners and educators should therefore undertake basic technical preparation before beginning the course. Recommended measures include using an updated browser, confirming internet connectivity and testing the relevant course links. For classroom-based activities, educators should verify that devices, projection equipment and internet access function correctly. Where possible, alternative educational activities should be prepared in case of temporary technical difficulties.

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Learners should also be informed about available support channels. Clear communication can prevent relatively minor issues from interrupting the learning process.

PROBLEM	POSSIBLE CAUSE	RECOMMENDED ACTION
Website does not load	Connectivity or temporary website issue	Check connection, refresh and verify the official URL
Module does not open	Browser compatibility or link issue	Try another updated browser or reopen the module
Interactive material displays incorrectly	Device or browser limitations	Adjust display settings and test another device
Text is difficult to read	Display or accessibility settings	Use available text-size and contrast adjustments
Audio does not play	Device sound settings	Check volume, mute settings and audio output
Knowledge check does not respond	Incomplete interaction or temporary error	Review required selections and retry
Learning progress appears missing	No confirmed personal tracking system	Consult personal learning records or the relevant platform instructions
Content loads slowly	Limited internet bandwidth	Reduce other network activity and retry
Link appears broken	Resource location or availability has changed	Return to the official learning page and report the issue

Technical problems should be documented clearly when they cannot be resolved through basic troubleshooting. A useful report includes the affected module, device type, browser, approximate time and description of the problem. Screenshots may be helpful, provided they do not contain passwords or sensitive personal information.

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5.2 Getting technical and educational support

Different problems may require different forms of support. Technical issues involving website access or interactive content should be reported through the official project communication channels. Questions about learning content, practical assignments or assessment requirements should normally be directed to the educator responsible for the training activity.

Learners participating independently can consult the project website for available contact information. When requesting assistance, users should explain the issue as clearly as possible.

For example, stating that a specific module does not open in a particular browser is more useful than reporting that the entire platform is not functioning. Educational support should also be available for participants who encounter difficulties understanding technical concepts or completing practical assignments.

5.3 Frequently asked questions

Who can use the ECO LUME online course?

The course is primarily intended for VET learners, educators and professionals interested in sustainable lighting and light pollution mitigation. It may also be relevant to municipalities, environmental organisations and other stakeholders.

Do I need previous technical knowledge?

The introductory module is designed to provide foundational knowledge. Previous experience may support understanding of more technical topics, but it is not essential for beginning the course.

How long does the online course take?

The course consists of five modules, each requiring approximately 45 minutes. The total core digital learning time is therefore approximately three hours and 45 minutes. Additional time is recommended for practical activities and reflection.

Is the online course the same as the full vocational curriculum?

No. The digital course provides a shorter self-paced learning pathway. The broader VET ECO LUME vocational curriculum is presented as a 29-hour programme and includes more extensive educational content and practical learning opportunities.

Do I need to complete the modules in order?

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The recommended sequence begins with Module 1 and progresses towards Module 5. However, learners can return to individual modules as needed, and educators can select particular modules for specific learning objectives.

Is registration required?

The public course page currently provides direct access links without a mandatory registration procedure. Users should follow the instructions available through the official learning page.

Can I access the course from a smartphone?

The course is web-based, and mobile access may be possible depending on the device and individual module. For technical activities and extended assignments, a computer or laptop is generally recommended.

Can educators use the modules in regular classes?

Yes. The modules can complement existing vocational programmes and be combined with classroom discussions, practical assignments and assessment activities.

Can I use the course for professional development?

Yes. The course can support introductory professional learning and awareness of sustainable lighting practices. It does not replace specialist technical qualifications or professional authorisation.

Are the resources available in multiple languages?

The project website provides English, Croatian, Estonian, German and Spanish language options. The availability of individual translated learning modules should be confirmed before implementation.

What should I do if I find inaccurate information or a technical problem?

Document the issue and communicate it through the official project channels. Constructive feedback can support the continued improvement of the educational resources.

5.4 Final recommendations and conclusions

The VET ECO LUME project demonstrates the potential of digital vocational education to address emerging environmental and technical challenges. Artificial lighting plays an essential role in modern society, but its responsible use requires informed decisions that consider both human needs and environmental conditions. Sustainable lighting is not simply about reducing illumination. It involves providing appropriate lighting where and when it is needed while avoiding unnecessary

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impacts. Achieving this balance requires technical knowledge, environmental awareness, professional judgement and cooperation.

The VET ECO LUME online course introduces these dimensions through five interconnected modules.

The Instruction E-Booklet supports the effective use of those modules by providing technical guidance, educational recommendations and practical learning tools.

For learners, the publication encourages active engagement, independent learning and reflection.

For educators, it provides a framework for integrating digital learning into vocational programmes and connecting theoretical content with practical activities.

For institutions and stakeholders, it supports the continued use of educational resources and the wider promotion of responsible lighting practices.

The practical value of the project will ultimately be reflected in how the acquired knowledge is applied. By encouraging learners to observe, analyse, propose solutions and communicate responsibly, VET ECO LUME contributes to the development of competences relevant to the green and digital transitions.

The continued cooperation of educational institutions, professionals, public authorities and communities can help transform this learning into lasting improvements. Through accessible education and evidence-based action, VET ECO LUME aims to support a future in which artificial lighting meets human needs while respecting natural darkness, biodiversity and environmental sustainability.

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