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*Open: Wide Minds will Find Eco Virtual
STEAM Solutions against Climate Change!*

2022-1-R001-KA220-SCH-000084942

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Content

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Lesson plan



NAME:

World of Threatened and Endangered Plant Species

LESSON 1

DURATION: 50min

TOPIC:

Science

TOOLS:

Computer and electronic devices, projector, interactive whiteboard, paper sheets, pens/pencils

MAIN GOALS:

- Facilitate their understanding of endangered plant species conservation.
- Understand that endangered species is a global issue.
- Learn the difference between the terms threatened, endangered, and extinct.
- Learn facts about select endangered plant species from around the world, with focus on those found in Europe/Romania, and be able to discuss.

LEARNING OUTCOMES:

- Extensive knowledge of climate change & global warming
- The role of science in studying endangered plant species
- Integrating science into environmental problems
- Adopting ecological lifestyle
- Considering environmental consequences before taking a decision
- Adapting habits into climate change

LEARNING METHODS AND TECHNIQUES:

- brainstorming
- online research
- oral presentation
- self produced creative work



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ACTIVITIES:

Activity 1: The World of Threatened and Endangered Species

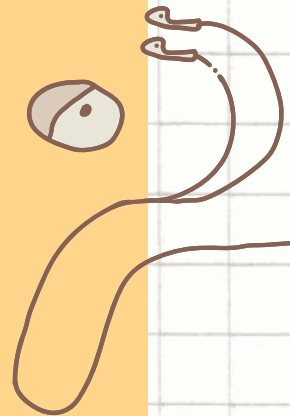
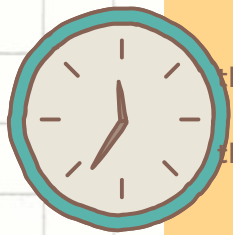
Students will be presented with a scripted slide show which acquaints them with several endangered plant species in different countries and then an emphasis on species in Romania. Students will then use this knowledge to play "The World of Threatened/Endangered Species" game with their classmates.

PROCEDURE:

1. Present the prepared slide show to students, using the prepared script to describe each slide.
2. Explain the game rules:
 - a) Two students will start by standing side-by-side.
 - b) The teacher will ask one of the questions from the question cards.
 - c) The first student to give the correct answer collects the card from the teacher and rotates to the next student
 - d) The next student stands and the two students compete to answer the next question
3. Begin the game.
4. Continue until all cards have been distributed to the students.
5. The student who collects the most question cards is the winner of the game.
6. Collect all cards from students.

EXTENSION :

The teacher divides students into groups. Each group should choose five-six endangered species not presented previously. Students should research and create their own scripted slide show. Have each group present their slides to the rest of the class.





ACTIVITIES:

Activity 2: Healing Plants (outdoor activity)

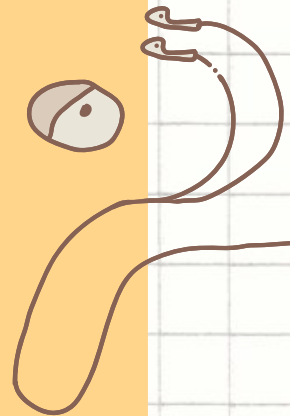
PROCEDURE:

1. Prior to this activity, the teacher and the students identify the different plants around the school that have medicinal purposes, if appropriate (such plants exist, etc.). The teacher use a field guide or website to identify the history and medical benefits of the plants.
2. The teacher explains to students that throughout early human history, man was able identify those plants that were helpful to their cure their ailments.
3. The teacher explains that in order to remember which plants to return to for a particular medicine, one must have a general description of the plant's structure and growth habit.
4. The teacher reviews plant characteristics with students - leaf shape, arrangement, attachment, flower arrangement, etc.
5. The teacher passes out the plant data sheets and clip boards.
6. Guide the students through the plants previously identified around the school, telling them the history and medicinal purpose of each of the plants
7. Students should fill in their "Medicinal Plant Data Sheets" as the teacher provides them the necessary information. The students are given several minutes to observe the characteristics of the plants and to fill in the plant data sheets.
8. Then, the students will be given a guided tour of the school grounds as the teacher points out and describes the plants that have medicinal value in our society. Students will then characterise the features of the plants described by the teacher.

Alternatively, teachers can fill in the Medicinal Plant Data sheets on plants found around the schoolyard. Copy and cut out the individual plant data charts. Working in teams, students go on a plant hunt using the description and pictures found on the data charts. Students collect leaves as evidence of finding the plant. (Note: students should only gather leaves of plants that are not threatened or endangered.)

If plants are not readily available around the school grounds, a teacher can bring plants from nearby parks or nature preserves and set them out around the school grounds for examination or on an outdoor table. Alternatively, if plants are not available, a teacher may want to just bring the students outside to a nearby tree and have them brainstorm the different parts of the tree that could potentially act as medicines.

Have students collect and press the leaves from the plants (that are not threatened/endangered) discussed during the nature walk. Students can use their collected data along with the pressed leaves to create a poster board presentation.





Lesson plan



NAME: Broken Webs

LESSON 2

DURATION: 50min

TOPIC: Science

TOOLS: Computer and electronic devices, handouts of a food chain/web, large sheets of blank paper or white boards, writing utensils

MAIN GOALS:

- Understanding the primary reasons that animal or plant species become threatened or endangered.
- Gaining an understanding (and explaining) of the interdependence of species within an ecosystem.
- Being able to identify the causes of habitat destruction
- Describing the connection between habitat destruction and loss of species
- Observing that loss of habitat is a main cause in endangered species, and explain the process.

LEARNING OUTCOMES:

- Extensive knowledge of climate change & global warming
- The role of science in studying endangered habitats
- Integrating science into environmental problems
- Adopting ecological lifestyle
- Considering environmental consequences before taking a decision
- Adapting habits into climate change
- Becoming aware of the dangers created to natural habitats by global warming

LEARNING METHODS AND TECHNIQUES:

- Brainstorming
- Inquiry-base
- Elaborative interrogation;



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ACTIVITIES:

Activity 1: Broken Webs

The teacher explains the students that a community is composed of a vast number of species interacting with each other through competition, predation, mutualism, commensalism, and parasitism. One way to organize all the different populations within a community is to place them into a scheme based on which species feed on each other, generating a food web. This type of scheme reveals the interdependence between the species found within a given area. Loss of a single species within a community can directly or indirectly affect up to 40 other species, drastically altering the dynamics found within the food web. then the teacher shows the students an example of such a web (a photo,a video or a handout).An example is on Quiver application- use this link in order to download the worksheet [Food Chain.pdf \(quivervision.com\)](#), also the students are showed the next video in order for them to learn more about the process involved in any food chain/web (<https://youtu.be/GZn3u1eg59I>)

Activity 2: Hypothesis-based project

Step 1.

The students are given a handout and they are supposed to complete the broken food web with the correct choice given.

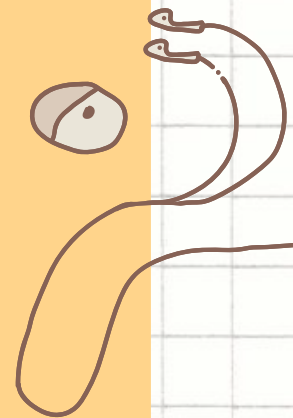
Step 2.

Project time-The effects of natural disasters on food webs.

The students are divided into four groups and they are given large sheets of paper, having to represent a similar web based on a given scenario:

A flood has severely affected a rural area of Romania, destroying the habitat(the field) and separating it into two smaller land plots. Redesign your food web to reflect the possible effects from this habitat alteration. The questions given will prove helpful in both understanding the task and designing the web:

- 1.Explain why you chose the changes you did to the food web.
- 2.Which organisms are affected directly and indirectly from the fragmentation?
- 3.Which species in the habitat will not be affected by a smaller sized habitat? Why?





ACTIVITIES:

Activity 3. Presentation and Feedback

After 15 minutes, a representative from each group will have 1 minute to present their work to the class. The teacher gives feedback.

Activity 4: Evaluation

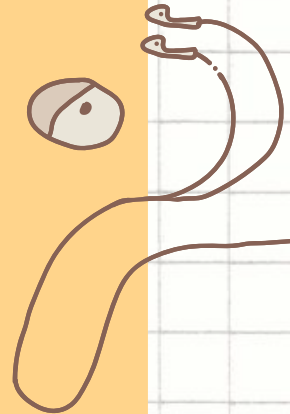
At the end of the lesson, so as to assess the students' achievements, the teacher gives them a handout, having to explain the reasons for which the given chains are broken.

Resources:

Products - QuiverVision 3D Augmented Reality coloring apps

<https://youtu.be/j78g5iRnYBM>

https://youtu.be/2lqhJNgn_Wg





Lesson plan



NAME: Global Warming and Green House Effect

LESSON 3

DURATION: 50min

TOPIC: Science

TOOLS: Computer and electronic devices, projector, interactive whiteboard, Internet access, paper sheets, coloured pencils, pens, markers

MAIN GOALS:

- Understanding the concept of global warming and the greenhouse effect.
- Describing the reasons for the greenhouse effect and its effects.
- Giving examples of potential problems and negative consequences of global warming and the greenhouse effect.
- Projecting the concept through a poster.
- Suggesting actions to reduce the greenhouse effect in order to save our planet.

LEARNING OUTCOMES:

- Extensive knowledge of climate change & global warming
- The role of science in studying climate change & global warming
- Integrating science into environmental problems
- Adopting ecological lifestyle
- Considering environmental consequences before taking a decision
- Adapting habits into climate change
- Becoming aware of the dangers created worldwide by global warming

LEARNING METHODS AND TECHNIQUES:

- Brainstorming;
- Application of science in real-world contexts;
- Conceptual understanding of key concepts;
- Inquiry-based;
- Discussion.



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ACTIVITIES:

Activity 1:

The teacher displays the below picture to the class.

Suggested questions:

1. What is happening in the images?
2. Have you ever seen or experienced such situations?
3. What are the reasons for happening such situations?
4. What do we call these actions?



The students respond.

The teacher then explains that these are all happening due to climate change. "Climate change" refers to the increasing changes in the measures of climate over a long period of time - including precipitation, temperature, and wind patterns. And global warming is one of the reasons for climate change. "Global warming" refers to the rise in global temperatures due mainly to the increasing concentrations of greenhouse gases in the atmosphere.

