



3.2 Scenario Identification Card

Category	Description
Title	<i>LIGHT POLLUTION? WHAT'S THAT?</i>
Teaching theme/problem	Students are invited to discover the impact of light pollution in our lives, the unnecessary energy expenditure and to provide suggestions to mitigate the problem
Keywords	STEAM, light pollution, energy efficiency, health, animal life
Language	English
Thematic classification	STEAM oriented Education
Learning/Teaching main objectives:	<ul style="list-style-type: none"> • Light Pollution impacts on: <ul style="list-style-type: none"> o Astronomy (S) o Energy Waste (T) o Animal Behaviour (S) o Health (S) • Assessing Light Pollution in the Community (M) • Presenting and debating the theme with the community (A) • Propose solutions (E)
Suggested age group	12-18
Estimated level of difficulty	Easy
Material and technical infrastructure needed	STEAM IDEAS' Square physical and/or digital (new created) , ICT school infrastructure, 1-1 laptops/tablets/iPads
School - Stakeholders Synergies	Adapted to local needs and infrastructures: field trip to assess the light pollution in the region surrounding the school, visit industries related to illumination, discuss the problem with interior designers and municipality architects.
Typical interaction time	1/2 month
Teaching level	Adapted to local curricula and opportunities
Level of interactivity	High
Type of interactivity	Physical, digital, educational field trips, events
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3.3 Scenario Identification Picture



3. Main Project - MP: LIGHT POLLUTION AWARENESS CAMPAIGN


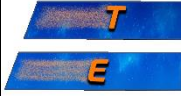
Act #	Description of activities, strategies, methods, means, resources, and synergies		Learning goals - Learning outcomes Features/Competences	STEAM Fields
A1	Science Teacher	Show videos related to light pollution and its impact in our lives. (See references for interesting videos)	Educational Method <i>Concept Formation</i>	This activity introduces students to the concept of light pollution and invite them to reflect on it.
	Students	Students discuss in groups and make a list of things they already know about the topic, things they discovered by watching the video. Tools: tablets or notebooks	<ul style="list-style-type: none"> • Understand the concept of light pollution • Reflect on the concept and contextualize to their daily lives <p>Critical Thinking, Curiosity, Social Awareness</p>	 In classroom 90 m
STEAM Ideas' Square (SIS) Operation - School Community Synergies	<p>During this stage of the activity STEAM teachers and others can collaborate to prepare the various steps of this design thinking intervention. They should choose and adapt the Dark Skies Rangers Activities (https://www.globeatnight.org/dsr/) in order to provide them as tools for the students next steps in the project. The choice of activities will depend on the contents of interest to the various educators and the choice of research selected by the students.</p> <p>Science teachers should provide the necessary material to spark the interest of students on studying the impact of light pollution on fauna and flora (several sources of information are provided in the reference section). Technology educators should prepare the supporting documentation to enable students to assess the light pollution in the designated area and the calculate the impact of their foreseen intervention. Regardless of the choice of the students the first step should always involve a light audit. It can be a simple mapping of light poles or a more complex intervention with identification of lamps, fixture construction, etc. Art teachers should structure a series of option for to support students during the creation of the community event, the final event where the students' projects will be</p>			Time: 1 – 2b collaborative days.

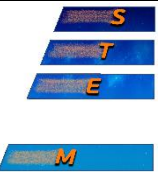
	<p>presented to the community, preferably enabling (together with the Technology and Engineering teachers) the various tools and resources that might be available in the STEAM idea square. Mathematics teacher should get ready to support students during their street audit activities and to properly produce a report on potential savings the municipality (or school, or local business) might have by adopting the solutions the students might propose. The activities should be aligned with the Design Thinking steps and solutions produced together by the educators in order to provide to students a genuine STEAM experience. The role of Engineering will be strongly connected with the construction of a mockup of a properly illuminated street. Engineering teachers should also provide a list of devices regularly used by the illumination industry and prepare online spaces (google docs or other collaborative apps) for students to test their ideas and verify the efficacy and efficiency of their proposals)</p>				
<p>School-Stakeholders Synergies</p>	<p>At this stage of the project teachers and students should identify stakeholders in the community that can help enrich the project. Either because they are producing components of the illumination systems or because their professions can help enlighten the impact of light pollution in our lives. Biologists, doctors, engineers, policy makers, architects, interior designers, psychologists might greatly enrich the projects.</p>			<p>Time: 2 hs</p>	
<p>A2</p>	<p>All teachers</p>	<p>At this stage the STEAM teachers should present to the students the various tools and resources they will have available to proceed with a street audit where they will measure the level of light pollution in an area of their choice.</p> <p>Science and Mathematics teachers will support students during the audit to ensure all components are adequately collected: existing fauna and flora, proper identification of the light pollution sources, calculating the cost associated to the particular sources of light identified as the light pollution cause.</p> <p>Technology and Engineering teachers will provide elements to help students acquire the desirable data by presenting to them the various options. Art teachers will help the preparation of their strategic plan with creation of maps and illustrating their findings.</p>	<p>Educ Method Inquiry</p>	<ul style="list-style-type: none"> • To learn how to prepare a strategic plan • Learn about the sources of light pollution <p><i>Critical thinking, collaboration, numeracy and science literacy</i></p>	



