ERASMUS+ KA220-SCH - Cooperation partnerships in school education

freeland

Promoting STEAM through participatory urban regeneration

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Learning Module on Climate Change

Co-funded by the European Union

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Climate Change – Temperature & cities

Description of the module

This module focuses on Climate Change influence on urban environment, and microclimate differences of an urban area due to different thermal properties of natural and artificial surfaces. The module includes a series of educational and practical activities aimed at investigating the temperature increase in cities and how the thermal characteristics of an urban spaces affect local temperature.

Learning objectives

Students will learn about:

- If and when temperature starts to increase in our cities
- How thermal property of urban spaces affect microclimate of such spaces
- Methods of surface temperature measurement of urban manufactured and green areas

Students will be able to:

- measure quantitatively temperature of urban surfaces using non-contact infrared (IR) thermometers or hand-held IR cameras
- use web and desktop applications for data collection and chart design
- analyse and compare collected data
- work in teams
- present results of their activities through video, presentations or artistic products organizing participatory events for the public

Methods that will be used

- Brainstorming
- Inquiry-Based Learning (IBL)
- Outdoor observation and hands-on measurements

- Visual documentation (photos, sketches, or maps to capture observations)
- Working groups (students work in teams to share tasks and ideas)
- Data analysis with charts/tables
- Use of ICT, digital tools and platforms
- Artistic production, crafting

School subjects involved

Science (Physics and Biology), Maths, ICT, English, Art, Civil Education

Module duration and suggested time allocation

Steps	Duration (hours/days)	Description of methods
Step 1: Presentation of the place & problem discussion	½ to 1 hour	Circle time, Brainstorming
Step 2: Outdoor laboratories & research	30 minutes per day outdoors for taking measurements for a total of 10-20 days	Group work Hands-on activities Data analysis and discussion
Step 3: Designing	1 hour	
Step 4: Data evaluation	2-3 hours	Participatory discussions
Step 5: Project delivery & civic engagement plan announcement	4-5 hours	Public presentation: participatory events (organization of materials and events)

Step by step template

Step 1: Presentation of the place & problem discussion

In this step, the real-world problem of urban neglect is presented and conceptualized. The presentation/orientation could be made outside or by using virtual resources (ppt presentations, videos, Google Map, Freeland Platform, etc.). The goal of this step is to describe the place in terms of problems and opportunities.

To identify the problem, a guided discussion utilizing the **Circle Time** tool is recommended. During the Circle Time activities, questions can be used to start the discussion.

Duration: 30 minutes to 1 hour

Activities and methods

The teachers take the students outdoors to a neglected built space (e.g. abandoned buildings, squares with some green areas, etc.) which should have some trees and invite them to walk around trying to perceive the space and changes in temperature from one area to another.

Then, through the Circle Time method they are invited to answer some questions.

- *"What is the difference between climate and weather?"*
- *"What is Climate Change? Does it have a greater or lesser impact on the cities?"*
- *"Did you felt some difference in temperature walking around and passing from one space to another?"*

Students should recall their prior knowledge to answer questions and recording observations and suggestions to support IBL in the next steps.

Tips & Tricks

This activity should be performed outdoor, in a place with some green space. If going outside is not possible, some photos/video or maps can be shown instead.

Resources needed

Notebook and pen to take notes, Internet connection, smartphones.

Cross-curricular links

Science, Biology

Step 2: Outdoor laboratories & research

One or more outdoor laboratories/activities are proposed by the science teacher. The students investigate the selected topics emerged in the first step (e.g. high temperature during the summertime, vegetation's wellbeing, etc.), following the **Inquiry Based Learning** (IBL) approach.

One student group will recreate the place virtually with the support of the **Platform**, while other groups focus on data collection, analysis and reporting.

The groups compare the results and put them into the Platform.

The result is an output in the form of report, presentation, video or artistic product, that can be evaluated by teachers following the school's evaluation grid.

Duration: depends on the laboratory.

Activities and methods

Two laboratories are related to this topic, and their description contains the details of application:

- The Laboratory "How hot is your city?", related to the assessment of climate trends in an urban space, the "heat island" phenomenon, and mitigation options (garden, park, abandoned area with spontaneous vegetation).
- The Laboratory "Atmospheric CO_2", related to the CO_2 measurement in the atmosphere in different urban spaces (street vs parks, etc.) to understand how it varies depending on the characteristics of the environment and the distance from the sources, and to reflect on solutions to lower its concentration.