Activity 2:

The teacher shows two videos to the students:



<https://youtu.be/ztWHqUFJRTs>

<https://youtu.be/PqxMzKLYrZ4>

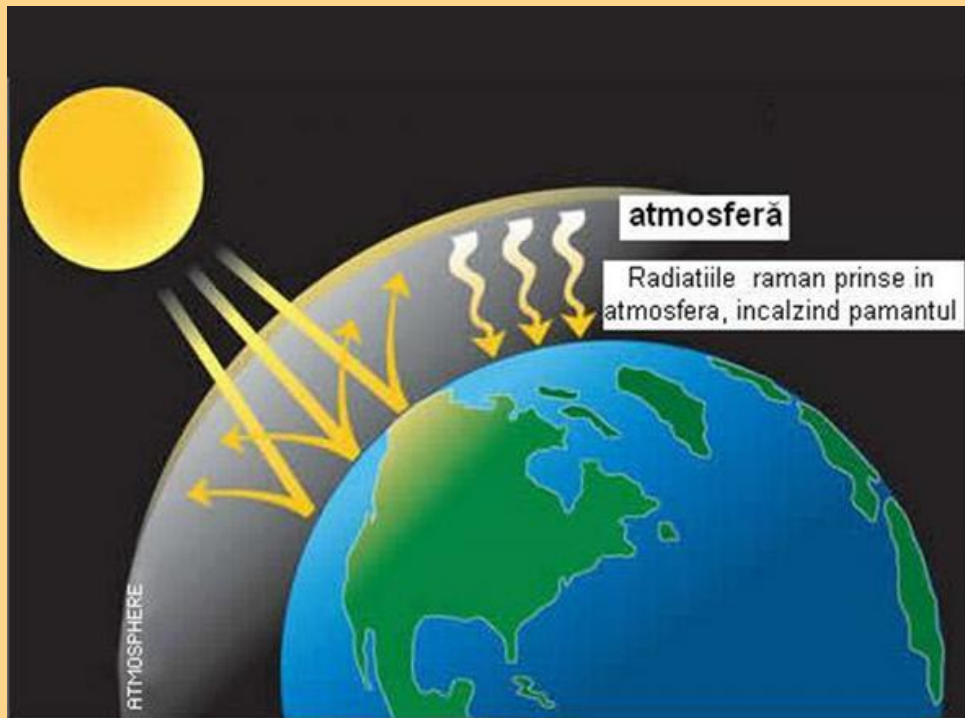
Activity 3:

After the interaction with the videos, the teacher tells the students to prepare a poster of the greenhouse effect and distributes them colour paper and pencils.

The teacher guides them on how to prepare the poster using the below poster as a model.



ACTIVITIES:



Once they prepared the poster tell them to present.

Activity 4:

After the preparation of the poster and presentation , the teacher asks students the preventive actions to reduce global warming and the greenhouse effect. The teacher lets them speak and share their own ideas. After the interactions they are told that they are going to watch another video on Climate Change - We are the PROBLEM & the SOLUTION.
https://youtu.be/-D_Np-3dVBO

Activity 5:

After watching the video, the students are asked to write on the bottom/on the back of their project a few possible solutions to reduce global warming.

Activity 6. Feedback/Homework:

The teacher praises and thanks the students for their involvement and assigns their homework: A drawing suggesting a way each of them can help prevent global warming.



Lesson plan



NAME: Greenhouse effect

LESSON 4

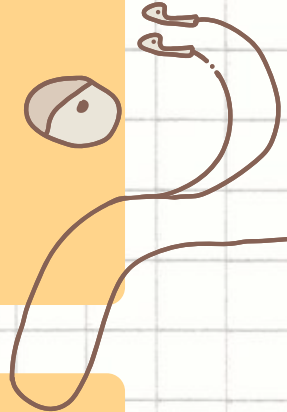
DURATION :2x50min

TOPIC: Technology

TOOLS: Computer, access to the Internet, paper and pencil, software
- OneNote, Word /students need, etc.

MAIN GOALS:

- Learning about climate change and global warming
- Learning about the Greenhouse effect
- Learning about the greenhouse gases
- Testing what happens to the temperature in a covered glass container on a sunny day.



LEARNING OUTCOMES:

- Knowledge of greenhouse effect & green
- Maths' importance in tackling climate change relevant problems
- Integrating technology into environmental problems
- Doing simple experiments
- Conclusions about greenhouse effect
- Changing opinion about the greenhouse effect.
- It's good to do experiments with well known facts.

LEARNING METHODS AND TECHNIQUES:

- Testing,
- Experimenting,
- Discussion.



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ACTIVITIES:

First part: "What is Greenhouse effect".

What is Greenhouse effect? Students watch the video.

Discussion about "What do you know about greenhouse effect?"

The students use tablets to do the forms: What do you think about greenhouse effect? (for teacher -https://forms.office.com/Pages/ShareFormPage.aspx?id=ZOv8NgGqvEuoGn5m_Is9LXPbkYnkyJ9Gtp2hXBEUILVUQ0UzMFVRSldZNzLlWkZCMINCNOoySjNRUS4u&sharetoken=PuCi2tndf3GZvrVhsoS6/)

Teacher shows the results. After that she/he sends Picture "What is greenhouse effect"

Students discuss the picture and after that they do the forms again. The results may be different.

Main topic: Without the greenhouse effect, life on Earth as we know it would not be possible. The greenhouse effect is a very natural and essential process. It has been around for millions of years.

During the day, the sun shines on planet Earth. But only about one half of the sun's energy reaches the Earth (26% of the solar energy (energy from the sun) is lost in space, and 19% is absorbed by the atmosphere /cloud).

At night, most of the sun's energy escapes back into space. Most but not all. Thanks to the greenhouse effect, some of the heat is trapped in the atmosphere, and it protects us from the chill of space. The greenhouse effect is what keeps the Earth's temperature stable.

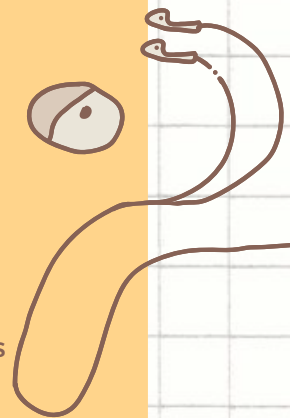
Experiment 1. Two Thermometers

1. Materials:

- Two thermometers
- A clear bowl, jar or vase and something to cover it
- Recording Sheet - on the tablets

2. What to do /picture/

- Lay both thermometers for a few minutes outside in a sunny area.
- Mark down the time and the temperatures of both thermometers on your record sheet (link ours).
- Place a vase in the sun with a thermometer in it. Cover it with a plastic wrap or a dark t-shirt.
- Place the second thermometer next to the bowl (not in the shade).
- Record the temperatures on both thermometers every 5-10 minutes.





ACTIVITIES:

The question is: Why are the temperatures inside and outside of the vase different?

3. What it means:

Solar energy (light) goes inside the vase and is changed into thermal energy (heat). This heat cannot escape the vase. It's trapped and the air inside of the vase gets warmer and warmer as more light (solar energy) enters the vase. This is very similar to the greenhouse effect (we will talk more about gases in the next experiment).

The second thermometer is exposed to air. Even though it doesn't seem like much is happening in the air, a lot of factors are at work that allow the warmer air to mix with the cooler air in a constant interactive dance.

Second part: "What are the greenhouse gases?"

Teacher sends to the tablets [Picture 2](#) and discusses it together with the students.

Greenhouse gases trap energy from the sun. They absorb the heat and prevent it from going back into space. There are many different gases. Some you might have heard of are water vapor, carbon dioxide, ozone, nitrous oxide, and methane.

Experiment 2: Greenhouse gases / Pictute experiment 2/

1. Materials:

- 4 plastic sandwich bags (and maybe more for backup)
- vinegar
- baking soda
- water
- toilet paper roll to make 4 toilet paper pockets to hold soda

2. What to do:

- Lay out toilet paper squares and place 2 tablespoons of baking soda in the center of each one. Fold your soda pockets carefully. We used 3 squares for each pocket.
- Fill plastic bag 1 with 2 tablespoons of vinegar, bag 2 with 8 tablespoons, bag 3 with 12 tablespoons, and bag 4 with a 50/50 mixture of vinegar and water (say 5 tablespoons of vinegar and 5 tablespoons of water).
- Drop a soda pocket into each plastic bag in turn and seal quickly.





ACTIVITIES:

3. Students take notes during the process on their tablets

What happens when we add baking soda to the vinegar? Why did the bags pop? What amount of vinegar created the best reaction?

In this experiment, two chemicals work together to create carbon dioxide gas. Once the baking soda and vinegar mix, carbon dioxide gas starts to fill the bag until it runs out of room and POP goes the bag.

4. Discussion: So why do we keep hearing that the Greenhouse effect is bad?

If the greenhouse effect is something we need to sustain life on earth and it has been around for millions of years, why do we keep hearing about how bad it is?

Ever since the industrial revolution, and especially in the last few decades, human activities increased the amount of greenhouse gases in the atmosphere. It means that more heat is trapped in the atmosphere than ever before, which upsets the Earth's energy balance.

It means that the Earth's natural systems, such as weather patterns, water level balance, and ecosystems, change negatively. You have probably heard about the population of polar bears decreasing as the Arctic ice continues to melt, but do you know that bacteria and viruses trapped in ice for thousands of years are now being released as the ice melts?

Experiment 3: How heat can harm plants and melt ice /Picture experiment 3

1. Materials:

- Two plants of the same size
- A car
- A sunny day
- 2 thermometers
- 2 chocolates, each inside its own plastic bag
- Tablets

Source: [How to Explain the Greenhouse Effect to Kids \(with printables\) - KidMinds](#)





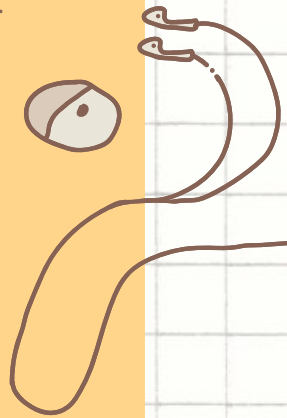
ACTIVITIES:

2. What to do:

- On a sunny day, place one chocolate (inside a plastic bag) and one of your plants inside a car. Roll up all the windows.
- Place one of the thermometers inside the car in such a way that you can see the readings.
- Close the car door.
- Place the second plant, chocolate (inside a plastic bag) and the second thermometer outside the car.
- Check back every 10-15 minutes and write down the readings on your observation sheet.
- Keep an eye on the temperature reading! It can get pretty hot inside the car. Take the thermometer out before the mercury reaches the top to prevent it from bursting!
- After recording a few readings, you can take the thermometers inside the house and leave the plants and the chocolate inside the car for a few hours.