		<p>A list of steps for the conduction of the audit procedure should be co-developed with the students (several tools are available in the Outdoor Lighting Audit section of the Dark Skies Rangers Materials - https://www.globeatnight.org/dsr/)</p> <p>Access to guidelines on types of illumination and tips on what is a good type of street illumination pole should be provided to the students</p> <p>Tools: google maps, light pollution map, light pollution mobile apps</p>			
	Students	<p>Students should make their choices in terms of the locations to be audited and prepare their on-site activity to collect the data using for instance Google Maps with the street view.</p> <p>Students should work in teams. The same team that will proceed with the streets' audits.</p> <p>Tools: tablets, notebooks, online collaborative spaces (i.e. Google Docs, Teams, etc.)</p>			<p>In classroom duration 90 min</p>
Act #	Description of activities, strategies, methods, means, resources, and synergies			Learning goals - Learning outcomes Features/Competences	STEAM Fields
A3	Science Teachers	<p>After studying the designated area students will be supported by the science teacher in order to make a more concrete analysis on the various ecosystems being affected by the identified light pollution sources and</p>	Educ Method Inquiry	<ul style="list-style-type: none"> • Learn about the impact of light pollution on fauna, flora and our health • To research and explore solutions 	

		research on the various solutions that could be adopted to mitigate the problem.			
	Students	With the help of their science teachers' students will gain awareness about the influence of light pollution in local fauna and flora and research about possible solutions for the problems encountered.		Critical thinking, creativity	
		Tools: Exploration of information online			
A4	Engineering Teacher Mathematics Teachers Art Teachers	At this stage engineering teachers should make available all technical information about the different lamps and light fixtures and poles associated with suggestion of options that can be adopted. Mathematics teachers should support the assessment on how much funding could be saved by the municipality if they adopt the students' suggestions. Art teachers will support students with the design of their plans.	Educ Method Inquiry	<ul style="list-style-type: none"> • To learn about different illumination systems • Analyze the impact and efficacy of the use of different types of lamps <p>Creativity, Critical Thinking, Numeracy, Financial Literacy</p>	
		Tools: Light pollution simulator,			
	Students	After finishing the audit students should evaluate the possible solutions to mitigate the light pollution in the studied areas. They will also assess how much taxpayer's money can be saved by implementing the proposed changes. With this information in hand students' study and design the changes they will propose in the form of a mockup. With the help of the teachers, they will make an investigation of the materials to be used, select, and prepare the draft plans for the construction of their mockups. During this stage students should also plan their interventions in the local community by organizing for instance the Light Pollution Awareness event. They should prepare a survey to be distributed to the school and local community enabling a proper evaluation of their level of awareness on the topic. Following these results students should plan their intervention (exhibit, dance, theater, musical etc.)			In classroom duration 45m

		Tools: tablets, notebooks, online surveys (i.e google forms, limesurvey, etc.)		
(SIS) - School Community Synergies	<p>Biology or natural science educators in the school community can be of great help to the students, for them to better understand the impact of excessive light in the development of plants and animals. Mathematics educators can provide at this stage support for the production of the necessary reports on the unnecessary illumination in the audited locations. Technology and engineering teachers can support the plans for creation of mock-ups in case the students would like to use such format to present their ideas.</p> <p>At this stage Engineering, Mathematics and Arts teachers can also make different suggestions for the materialization of the students' ideas for further research, for sharing with the local authorities and local communities:</p> <p>Science Teachers can suggest experiments that can be performed at a school level to collect evidence on the impact of light pollution on plants and animals</p>			Time: 3h
School-Stakeholders Synergies	<p>Teachers should at this stage help students to identify stakeholders in their community that can be relevant for the achievement of changes in the street illumination of the audited area, or companies involved in interior design (where illumination have a big role), lamp industries or retail sellers of illumination. Medical doctors can be invited to discuss with students the impact of excessive light in our health. At this stage students should also choose the strategy to present their finding to the local authorities and local community.</p>			Time 1h / Field trip
				
