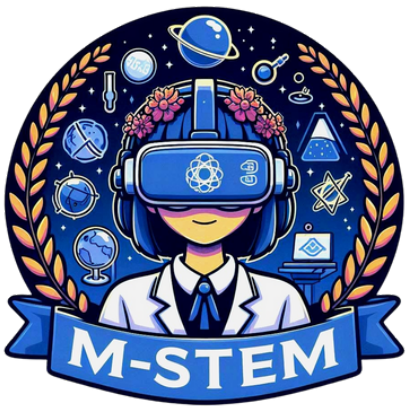

THE CLIMATE AND MY PLAYGROUND

MSTEM

METAVERSE-BASED STEM EDUCATION FOR A SUSTAINABLE AND RESILIENT FUTURE

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Co-funded by the European Union

My playground: a place for climate mitigation

DESCRIPTION OF THE LESSON

With global warming, the frequency of heat waves and the rise in average temperature mean that the playground is becoming an unpleasant place because it is too hot. The break that allows pupils to recharge their batteries becomes an unpleasant moment.

The aim of the session is to make pupils imagine a playground as an island of coolness and not as an island of heat.

In the context of this research, the metaverse will facilitate interactions between school pupils in the same city, the same country or even in different countries.

Overall, the temperature of the playground depends on three parameters:

- the albedo of the surface, i.e. the capacity of a surface to reject the energy received
- the possibility of evaporation of water, which consumes heat
- the thermal inertia of the materials, i.e. their capacity to store heat.
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TEACHING METHODS

- Problem solving and group work
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The problem is posed based on the students‘ experiences. This gives meaning to the session and encourages the students’ engagement in STEM.
Group work will allow students to exchange and compare ideas. The teacher will guide their reflection by distributing the appropriate documents at the right time.
The groups will be able to present different phases of their work: protocols, measurement results and proposed arrangements, posters and, depending on the case, arrangements for the playground.

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Lesson plan

1. Presentation of the problem to be solved

After discussing well-being in the playground in summer, the following problem is posed:

How can the playground be modified to make it cooler in summer?

Collection of proposals from pupils

2. Group work: proposals and creation of a scientific protocol to argue the development proposal

Questions to accompany the groups' thinking:

- Which areas of the playground are pleasant to be in during the summer? Why
- Which areas are unpleasant to be in during the summer? Why?
-

Example of pupils' ideas

- It's cooler in the shade of a tree.
- It's hot on the tarmac. It should be replaced with grass.
- In the water, it's cooler.

How can the validity of the layout be tested?

Each group devises a protocol for measuring one or more physical parameters.

3. Communication and use of results

Each group finds the best way to communicate the results of its measurements in relation to the proposed layout.

4. Augmented reality tour of the new playground

Each group presents its project during an augmented reality virtual tour of the new playground.

The oral presentation is followed by a question and answer session.

5. Continuation of the work

- Presentation of the projects to the school principal and the town hall.
- How can we mitigate the effects of global warming at home and in my city?

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Lesson table

Stages of the lesson	
• Presentation of the situation and formulation of the problem. • Collection of pupils' ideas	15-20min
• Formation of groups and announcement of the instruction: ‘How can the playground be modified to make it cooler in summer?’ • For each proposed layout, a scientific argument based on measurements is requested.	1 h
Taking measurements (temperature, albedo, etc.) and communicating the results to argue the effectiveness of the proposed development.	1h
Augmented reality tour of the new playground and presentation of the scientific arguments	1h

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Lesson resources

RESOURCES

- https://mynasadata.larc.nasa.gov/mini-lessonactivity/valuing-albedo
- https://www.ted.com/talks/takaharu_tezuka_the_best_kindergarten_you_ve_ever_seen/up-next
- https://www.paris.fr/pages/les-cours-oasis-7389
- Application on the telephone to measure the albedo
- Thermometer
- Device to measure humidity

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Work and homework

INDIVIDUAL WORK WITH SHORT EXPLANATION

The pupils will explore the areas of the school playground or outdoor places where it is nice in summer. This first stage will feed their imagination for future development of the playground.

These developments must be justified by physical measurements of temperature, albedo and humidity levels.

The measurements will be taken in a place with the desired layout and in a place without this layout (e.g. in the shade of a tree and in full sunlight). This will allow the importance of the control experiment in scientific reasoning to be worked on.

For the measurements to be comparable, they must also be taken under similar conditions (height above the ground, for example).

Evaluation and indicators

Evaluation criteria	
Relevance of the proposed developments in relation to the measurements taken	1
Quality of oral presentation	2

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Overview of the lesson

In this project, the pupils will come up with ways of taking reasoned action on the effects of global warming.
Starting from their everyday environment, the playground, they will think about possible changes to the playground that will lead to a drop in temperature and therefore greater comfort.

Each design must be accompanied by scientific arguments related to temperature, albedo or humidity measurements. These three parameters are the keys to feeling the effects of heat less in a given place.
In the end, the pupils will have practised a scientific approach in its entirety. The results obtained will enable them to take direct action on one of the means of combating global warming: mitigation.

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The Oasis Berthelot courtyard, an oasis of freshness in the heart of Montrouge (south of Paris)

Before the project

- a concrete, impermeable courtyard
- a floor that contributed to the formation of heat islands

After the project

- a cooler playground thanks to the integration of plants and the removal of soil sealants
- better rainwater management
- more fun facilities and a more user-friendly playground
- uses aimed at promoting contact with and exploration of nature

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