3. Results

The temperature inside a parked car on a sunny day can be 160 (80C) degrees higher than outside the car! Sunshine (solar energy) goes through the car windows and heats up the interior. Depending on how hot of a day it is, there might be enough heat trapped inside to bake eggs.





Lesson plan



NAME: How can we explain about greenhouse gases to younger student from the primary school

LESSON 5

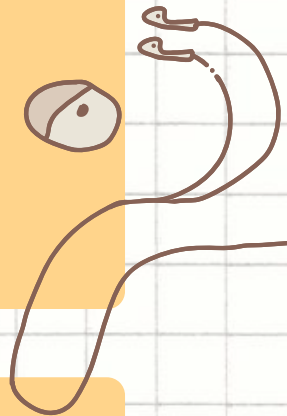
DURATION: 3x50min

TOPIC: Technology

TOOLS: Tablets/Computer, 3D printer, colour printer

MAIN GOALS:

- Learning about greenhouses gases
- Discussion about the topic
- Design models, organise an event to publicise the topic.



LEARNING OUTCOMES:

- Knowledge of greenhouse effect
- The information is important to be public in order to have a good effect
- Using technology to make the topic public.
- Integrating technology into environmental problems
- Design 3D models
- Design flyers
- Organise an event to public the results.

LEARNING METHODS AND TECHNIQUES:

- Testing,
- Experimenting,
- Discussion.



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ACTIVITIES:

First part: Knowledge “How Do Greenhouse Gases Actually Work?”

How Do Greenhouse Gases Actually Work? Students watch the video and discuss it.

The teacher starts the conversation with a question “Think how do you feel when you enter a greenhouse or when you sit in a room with lots of windows on a hot day.”

Main topic: The Earth is like a room with closed windows. When the sun shines, sunlight passes through the windows creating heat which cannot escape. The same happens in our atmosphere. Sunlight passes through bringing with it heat which then cannot escape.

Activity 1. How can you explain the topic for younger students than you. /Group work /3 students in each group/

1. What to do:

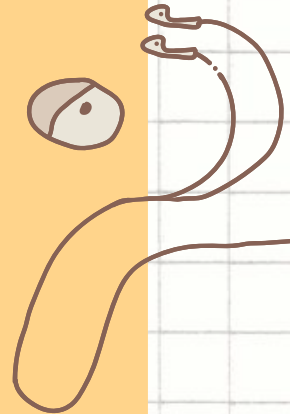
- Students read the text, every group has to read different paragraphs on their tablets.
- Students create short simple text for younger students in primary class on their tablets, use their school Microsoft accounts, in shared document.
- Insert pictures, create with drawing software <https://www.gifpal.com/> , <https://sketch.io/sketchpad/> , or other app
- Each group shows their results and comments with other students.
- Create mind map with the product of activity of each group in <https://coggle.it/>

Second part: “What are the greenhouse gases?”

1. Teacher sends to the tablets Greenhouse gases

Discussion about what kind of chemical elements are in the atmosphere because of human activity.

Greenhouse gases trap energy from the sun. They absorb the heat and prevent it from going back into space. There are many different gases. Some you might have heard of are water vapor, carbon dioxide, ozone, nitrous oxide, and methane.





ACTIVITIES:

It's not greenhouse gases themselves that are bad, without them the Earth would be too cold for life to exist, but humans are adding too many greenhouse gases into the atmosphere by burning fossil fuels and our general over consuming lifestyle. Even a small temperature increase could have a catastrophic effect for our planet.

What are greenhouse gases: Carbon dioxide, Methane, Ozone, Nitrous Oxide, Chlorofluorocarbons

2. Teacher sends Where do greenhouse gases emissions come from
Discussion about what kind of human activity generate greenhouse gases in the atmosphere.

Activity 2: Greenhouse gases models

1. Materials:

- 3D printer
- Tablets/laptops with 3D design software Tinkercad or another app for 3D printers

2. What to do:

- Create six groups of students. Each group designs a model of a greenhouse gas. The model can be like a flat coin, or balls, or another shape /depends of student's preferences/, with letter of the chemical element - example
- Print the models with a 3D printer.

3. Knowledge:

METHANE MODEL Methane is the gas often linked with cows. The chemical formula is CH_4 . This is 1 Carbon atom surrounded by 4 Hydrogen atoms. Methane is released from livestock, landfill sites and when coal, oil and natural gas are extracted from the Earth.

OZONE MODEL Ozone is a gas composed of three atoms of oxygen. It's blue and has a strong smell. The oxygen we breathe has two atoms of oxygen and has no colour or odour. The ozone layer blocks radiation from the sun. Good ozone occurs naturally in the upper stratosphere (the layer of space 6-30 miles above the surface of the earth) it forms when UV light hits oxygen molecules splitting them into two atoms of oxygen. If one O atom combines with an O_2 molecule ozone is created.

CHLOROFLUOROCARBONS (CFCS) - CFCs are made up from chlorine, fluorine, carbon and hydrogen. Chlorofluorocarbons are the greenhouse gas responsible for the depletion of our ozone layer. They are man-made and not found in nature. CFCs were found in aerosols, fridges, and foam products. They break down ozone gas, which seriously depletes the ozone layer, reducing its ability to protect us from the sun's harmful rays. The CFC molecule below contains 1 carbon molecule in the centre, surrounded by 3 chlorine molecules and 1 fluorine molecule.





ACTIVITIES:

NITROUS OXIDE MODEL Nitrous oxide N_2O is a natural part of the nitrogen cycle. Too much Nitrous Oxide (from burning fossil fuels) can lead to smog and acid rain.

WATER VAPOUR MODEL Water vapours is water (H_2O) in its gaseous form. It forms clouds and drops back to Earth as rain. It might surprise you to know that water vapours are the largest contributor to the Earth's greenhouse effect, but this is directly related to the Earth's temperature. It's the increase in temperature that has led to an increase in water vapours in the atmosphere.

CARBON DIOXIDE MODEL Carbon dioxide is probably the most famous of the greenhouse gases. CO_2 is released whenever fossil fuels are burned, carbon powered power plants and transportation are the main causes of the increase in CO_2 we are seeing.

Activity 3. Flyer HOW TO REDUCE CARBON EMISSIONS

1. Materials:

- Tablets/laptops for Canva
- Colour printer

2. What to do:

- Students create a flyer design HOW TO REDUCE CARBON EMISSIONS
- Printing with a colour printer.

3. Knowledge:

- Use electric or hybrid cars.
- Use heating and air conditioning less.
- Recycle and reuse as much as possible.
- Buy energy efficient products such as light bulbs and unplug electrical devices when not using them.
- Walk or cycle instead of taking the car.
- Eat less meat, grow your own food, and don't WASTE food!
- Consume less generally.
- Fight for renewable energy and for change!

Third part: Exhibition "Greenhouse gases"

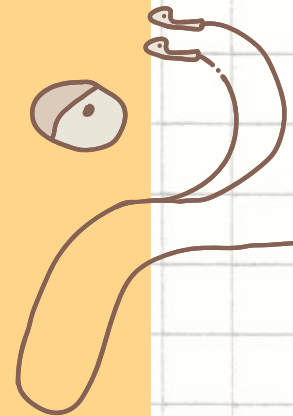
Activity 4: Organise an exhibition.

Students are showing mind maps /Activity 1/, 3D models /Activity 2/ in the school. They invite younger students from primary school to visit. They talk about greenhouse gases with primary students. They are handing out the flyers /Activity 3/. The event is filmed. The video is distributed through the school's website.

Source: [Global Warming - Greenhouse Gas Models for Kids \(science-sparks.com\)](https://www.youtube.com/watch?v=sTvqIijqvTg)

<https://www.youtube.com/watch?v=sTvqIijqvTg>

<https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions>





Lesson plan



NAME:

Acid rain

LESSON 6

DURATION :2x50min

TOPIC:

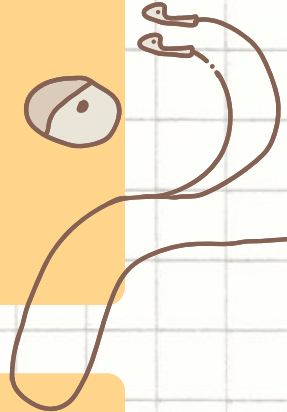
Technology

TOOLS:

Computer/ tablets, software, etc.

MAIN GOALS:

- Learning about acid rain
- Learning about human activity, which is the reason for the acid rain.
- Experiment with plants
- Share the results with other students in the school.



LEARNING OUTCOMES:

- Knowledge of acid rain
- The information is important to be public, to have a good effect.
- technology is important to make the topic public.
- Integrating technology into environmental problems
- Doing simply experiments
- Conclusions about acid rain
-

LEARNING METHODS AND TECHNIQUES:

- Testing,
- Experimenting,
- Discussion.



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ACTIVITIES:

First part: Knowledge “What is Acid Rain”.

Activity 1. What is acid rain?

1. <https://www.youtube.com/watch?v=WldWjqZsGgg> Students watch the video.
2. For 5 minutes students write notes about the most important things in the video on their tablets, use an app for writing /Word - Microsoft school account, or app like TextMaker Mobile, or other.../.
3. Discussion about “What is the result of the acid rain?”. Every student reads the notes.
4. Teacher creates a mind map called “Acid rain”. The students take their notes in mind map <https://coggle.it/>
Option: create and take the notes on <https://padlet.com/>
5. Teacher shows the picture and talks about it.

<https://www.climateandweather.net/wp-content/uploads/2022/08/Acid-Rain-Side.jpg>

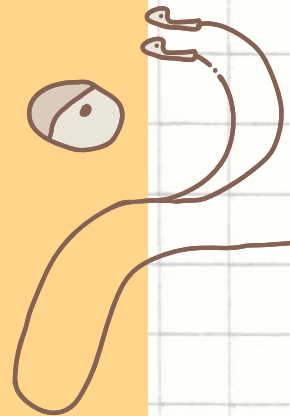
Main topic: Acid rain is any form of precipitation with high levels of nitric and sulphuric acids. Acid rain can occur as deposition of a mixture from wet (rain, snow, sleet, fog, cloud water, and dew) and dry (acidifying particles and gases) acidic components. Burning fossil fuels causes acid rain. Burning oil, gas and coal in power stations releases Sulphur Dioxide (SO₂) into the atmosphere. Burning oil and petrol in motor vehicles puts nitrogen oxides (NO_x) into the atmosphere. These gases mix with water droplets in the atmosphere creating weak solutions of nitric and sulphuric acids. When precipitation occurs, these solutions fall as acid rain.