The two laboratories include hands-on activities, data elaboration on PC, preparation of digital presentations but also a discussion phase which is meant as a participatory activity with the engagement of the local stakeholders.

Tips & Tricks

It is suggested to perform the activities along the school year (from October/November to April), in order to have an amount of data sufficient to make a better statistic and scientific-based analysis.

Resources needed

The list of tools is reported in the description of each laboratory.

Cross-curricular links

Physics, Biology, Maths, ICT, Art.

After the laboratory/ies are performed, the groups will gather the results and summarize them in a report or a video that can be evaluated by teachers following the school's evaluation grid. Eventually, a student group will import the data into the Platform to recreate the place virtually with the support of the partners (See Step 3: Designing).

Step 3: Designing

With the support of their teachers, students develop possible solutions to the problems identified in the previous steps. For example, they might consider which types of vegetation are most suitable for mitigating local high temperatures or reducing CO_2 emissions, or explore alternative options—such as using more reflective paints or increasing shaded areas—if planting is not feasible.

The **Platform** is used to visualise the variations of the place (e.g. changes in temperature, growth of different plants, etc.)

The project must impact the social aspect of the place. The work must be inclusive, collecting different experiences and knowledge from native and foreign students and citizens (family members, stakeholders following the project, etc.).

Suggested projects

Events to communicate the research results to citizens, neighbors and parents, actions to raise awareness on Climate Change, games or events that include different cultures, actions to revitalise the place.

Duration: 3 hours

Activities and methods

Students summarize results creating products that can be useful and easy to understand for the community and try to plan solutions suitable for their city/neighborhood.

Some ideas could be:

- Creating short videos or commercials explaining the "heat island effect" or the human-induced increase of CO_2, and the adaptation options to mitigate them.

- Creating artistic products or painting abandoned walls or parking areas with “Climate stripes” to describe the temperature increase of their city or what are happening in terms of Climate Change.
- Other ideas that students can elaborate.

Tips & Tricks

Possible obstacles in creating installations or paintings resulting from the time required to obtain authorizations can be overcome by immediately involving the administrations in the project.

Resources needed

PC/laptop, software’s for presentations or video editing, web applications to create charts, mobile phones for making movies, paint or colors, brushes, billboards, etc., teachers, artists or technicians’ guidance for information rendering.

Cross-curricular links

Physics, Biology, ICT, Art, Communication, Civil Education.

Step 4: Data Evaluation

This is a work-in-progress step where the project is proposed to peers, teachers or local community in a participatory discussion.

Schools are in charge of inviting citizens and stakeholders, collecting feedback and improving the final design of the project.

Duration: 2-3 hours.

Activities and methods

Students organize an event at the measurement sites open to stakeholders to present the Freeland project and products related to it.

A projection of videos or explanations of artistic installations, together with a guided tour using thermal cameras will attract families and kids, and it will be a nice demonstration of what are happening in their city.

The event will include the evaluation by the public to understand the value and the sustainability of their initiative, and list of stakeholders interested to actively participate in the project.

Resources needed

Projector, roll-up projection screen or white wall, feedback forms (paper or digital), moderation support for discussion, other materials planned by students.

Cross-curricular links

ICT, Social and Communication skills, Language, Civil Education.

Step 5: Project delivery & civic engagement plan announcement

The students run the final project and plan the participatory engagement.

Schools with stakeholders propose a civic engagement plan or actions to solve the problems of the place through an approach based on actions, civic engagement and, if possible, resilience and urban regeneration principles.

Suggested civic engagement plan

Exhibition and photographic reports to show possible renovation of the area following solution found by students/citizen discussions.

Additional reading materials:

- Climate datasets:
  https://era-explorer.climate.copernicus.eu/?lat=43.94&lng=11.09&plot=2
- Web-apps to create charts and maps:
  https://www.datawrapper.de/
  https://www.tableau.com/en-gb
- Web-app to create mind maps, podcasts, video and reports:
  https://notebooklm.google/
- Web-app for graphic design and creation of presentations:
  https://www.canva.com/
  https://www.mentimeter.com/
  https://kahoot.com/

Appendix:

- Laboratory “How hot is your city?”
- Laboratory “Atmospheric CO_2”

Sources:

- *FREELAND Methodology*