Act #	Description of activities, strategies, methods, means, resources and synergies		Learning goals - Learning outcomes Features/Competences	STEAM Fields
A5	Engineer techers, science, and mathematics	<p>Teachers will support students to create a mockup with their proposal for a proper illumination of a street. Their role will be the support for the construction of the electric part of the student's mockup. The other teachers will help the groups prepare their audit reports in a format that can be delivered to the local authorities.</p>	<p>Educational Method <i>IBL</i></p> <ul style="list-style-type: none"> To create an electrical circuit, learn about Learn the various properties of different lamps 	

	Students	Students will produce a mockup depicting the changes in street illumination they will suggest to local authorities. Students will put in practice the project designed in the previous phase where all the materials were selected, the necessary technology identified, and the design discussed will be implemented. They will also work on the reports of their findings and prepare it to be delivered to the relevant authorities.		<ul style="list-style-type: none"> To share it within school and with local community. To present their ideas to the local authorities <p>Problem solving skills, collaboration and cooperation, persistency. Communication skills</p>	
		Tools: Lamps, electric circuits			In classroom (Depends on the complexity of the project)
A6	Art Teacher	Will support the students for the creation of their mockup by showing them different techniques in accordance with their choices for the construction of the school mockup	Educational Method <i>IBL</i>	<ul style="list-style-type: none"> To apply different artistic techniques in order to materialize the created design. <p>Artistic competencies, presentation skills. Collaboration and cooperation. Communication</p>	
	Students	Students will work in groups for the materialization of their mockups. In this part of the project, they will create all the artistic parts of their mockup and insert the illumination circuits in it. Tools: Chosen materials to produce the mockup.			In classroom (Depends on the complexity of the project)
SIS Operation School Community Synergies		The participation of all STEAM teachers is very important at this stage in order to provide the necessary tutoring to the materialization of the student's choices. At this stage students should be working in groups and will not only build their mockups but also produce the and deliver the report with their findings to the relevant authorities. They will also prepare the Light Pollution Awareness Campaign where their findings and proposals will be presented to the community.			

School-Stakeholders Synergies		Relevant stakeholders of the community should be invited to actively collaborate in the materialization of the students ideas and wherever possible enrich them and help maximize their impact			
Act #	Description of activities, strategies, methods, means, resources and synergies		Learning goals - Learning outcomes Features/Competences	STEAM Fields	
A7	ICT Teacher	Support for the preparation of an exhibit online and onsite ensuring the inclusion of accessibility tools. The preparation of a survey to evaluate the impact of the activity on the participants.	Educational Method <i>IBL</i>	<ul style="list-style-type: none"> To create posters To create an online exhibit To share it within school and with local community 	
	Students	Students will produce their awareness exhibit using a digital tool and either print them to accompany the mockups presentation or use projectors inside the exhibit venue to present their awareness campaign material.			
Tools: Canva, Artsteps or other alike projects					
	ICT	ICT teacher will support students to create a digital brochure with a summary of all the relevant parts of their research and proposed solutions.			
	Students	Students will prepare a summary of their findings in the form of a brochure to be delivered formally to the local authorities, or other identified stakeholders, in the inauguration of the Light Pollution Awareness Campaign			



	Tools: Canva or other similar tool for the production of the brochure	
SIS Operation - School Community Synergies	Students will prepare the information about a Light Pollution Awareness Campaign to be featured in the school website. The whole school community will be invited to support the dissemination of the activity. An interactive exhibit will be produced, and photographs of the onsite materials will be used to illustrate the page where the invitation to the community will appear.	
School-Stakeholders Synergies	Relevant stakeholders of the local community will be invited to support the dissemination of the Light Pollution Awareness Campaign. All members of the local community will be invited to participate in the event. During the inauguration of the Light Pollution Awareness Campaign a brochure with all the findings and suggestions for improvement will be delivered to the relevant stakeholders.	

4. References

Light Pollution 101 – National Geographic - https://www.youtube.com/watch?v=V_A78zDBwYE

Losing the Dark – International Dark Skies Association - <https://www.youtube.com/watch?v=dd82jajtFlo>

Light Pollution: The Solution is Easy - https://www.youtube.com/watch?v=vk_yirISflc

Light Pollution Rap: <https://www.youtube.com/watch?v=Y7NrNQHMJtE>

Dark Skies Rangers and Energy Education Materials: <https://www.globeatnight.org/dsr/>





5. ANNEXS





6. Abbreviations, short terms apps used in Educational Scenario

- F1. Literacy competence
- F2. Multilingual competence
- F3. F3M. Mathematical competence and F3S. competence in science, F3T. technology and F3E. engineering //or/ F3MS, F3ST, (STEM=F3)
- F4. Digital competence
- F5. F5P. Personal, F5S. social and F5L. learning to learn competence
- F6. Civic competence
- F7. Entrepreneurship competence
- F8. F8C. Cultural awareness and F8E. expression competence





NEXT STEP Partnership



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