Acid rain causes many problems. What problems are caused by acid rain? Acid rain causes a range of problems. Acid rain increases the acidity levels of rivers, lakes and seas. This can kill aquatic life. Acid rain increases the acidity levels of soils. This can kill vegetation.

/source: <https://www.internetgeography.net/topics/what-problems-are-caused-by-acid-rain/>

Activity 2. How does human activity generate acid rain?

1. Students watch the video <https://www.youtube.com/watch?v=YK4kWUA3BMs>
2. For 5 minutes students write a note about the most important things in the video
3. Discussion about “How human activity generates acid rain?”. Every student read the notes.
4. Students share their notes in the mind map /padlet/.





ACTIVITIES:

Second part

Experiment 1. The effect of acid rain

1. Materials:

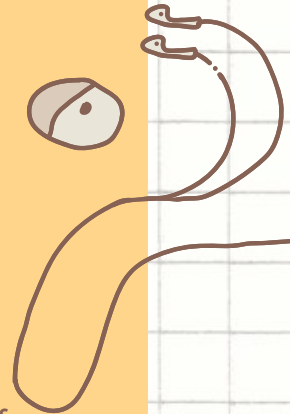
- 3 1-quart jars with lids
- Measuring cup
- 3 small potted green plants
- Vinegar or lemon juice
- 6 labels or strips of masking tape
- Laptops/tablets
- Crayons

2. What to do /picture/ Students work together.

- Take labels on the jars. Label the first plant and jar "a little acid". Label the next plant and jar "a lot of acid", the third jar and plant, "plain water."
- One of them create document with Microsoft <https://www.office.com> and shares with others. The document can be Word, Power Point, or something else.

Everyday some of the students must visit the experimental place and record the result in the document. So, the document needs to have a date, photo of three plants, and texts about it.

- Mix the water for the plant that will get "a little acid" by measuring $\frac{1}{4}$ cup of vinegar or lemon juice and placing it into the jar labelled "a little acid" and fill the rest of the jar with tap water.
- For the plant receiving "a lot of acid", pour 1 cup of the vinegar or lemon juice into the jar and fill the rest with tap water.
- Fill the third jar, labelled "plain water", just with tap water.
- make note of and discuss which plant looks best. Which one looks the worst? How do the plants differ in colour? Continue to record all of their observations in the shared document by photo and writing what they see after each watering.
- Water and observe the plants for at least one week.
- After the experiment, students present the results.
- Create a video with the pictures of the plants, to see change tracking.





ACTIVITIES:

Third part: Make a flyer about what can we do to help

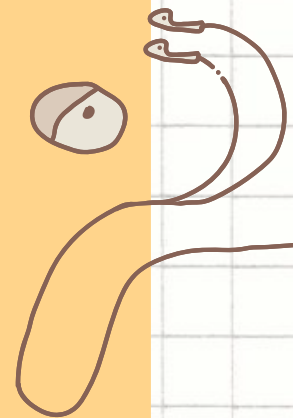
Activity 3. Teacher shares the page <https://ypte.org.uk/factsheets/acid-rain/what-can-we-do-to-help>

Students create a design of flyer in <https://www.canva.com/>

What can we do to help?

Reduce emissions:

- Car exhaust fossil fuels is still one of the cheapest ways to produce electricity so people are now researching new ways to burn fuel which don't produce so much pollution.
- Governments need to spend more money on pollution control even if it does mean an increase in the price of electricity.
- Sulphur can also be 'washed' out of smoke by spraying a mixture of water and powdered limestone into the smokestack.
- Cars are now fitted with catalytic converters which remove three dangerous chemicals from exhaust gases.
- Find alternative sources of energy:
- Governments need to invest in researching different ways to produce energy.
- Two other sources that are currently used are hydroelectric and nuclear power. These are 'clean' as far as acid rain goes but what other impact do they have on our environment?
- Other sources could be solar energy or windmills but how reliable would these be in places where it is not very windy or sunny?
- All energy sources have different benefits and costs, and all these have to be weighed up before any government decides which of them it is going to use.
- Conserving resources:
- Greater subsidies of public transport by the government to encourage people to use public transport rather than always travelling by car.
- Every individual can try to save energy by switching off lights when they are not being used and using energy-saving appliances - when less electricity is being used, pollution from power plants decreases.
- Walking, cycling, and sharing cars all reduce the pollution from vehicles.





ACTIVITIES:

Fourth part: Results of the acid rain

Activity 4: Organise an open lesson.

Students are showing a presentation of the result of the experiment. They invite other students from the school. Show the three plants on the shared document. They are handing out the flyers /Activity 3/.

Teacher creates a video from the event and publishes it on the school website.

Source:

[Pollution Experiment | Education.com](https://www.internetgeography.net/education/pollution-experiment/)

<https://www.internetgeography.net/topics/what-problems-are-caused-by-acid-rain/>

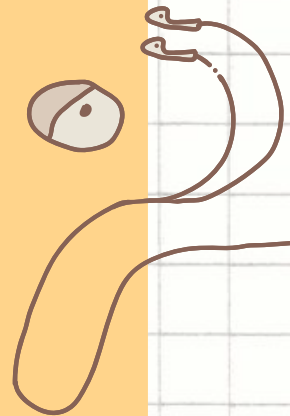
<https://www.youtube.com/watch?v=WldWjqZsGgg>

<https://www.climateandweather.net/wp-content/uploads/2022/08/Acid-Rain-Side.jpg>

<https://www.youtube.com/watch?v=YK4kWUA3BMs>

<https://www.internetgeography.net/topics/what-problems-are-caused-by-acid-rain/>

<https://ypte.org.uk/factsheets/acid-rain/what-can-we-do-to-help>





Lesson plan



NAME: Earth is in our hands

LESSON 7

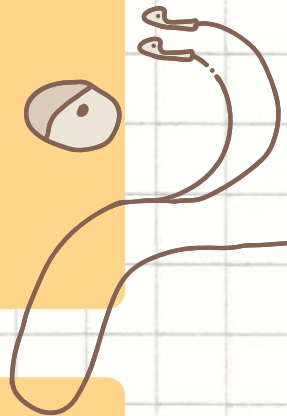
DURATION :2x50min

TOPIC: Technology

TOOLS: Computer/ tablets, software, etc.(Climate Activists Tutorial on Google Earth for Web, Google Earth Engine Timelapse)

MAIN GOALS:

- Learning about climate change
- Online voyage to see what happened with our Home, because of climate changes.



LEARNING OUTCOMES:

- Knowledge of climate changes
- Technology is important to feel deep inside the global problem with climate change.
- Integrating technology into environmental problems
- Students will explore how the environment of their own community has changed over the past 30 years.
- Students will discuss different actions they can take to tackle climate change.

LEARNING METHODS AND TECHNIQUES:

- Self-study,
- Discussion



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ACTIVITIES:

First part: Climate activist

Activity 1. Climate change: We are the problem and a solution

1. https://www.youtube.com/watch?v=-D_Np-3dVBQ Students watch the video.
2. Discussion about it - what can be the solution; what can we do about it.

Activity 2. What means Climate Activist

Teacher shares the word "Activist" with students. Do they know what this means?

Explain that an Activist is someone who cares about specific issues and campaigns to highlight the issue or make more people aware of it. There are different Youth Climate Activists who are all campaigning to protect our natural world.

Young climate activists Teacher open the link on a large touch screen.

Students go to the device and open the point of information, read the notes.

Discuss about it with other students.

After students have spent some time exploring, ask them to think about the following questions:

- What are some of the different ways the activists help teach others about climate change?
- What have you learnt from the climate activists?

Activity 3. How the Earth is changing

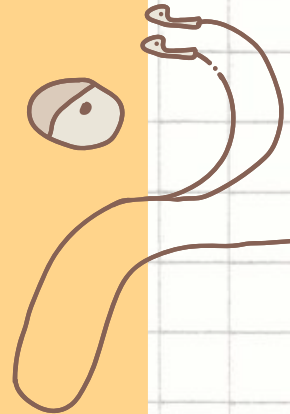
Discussing "What are the changes in your city, because of climate changes?"

Many people around the world are noticing that climate change is impacting where they live.

Have students noticed any impacts of climate change on their communities?

Pull up Google Earth Engine time-lapse for the class: [Timelapse - Google Earth Engine](#) Look at the different places time-lapse together as a class. Why might this be happening?

Discussion. Share with students to discover what happened in different places. What changes can they see happening here? What positive changes might be happening e.g job creations, better transport links alongside the negative impacts this growth might be having on the environment? E.g using the earth's resources, less green space, pollution of the oceans in the construction of the islands.





ACTIVITIES:

Activity 4. How my Home changed.

What to do:

Use [Timelapse - Google Earth Engine](#) to understand how your local city has changed from 1984 until 2018.

- Type in the name of your nearest city to the search bar. If Time-lapse isn't available for this, type in the capital city of your country.
- Watch the Time-lapse to see how your city has changed. Use this as a guide to answer the following questions:

1. How has the environmental landscape of the city changed since 1984?
2. Why might these changes have happened?
3. Do you see any problems occurring if your city continues to change in this way?
4. Do you see any benefits to your city having changed since 1984?
5. Is there more or less green space in your city in 2018 compared to 1984?
6. Has your home city taken any precautions to tackle climate change, that you can see?

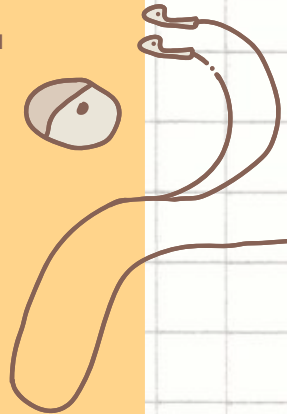
Second part. Discover the Earth

Activity 5. Students can explore the natural world and the reasons why we must protect it through further Voyager Stories.

- I am Amazon - <https://g.co/iamamazon>
- Helping people and animals co-exist - <https://earth.app.goo.gl/U717>
- Polar sea ice coverage - <https://goo.gle/31UKStj>
- Protecting the Earth's last wild places - <https://earth.app.goo.gl/YZgGXH>
- See climate change's impacts - <https://earth.app.goo.gl/sbyogQ>

Activity 6. After discovering Voyager Story, every student creates a design of a small size poster with an environmental message in <https://www.canva.com/>.

One of them create padlet.com for sharing the posters.
Printing the posters and exhibiting them in the school.





ACTIVITIES:

Application:

About Google Earth | g.co/earth Google Earth is an interactive 3D globe available on Chrome, Android, iOS, and Desktop. This detailed representation of the planet includes worldwide satellite imagery, 3D buildings and terrain for hundreds of cities, and Street View.

Google Earth Versions with Voyager

Complete list of Earth versions: <https://www.google.com/earth/versions>

1. Earth for Web: Earth is available on Chrome browser at <https://earth.google.com/web/>
2. Earth for Android: Search in the Google Play store or go to goo.gl/earth-android
3. Earth for iOS: Search in the App Store or go to goo.gl/earth-ios
4. Earth for Desktop: Free for users with advanced feature needs, including GIS data import and export, and historical imagery. Available on PC, Mac, or Linux. Download the app at: goo.gl/download-earthpro

Product Features - Earth for Web, Android, iOS

1. Knowledge Cards: Find rich information about places you search for.
2. Feeling Lucky: Click the dice icon and fly to a random, awesome place on the globe.
3. Measure Tool: Find out the length of an upcoming hike, the distance between Tokyo and Timbuktu, or the size of your neighbourhood park.
4. Orbit the world in 3D: Use the 3D button or tilt and rotate the map with two fingers to see locations from every angle.

About Voyager | g.co/earth/voyager

Google Earth's marquee feature, Voyager is a curated collection of guided tours, geography quizzes, and rich data visualisations by some of the world's leading storytellers, scientists, and nonprofits. Visit Voyager monthly for new features, and opt-in to receive a weekly push notification about new stories to explore.

How to access Voyager. Open Google Earth on Chrome, Android and iOS, and click the wheel icon in the menu. On the Voyager homepage, you'll find new content under Editor's Picks and categories, such as Games, Nature, and Culture.

Intro video to Creation Tools Easy to use and access for students and teachers alike: www.youtube.com/watch?v=5KtwMRedAbc

Source:

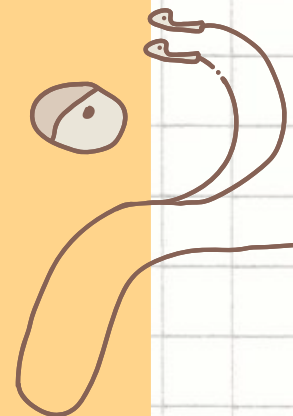
[Final-Earth-Its-Everybodys-Home-1.pdf \(globalgoals.org\)](#)

[Climate Change - We are the PROBLEM & the SOLUTION \(Animated Infographic\) - YouTube](#)

[Timelapse - Google Earth Engine](#)

[Young Climat Activists](#)

[Earth Engine Data Catalog | Google Developers](#)





Lesson plan



NAME: Melting glacial ice

LESSON 8

DURATION :2x50min

TOPIC: Technology

TOOLS: Computer/ tablets, software, etc.

MAIN GOALS:

- Learning about Melting glacial ice
- Learning about human activity, which is the reason for the Melting glacial ice.
- Experiment - create a model of Melting glacial ice.
- Share the results with other students in the school.



LEARNING OUTCOMES:

- Knowledge of Melting glacial ice
- The information is important to be public, to have a good effect.
- technology is important to make the topic public.
- Integrating technology into environmental problems
- Doing simple experiments

LEARNING METHODS AND TECHNIQUES:

- Experiments,
- Discussion



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ACTIVITIES:

First part: "Melting glacial ice".

Activity 1. A global problem about Melting glacial ice.

<https://www.youtube.com/watch?v=hIVXOC6a3ME>

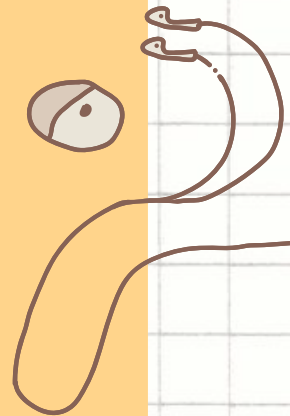
Students watch the video and discuss it. The global problem is that the Global Sea level rise is one of the major environmental challenges of the 21st century. As oceans rise, water encroaches on land, affecting populations that live along shorelines. Around the world residents are feeling the impact of rising seas. Additionally, freshwater supplies are being threatened by encroaching saltwater from rising seas. Sea level rise is mostly caused by melting land ice (primarily glaciers), which adds water to the ocean, as well as thermal expansion, the increase in volume that occurs when water heats up. Both ice melt and thermal expansion result from rising global average temperatures on land and in the sea - one facet of climate change.

Activity 2. Create an animation "Melting glacial ice".

<https://www.youtube.com/watch?v=yLm7PSsvW8g&t=34s> NASA's Earth Minute: Greenland Ice

Students watch the video on a large screen. Teacher shares with them, and on the second view, students take screenshots and write a note about the most important things about the topic. They use an app for pictures and add text in it / Google picture or Snapseed, Lightroom, etc./ They can find other pictures about the topic, and draw their own on an app for picture /Paint, Photoshop, etc./

Students create your own animation with the frames of screenshots with the app CapCut. They can speak, record, and insert it in their videos.





ACTIVITIES:

Second part. Experiment 1. Why are the glacial ice melting

1. Materials:

- Two identical plastic containers or one divided container
- Ice cubes
- Water (room temperature)
- Food colouring (optional)
- Timer or stopwatch

2. What to do /picture/ Students work together.

- Place an equal number of ice cubes in each container. You can use either regular ice cubes or ice cubes made with coloured water.
- Add a small amount of water to one of the containers.
- Set the timer or stopwatch. Visit the containers every few minutes to see what is happening.
- Record the time it takes for the ice in each container to melt on a shared document on their tablets. Take a picture during the experiment.

After the experiment, students present the results.

- Create a video with the pictures of the ice cubs, to see change tracking.

Third part: Make a flyer about what can we do to help

Activity 3. Teacher shares the page <https://www.iberdrola.com/sustainability/melting-glaciers-causes-effects-solutions>

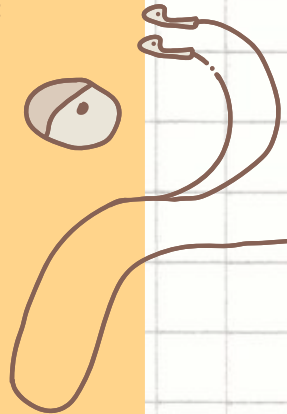
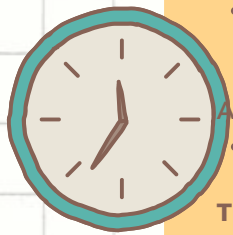
Students read the text, create a design of flyer on <https://www.canva.com/>

What can we do to help?

Stop climate change. To curtail climate change and save the glaciers, it is indispensable that global CO₂ emissions be reduced by 45 % over the next decade, and that they fall to zero after 2050.

Slow down their erosion. The scientific journal Nature suggested building a 100-metre-long dam in front of the Jakobshavn glacier (Greenland), the worst affected by Arctic melting, to contain its erosion.

Combine artificial icebergs. Indonesian architect Faris Rajak Kotahatuhaha won an award for his project Refreeze the Arctic, which consists of collecting water from melted glaciers, desalinating it and refreezing it to create large hexagonal ice blocks. Thanks to their shape, these icebergs could then be combined to create frozen masses. Increase their thickness. The University of Arizona proposed a seemingly simple solution: manufacture more ice. Their proposal consists of collecting ice from below the glacier through pumps driven by wind power to spread it over the upper ice caps, so that it will freeze, thus strengthening the consistency.





ACTIVITIES:

Fourth part: Results of the activities

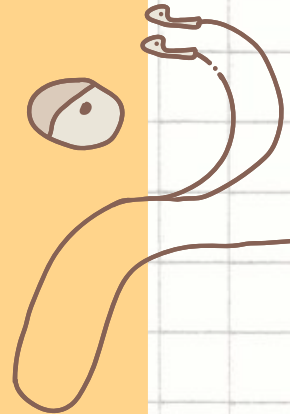
Public animations and videos on school sites or another platform.

Source:

<https://climate.nasa.gov/news/3038/the-anatomy-of-glacial-ice-loss/>

[Melting glacial ice – Science Learning Hub](#)

<https://www.jpl.nasa.gov/edu/news/2022/1/24/reflecting-on-greenlands-melting-glaciers-as-omg-mission-concludes/>





Lesson plan



NAME: The Cities of the Future - Smart Cities

LESSON 9

DURATION: 90min

TOPIC: Engineering

TOOLS: computer and electronic devices, projector, interactive whiteboard, paper and pencil

MAIN GOALS:

- This lesson is designed to work with science and technology secondary school students on the role of engineering in combating climate change.
- To understand that engineering in its various branches can be very important and applied in different contexts.
- Learn the concept of "Smart City".
- Learn the difference between a traditional city and a smart city.
- Learn the necessary conditions for a city to be considered a smart city.

LEARNING OUTCOMES:

- Knowledge about Smart Cities in Europe and their characteristics.
- Knowing about the necessary conditions to be "a smart city".
- Know about smart mobility - search
- Learning about - Smart mobility; Smart economy; Smart governance; Smart environment; Smart people; Smart living
- Good engineering practices in combating climate change;
- Adapting habits into climate change

LEARNING METHODS AND TECHNIQUES:

- Brainstorming;
- Oral presentation
- Elaborative interrogation;
- Online research
- Questionnaires



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ACTIVITIES:

1st Step:

- Presentation/Exposition by the teacher to his/her class about the role that engineering can play in "Today's World", in the fight against Climate Change.

2nd Step:

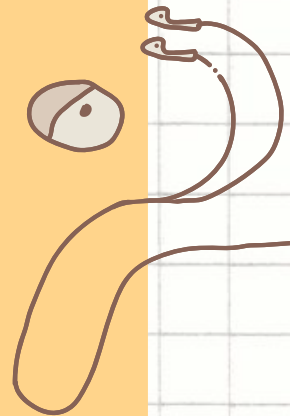
- Brainstorming follows on the various areas where engineering can act to mitigate the impact of climate change. Students will arrive at the idea of smart cities and the issue of urban mobility and the pollution that exists in large cities; the sustainable development of the extraction industry; to biodiversity in nature, in pastures and the need to have more and more so-called "clean energy".

3rd Step:

- Students will be organized into work groups to carry out a research work on - Smart Cities - What are they? What are the necessary conditions for a city to be smart - What characteristics should it have? The differences between a traditional city and a smart city. They should prepare a short oral presentation to answer these questions at the end of the session.

4th Step:

- Presentation of the students' group work on smart cities.





Lesson plan



NAME: Smart cities and the future of urban mobility

LESSON 10

DURATION: 90min

TOPIC: Engineering

TOOLS: computer and electronic devices, projector, interactive whiteboard, paper and pencil.

MAIN GOALS:

- Learn the concept of "Smart City".
- Learn the difference between a traditional city and a smart city.
- Learn the necessary conditions for a city to be considered a smart city.
- Knowing smart mobility concept in a city and solutions

LEARNING OUTCOMES:

- Know about smart mobility - search
- Learning about - Smart mobility; Smart economy; Smart governance; Smart environment; Smart people; Smart living;
- Knowing smart mobility concept in a city.
- Knowing smart mobility solutions.
- adapting habits into climate change
- applying ecological lifestyle
- considering environmental consequences before taking a decision

LEARNING METHODS AND TECHNIQUES:

- Brainstorming;
- Oral presentation
- Elaborative interrogation;
- Online research
- Questionnaires



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ACTIVITIES:

1st Step:

- As a motivational strategy, students will watch a short documentary about "How do you live in a Smart City"? A discussion follows on what conditions are necessary for a city to be smart?

2nd Step:

- After the discussion, the teacher projects the following scheme on the whiteboard about the conditions that imply a city to be smart - and goes in guided dialogue with the students to arrive at the definition and explanation of the various concepts to the students of - smart environment; intelligent quality of life; smart mobility; smart people; smart government and smart economy. It is intended that students understand that a smart city plays with all these factors.

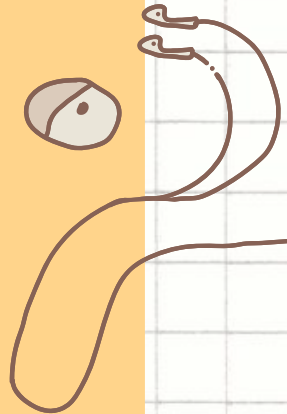


3rd Step:

- Next, students will work in groups of 4 students and survey what needs to be done in their city to become a city with smart mobility. The teacher shows a short video about what a city with smart mobility is and then the groups work on this topic for their city.

4th Step:

- The working groups present the results achieved on what still needs to be done in their city, in order to have smarter mobility.





Lesson plan



NAME: Mobility in my city

LESSON 11

DURATION: 120min

TOPIC: Engineering

TOOLS: computer and electronic devices, projector, interactive whiteboard, paper and pencil.

MAIN GOALS:

- Knowing smart mobility concept in a city and solutions;
- Learning what engineering can do to help find mobility solutions in a city;
- Learn good mobility practices in cities;
- Discover examples of smart cities around the world

LEARNING OUTCOMES:

- Know about smart mobility - search
- Learning about - Smart mobility; Smart economy; Smart governance; Smart environment; Smart people; Smart living;
- Knowing smart mobility concept in a city.
- Knowing smart mobility solutions.
- adapting habits into climate change
- applying ecological lifestyle
- considering environmental consequences before taking a decision

LEARNING METHODS AND TECHNIQUES:

- Exposing methods;
- Oral presentation
- take a quiz to do in the city;
- Online research
- Viewing of documentaries



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ACTIVITIES:

1st Step:

- As a motivational strategy, students will watch a short documentary about the - "10 Smartest Cities In The World". From the video, a discussion begins on some characteristics of these smart cities and on the way they "look at the issue of urban mobility".

2nd Step:

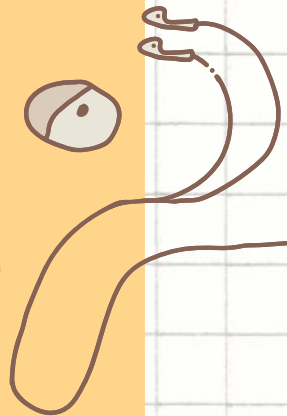
- Based on the discussion, the different solutions presented by cities in relation to this issue are recorded on the board. Then the teacher invites the class to watch another short 1m30s video about smart solutions to be applied in cities from the point of view of mobility.

3rd Step:

- Next, the teacher invites the students to reflect on their city - on what it offers in terms of modern mobility solutions and what should be improved. Next, he invites students to complete a questionnaire to apply to the population in the city - each student applies the questionnaire to 10 different people about what they think about mobility in their city and what can be improved? - There are 20 students, which makes a total of 200 answers.

4th Step:

- Students perform a statistical treatment of the questionnaires to the population of their city about what they would like to see resolved about the mobility of their city and how. They record the results, the solutions presented and then publish them on the school's website and send them to the municipal council.





Lesson plan



NAME: Shaping Eco citizens

LESSON 12

DURATION: 40min

TOPIC: Art

TOOLS: computer and electronic devices, projector, interactive whiteboard, recycling materials, cardboard (70x50 cm), pen and paper, scissors, glue

MAIN GOALS:

- Learn about climate change and global warming
- Define "Eco citizen"
- Describe how an Eco city should look like
- List types of renewable energy sources
- Describe waste sorting and how it should be done
- Use Art to learn about climate change and global warming

LEARNING OUTCOMES:

- Extensive knowledge of climate change & global warming
- New terms Eco city & Eco citizen
- Integrate Art into environmental problems
- Online research to collect data
- Organisational skills and decision making to create a model map
- Creative thinking how to use different recycling materials

LEARNING METHODS AND TECHNIQUES:

- Brainstorming
- Online research
- Oral presentation
- Self produced creative work



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ACTIVITIES:

Introduction part:

1. Teacher writes Eco city on the board and reads it to the students. Then he/she asks them to think and tell what they think the word means to them one by one. After that he/she does the same with the word Eco citizen.
2. Teacher asks students to brainstorm if they know any Eco city and why they think that city should be considered an Eco city. Students can give their answers freely by raising their hand.

Part 1:

After the introduction part students are divided into smaller groups (depending on the class size). Using technology they are asked to research online the following:

- Look for the definition of an Eco city?
- What each Eco city should contain to be considered an Eco city?
- Which building should be removed from your city to become a more Eco city?
- Who is an Eco citizen?
- What are in your opinion the 5 main characteristics of an Eco citizen?
- Research the types of renewable energy sources and write basic information about them?
- What are Eco city friendly vehicles?
- Research the internet and find a promo video of a city that has a label Eco city

Each group makes a short presentation of their research. One or two examples of promo videos are shown to the students.

Part 2: Make it real.

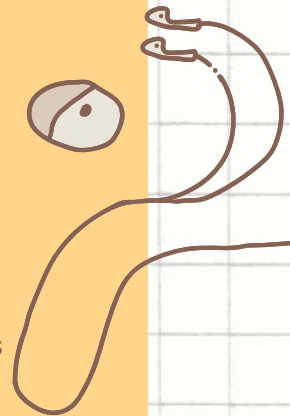
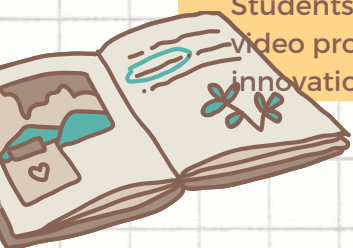
Using the knowledge gained from Step 1 students will make a model of an Eco city. For the model students will use recyclable materials like paper, plastic, cloth, etc. The model should be at least 70 x 50 cm long. It should contain all buildings and other parts that one Eco city should have.

- Make a sketch of an Eco city
- Create all segments using recyclable materials
- Use cardboard for the city surface
- Organize the city and make it real

Presentation:

Using tablets or mobile phones when finished with the model map students will make a video of the model map explaining why it is an Eco city.

Students can organize a meeting with the city mayor and present their final video product of their Eco city model. Students can present possible innovations in their local community so their city becomes more Eco city.





Lesson plan



NAME: Save our planet!

LESSON 13

DURATION: 40min

TOPIC: Art

TOOLS: computer and electronic devices, projector, interactive whiteboard, recycling materials, scissors, glue, coloring pens

MAIN GOALS:

- Learn about climate change and global warming
- Define the endangered animals
- Detect most endangered animals in your country
- Describe reasons why some animals become endangered
- Describe ways humans can help animals from becoming endangered
- Use Art to learn about climate change and global warming

LEARNING OUTCOMES:

- Extensive knowledge of climate change & global warming
- Endangered animals
- Integrate Art into environmental problems
- Online research to collect data
- Organisational skills and decision making to create a theatre play
- Creative thinking how to use different recycling materials

LEARNING METHODS AND TECHNIQUES:

- Brainstorming
- Online research
- Oral presentation
- Self produced creative work



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ACTIVITIES:

Introduction part:

1. Teacher writes endangered animals on the board and reads it to the students. Then he/she asks them to think and tell them how important it is to have less endangered animals.
2. Teacher asks students to brainstorm what would happen if we don't take care of endangered animals. Students can give their answers freely by raising their hand.

Part 1:

After the introduction part students are divided into smaller groups (depending on the class size). Using technology they are asked to research online the following:

- Which are the most endangered animals in the world?
- Which animals don't exist any more on our planet?
- What are the levels of endangerment?
- Which are the most endangered animals in your country?
- Which human technologies can help animals from becoming endangered?
- What is an animal green bridge?
- Research the internet and find videos about extinct animals.

Each group makes a short presentation of their research. One or two examples of promo videos are shown to the students.

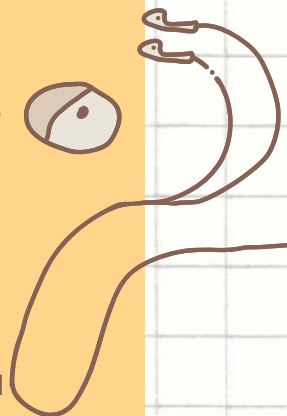
Part 2: Make it real.

Using the knowledge gained from Step 1 students will decide on 5 endangered animals that will become characters in their theater play. For each character students will make costumes using recycled materials. They will write the script for the theater play. The topic of the theater play will be an eco problem that will be resolved by the characters. Students will rehearse the play and make the video.

Presentation:

Using tablets or mobile phones when finished with the play students will make a video of the theatre play. The theatre play can be presented to the whole school during some school event or celebration.

Teachers can organize a visit to a museum, ZOO or an aquarium.





Lesson plan



NAME: Our beautiful flora!

LESSON 14

DURATION: 40min

TOPIC: Art

TOOLS: computer and electronic devices, projector, interactive whiteboard, recycling materials, scissors, glue, cardboard

MAIN GOALS:

- Learn about climate change and global warming
- Define the endangered plants
- Detect most endangered plants in your country
- Describe reasons why some plants become endangered
- Describe ways humans can help plants from becoming endangered
- Use Art to learn about climate change and global warming

LEARNING OUTCOMES:

- Extensive knowledge of climate change & global warming
- Endangered plant
- Integrate Art into environmental problems
- Online research to collect data
- Organisational skills and decision making to create an art work
- Creative thinking how to use different recycling materials

LEARNING METHODS AND TECHNIQUES:

- Brainstorming
- Online research
- Oral presentation
- Self produced creative work



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ACTIVITIES:

Introduction part:

1. Teacher writes endangered plants on the board and reads it to the students. Then he/she asks them to think and tell them how important it is to have less endangered plants.
2. Teacher asks students to brainstorm what would happen if we don't take care of endangered plants. Students can give their answers freely by raising their hand.

Part 1:

After the introduction part students are divided into smaller groups (depending on the class size). Using technology they are asked to research online the following:

- Which are the most endangered plants in the world?
- Which plants don't exist any more on our planet?
- Which are the most endangered plants in your country?
- Which human technologies can help plants from becoming endangered?
- What is a seed vault?
- What is a botanical garden?
- Research the internet and find videos about extinct plants.

Each group makes a short presentation of their research. One or two examples of promo videos are shown to the students.

Part 2: Make it real.

Using the knowledge gained from Step 1, the teacher will organize an art workshop where students will make brooches. Each brooch will be made with recycled materials like paper, cloth, etc. and will represent one endangered plant of student choice.

Presentation:

At the end a display of produced broches can be organized on the school corridor.

Teachers can organize a visit to a botanical garden, nature park or a national park.





Lesson plan



NAME: All around the climate change

LESSON 15

DURATION :40minx2

TOPIC: Mathematics

TOOLS: Computer, access to the web, paper and pencil

MAIN GOALS:

- Learning about climate change and global warming
- Exploring sites with data to see how climate change and global warming are monitored
- Learning how humans affect global warming
- Solving related maths problems



LEARNING OUTCOMES:

- Extensive knowledge of climate change & global warming
- Maths' importance in tackling climate change relevant problems
- Integrating maths into environmental problems
- Reading a simple dataset
- Calculating carbon footprint
- Percentage calculation
- Adapting habits into climate change

LEARNING METHODS AND TECHNIQUES:

- Brainstorming;
- Testing;
- Elaborative interrogation;
- Problem-solving;
- Inquiry-based;
- Problem-based.



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ACTIVITIES:

Class consists of 4 parts: Learning about climate change and global warming, how global warming and climate change are monitored and how humans impact on global warming and climate change, and lastly applying the knowledge.

Students will refer to the following pages to inform themselves:

First part:

1. [What is climate change? - UN](#)
2. [What is climate change? - BBC](#)
3. [Climate change and global warming explained in simple words for beginners](#)
4. [Global warming 101](#)

Second part:

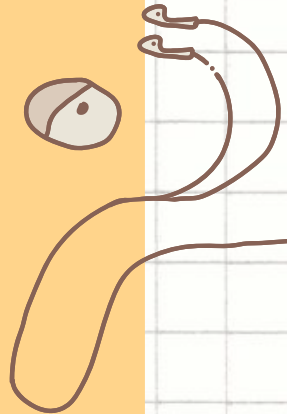
1. [Climate change impacts in Europe](#)
2. [Co2 emissions by country](#)
3. [Global warming math: The hard numbers](#)

Third part:

1. [Calculate your footprint](#)
2. [Calculate your household footprint](#)
3. [How you can stop global warming](#)
4. [9 ways we know humans caused climate change](#)
5. [How humans cause climate change](#)

Fourth part:

1. Take a look at the lesson on [Percent Increase and Decrease](#)
2. Complete the five exercises at the end of "Percent Increase and Decrease"
3. Complete the "[Worksheet on Math and Climate Change](#)", prepared by maths teacher Gisele Glosser





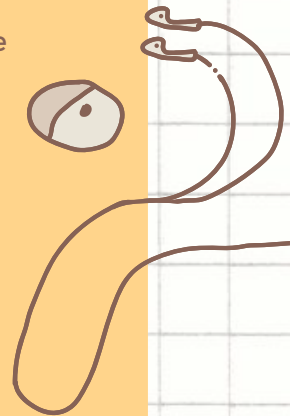
ACTIVITIES:

Then you can check the answer key to evaluate your work. Following verification of the answers, students should list:

- Three things they already do in your everyday life to help stop global warming;
- Five new things you could be doing to help stop global warming;
- Three things that are being done at your school to help stop global warming;
- Five new things that could be done at your school to help stop global warming.

Follow-up activity

Students calculate their personal and household footprint on a monthly and yearly basis. Then decide on new habits to reduce their footprint, and calculate it again on a monthly and yearly basis. In the end they find the difference it would make in a decade to understand the significance of their daily actions/activities.





Lesson plan



NAME: Heat Wave

LESSON 17

DURATION :40minx2

TOPIC: Mathematics

TOOLS: Computer, access to the web, paper, pencil and ruler

MAIN GOALS:

- Find the median and range of a data set, and identify these as measures of centre and spread
- Informally describe the shape of a data set using a dot plot
- Informally make comparisons between data sets based on median, range and shape
- Experience using long term weather data to look for climate trends



LEARNING OUTCOMES:

- Extensive knowledge of climate change & global warming
- Maths' importance in tackling climate change relevant problems
- Integrating maths into environmental problems
- Understanding a set of data
- Constructing viable arguments
- Critique other reasonings
- Percentage calculation
- Taking long term effects of the actions into consideration

LEARNING METHODS AND TECHNIQUES:

- Brainstorming;
- Application of maths in real-world contexts;
- Elaborative interrogation;
- Conceptual understanding of key concepts;
- Inquiry-based;
- Problem-based.



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ACTIVITIES:

1st part

First of all, students will be introduced to relevant maths vocabulary in case the students have not encountered it yet. The vocabulary includes variation, median, outlier, range, distribution and trend.

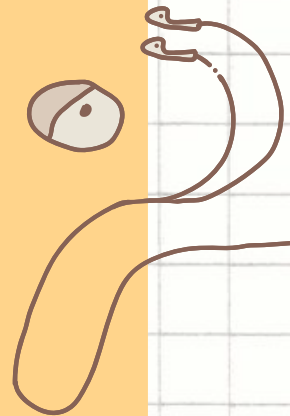
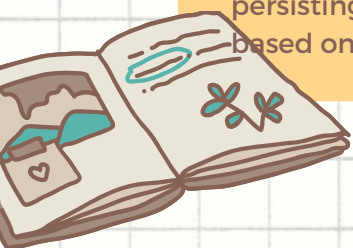
Then students will be asked to browse the differences between weather and climate. What is the difference between weather to change and climate to change? After that, they will write down three words on slips of paper to describe the previous summer and previous winter in their city. All the ideas will be collected to read out loud by the teacher, and he/she will emphasize how we experience the weather and climate differently: we may remember part of a season (a cold snap in a mild winter) more than another, or we may be influenced by our past experiences (where we have lived before) or our lifestyle (do we walk to school or drive in the winter) or our personal preferences (some people tolerate heat/cold better than others).

2nd part

Following this discussion session, students will work with climate data. Students use computers to access <https://en.climate-data.org/europe/> & <https://ec.europa.eu/eurostat/en/> & <https://cds.climate.copernicus.eu/cdsapp#!/home>. Some of the available data is complicated while some other is easier to figure out. Find something interesting and share it with the class, therefore students will be exposed to data and digital resources. Instructor might resort to another website that offers similar datasets.

Briefly review the definition of a “heat wave day”. The purpose of defining it rigorously is to have terms clearly defined before going deep into the data. Even though the students do not need remember the definition of “heat wave day” word by word, here it is:

Relatively simply, the North America Land Data Assimilation System (NLDAS) looked at the maximum temperatures in an area in May through September in the 30 years from 1981 to 2010. Any time the temperature went above 95% of those temperatures for two or more days in a row, each of the days was considered a “heat wave day.” Additionally, The World Meteorological Organization suggests a heatwave is ‘statistically unusual hot weather persisting for a number of days and nights’, but countries adapt this guideline based on the impact on the local population.





ACTIVITIES:

Ask following questions to students:

- Why do you think, according to the definition of NLDAS, they looked at temperatures only from May to September?
- Would a heat wave day in one northern European city be the same temperature as a heat wave day in a southern European city?

3rd part

Hand out cards to students with one data point on each one showing the number of heatwave days in a specific year in different European cities - one set of cards for the whole class. Ask students to organize from fewest to most in one long line (don't stack up numbers that are not the same).

Have students identify the median and range of the set. Since the median falls between two data points, use a pencil, ruler, or another marker to mark where it is.

Ask students:

- How does the median give us a measure of “centre” for this data?
- What does the range tell us about the spread of this data?

4th part

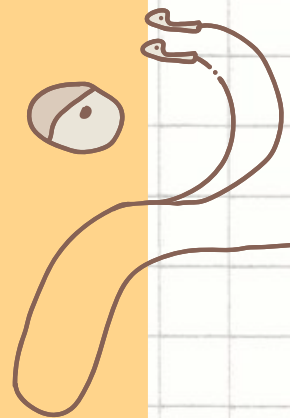
As a class, create a horizontal scale on the board for the heat wave data. Students should add the heat wave days cards to the scale on the board to create a dot plot.

5th part

Hand out “What a Year!” in pairs, students choose a year and look up the data of previously selected cities for that year. They review the process and vocabulary involved in finding the median and range and create a dot plot for their data.

After groups have finished, ask them to compare their data with the data from another group. They should make a reference to centre, shape, and spread when comparing.

- Do you see evidence of climate change when comparing two years' worth of data? Why or why not? What would we need to be more convinced?





ACTIVITIES:

6th part

Generate a discussion with students about what it means to have a trend, both informally and when it applies to data. Objective of the discussion is to enable students to understand that a trend shows a general, long-term direction, although there may be short-term fluctuations. Ask students to give examples of where they have seen trends (it does not have to be climate related).

Divide up the time into 5-year spans and assign a 5-year span to each group. Each group gets the data for their 5-year span and creates a dot plot, labelled with both the median and range. Ask students what they notice about both the numbers and the scale on the dot plot, compared to when we were graphing a single year.

Give students some time for observation and understanding. Then engage them in a discussion through following questions:

- Which 5-year period had the smallest range in the data? The largest? How does the range affect the look of the dot plot? What does that tell us about the heat wave days in those 5-year spans?

- Which 5-year periods had the data closely clustered together? Which had them spread apart?

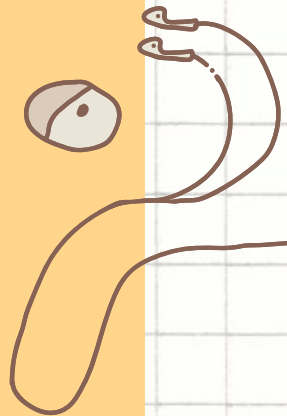
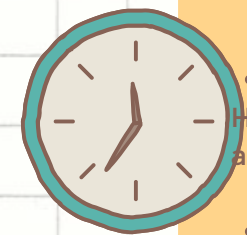
What does that tell us about the heat wave days in those 5-year spans?

- For which of the 5-year spans was the median near the middle of the range? For which was it not near the middle of the range? What does that tell us about the heat wave days in those 5-year spans?

- Do you notice any points in any of the plots that you would consider outliers? Why?

Follow- up activity

Students select a city/region/country in a given database and follow the same steps and routine to develop its relevant calculation skills.





Lesson plan



NAME: Climate Pattern

LESSON 18

DURATION :40minx2

TOPIC: Mathematics

TOOLS: Graph paper, calculators, projector, computer, access to the web, paper, pencil and average temperature data

MAIN GOALS:

- Practice math and critical thinking skills using practical, real-life numbers
- Recognize trends in data and use them to predict future changes
- Understand the connection between human activity and global climate change
- Develop and evaluate inferences and predictions that are based on data



LEARNING OUTCOMES:

- Extensive knowledge of climate change & global warming
- Maths' importance in tackling climate change relevant problems
- Integrating math into environmental problems
- Constructing viable arguments
- Critique the other reasonings
- Percentage calculation
- Statistics related basic calculation
- Considering environmental consequences before taking a decision

LEARNING METHODS AND TECHNIQUES:

- Brainstorming;
- Application of maths in real-world contexts;
- Elaborative interrogation;
- Conceptual understanding of key concepts;
- Inquiry-based;
- Problem-based.



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ACTIVITIES:

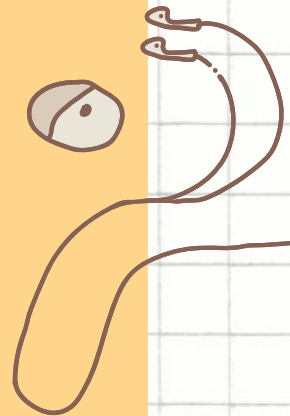
1st part

First of all, students will be introduced to relevant vocabulary in case the students have not encountered yet. The vocabulary includes climate change, global warming, greenhouse effect, mean, mode, median.

Then students will be asked to browse the differences between climate change and global warming? What is the difference between weather to change and climate to change? After that, they will write down three elements for each that allows us to separate climate change and global warming.

2nd part

Ask students to take a look at the table below (project it to the entire class or provide it on paper to each student). They will write down and compare their immediate observations.



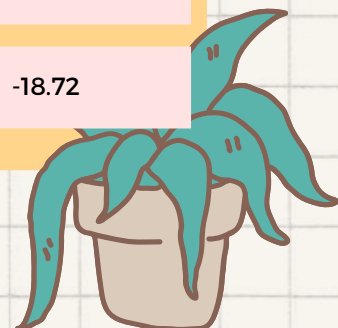
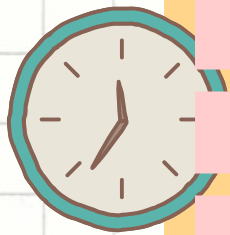
Year	Average Temp (Celsius)
1970	-19.93
1971	-19.8
1972	-21.56
1973	-21.1
1974	-20.94
1975	-20.53
1976	-20.69
1977	-19.38





ACTIVITIES:

Year	Average Temp (Celsius)	Year	Average Temp (Celsius)
1978	-20.16	1991	-18.48
1979	-20.83	1992	-20.74
1980	-20.22	1993	-18.78
1981	-17.88	1994	-18.06
1982	-19.74	1995	-19.24
1983	-19.63	1996	-18.92
1984	-20.83	1997	-18.92
1985	-20.31	1998	-17.38
1986	-20.57	1999	-18.67
1987	-21.02	2000	-19.9
1988	-17.61	2001	-18.61
1989	-20.53	2002	-17.92
1990	-19.51	2003	-17.51
		2004	-18.72





ACTIVITIES:

Decade Average

1970-79:

1980-89:

1990-1999:

2000-2004:

More years can be added through this website:

<https://data.giss.nasa.gov/csci/stations/>

3rd part

Students will answer the following questions while looking at the table:

1. Find the average temperature for each of the past four decades. What trend do you notice?
2. Find the mean, median and mode of temperatures between 1970 and 2004. Do the data give evidence of global warming trends?
3. Plot a graph of the temperatures. Use this data to extend your graph out to the next ten years. What does your prediction show?

4th part

As a class, use a computer hooked up to a projector access NASA's climate index website (<https://data.giss.nasa.gov/csci/stations/>). Click on the station closest to your hometown.

1. Compile the data from the last 25 years. You may download the data as text and/or view a GISTEMP.
2. Is it similar to or different from the data above?

5th part (Optional)

Have students find additional data set(s) from another NASA station or different source. You may have them calculate mean, median and mode or practice graphing skills by plotting data on a graph.

Wrap-up

As a follow-up discussion, pose the following questions to the students:

1. What are some possible causes of this recent increase in temperatures?
2. What are some possible effects of climate change in the long run?
3. Why is it considered such a risk?
4. What can we do to combat global warming?





Lesson plan



NAME: Sustainable Energy

LESSON 19

DURATION: 60min

TOPIC: Community Science Projects

TOOLS:

Handout with description of the experiment, Cardboard box (with a lid), Aluminium foil, Glue, Black construction paper, Clear plastic wrap or a transparent oven bag, Thermometer, Scissors, Tape, Writing utensils and paper to take notes and for data documentation

MAIN GOALS:

- Actively engaging students in scientific research that can help us better understand the impacts of climate change on our communities and the environment
- Developing critical thinking skills and scientific literacy.
- Developing a sense of ownership and responsibility for their local environment and community.
- Learning about how energy can be generated and used.
- Raising awareness about climate change and its impacts, promoting greater understanding and concern about this critical issue.

LEARNING OUTCOMES:

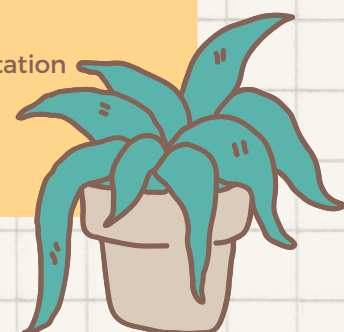
- Renewable Energy: Students will acquire a deeper understanding of renewable energy sources.
- Science and Engineering Principles: They will learn about the scientific principles behind solar energy, including how an energy source can be converted into heat.
- Environmental Impact: Students will gain awareness of the environmental benefits of using renewable energy sources. They will learn about reduced greenhouse gas emissions and the importance of sustainable practices.
- Practical Application of Knowledge
- Data Collection and Analysis
- Collaboration

LEARNING METHODS AND TECHNIQUES:

- Research and Reading
- Observation and Analysis
- Hands-On-Construction
- Trial and Error
- Data Collection and Measurement
- Data Analysis and Interpretation
- Group Collaboration
- Documentation
- Discussion and Reflection



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ACTIVITIES:

Activity: DIY Solar-Cooking

The goal of this project is to create a simple solar cooker that uses the energy of the sun to prepare food, promoting the use of renewable energy in everyday life. The teacher will explain to the students how the energy of the sun can be used by humans and a little bit about the history of solar cooking (<https://education.nationalgeographic.org/resource/power-sun/>). The teacher could explain that after food has been harvested, it can be cooked with solar energy. The first solar box cooker was created in 1767 by Swiss physicist Horace de Saussure. It was used to cook fruit and reached temperatures of 87.8 degrees Celsius (190 degrees Fahrenheit). The use of solar cookers for cooking, drying, and pasteurisation, which reduces the growth of microorganisms in food, is widespread nowadays. They are secure, do not create pollution or deforestation, and do not require fossil fuels. In large parts of India and other parts of the world solar cookers are used regularly.

Step 1: Design and assembly the solar cooker:

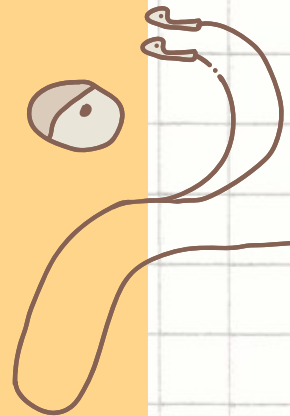
- Cut a flap in the lid of the cardboard box to act as a reflector.
- Cover the inner side of the flap with aluminium foil, which will reflect sunlight onto the cooking area.
- Line the bottom of the box with black construction paper. The dark colour will absorb the sunlight and convert it into heat.
- Create a transparent window on the lid using clear plastic wrap or a transparent oven bag. This allows sunlight to enter the box while trapping the heat inside.
- Use glue and tape to secure all the components in place.

Step 2: Testing

- On a sunny day, take your solar cooker outside to a sunny spot.
- Place a cooking pot or container with food on the black construction paper inside the cooker.
- Adjust the position of the reflector (the aluminium foil-covered flap) to direct the maximum amount of sunlight onto the cooking pot.
- Use a thermometer to monitor the temperature inside the cooker and record the changes over time.

Step 3: Cooking Experiment:

- Try cooking various simple recipes like heating water to make tea or cooking hotdogs to observe the effectiveness of the solar cooker.
- Measure the time it takes to cook the food compared to conventional cooking methods.





ACTIVITIES:

Step 4: Data Analysis

- Record and analyse your temperature and cooking time data.
- Compare the solar cooker's performance with traditional cooking methods in terms of energy consumption and environmental impact.

Step 5: Presentation

- Prepare a presentation to showcase your solar cooker project to your classmates or the school community.
- Explain the science behind the solar cooker, the cooking experiment results, and the potential benefits of using solar energy for cooking.

Students can learn about the fundamentals of capturing solar energy and see the possibilities of renewable energy in practical applications by creating their own solar cooker and experimenting with it. This initiative encourages eco-friendly behaviours and environmental awareness in addition to being entertaining and instructive.

Resources:

https://www.youtube.com/watch?v=Z1rgluKJBmY&ab_channel=MOESingapore

https://www.youtube.com/watch?v=PklwyebgaQ4&ab_channel=howtofunda

<https://education.nationalgeographic.org/resource/power-sun/>





Lesson plan



NAME: Community gardening

LESSON 20

DURATION: 50min

TOPIC: Community Science Projects

TOOLS: projector, laptop, speakers, whiteboard, paper sheets, pencils, pens. PDF brochure with the basic step by step to start a community garden with a specific selection of plants and soil adaptable to the local environment.

MAIN GOALS:

- Raise students' awareness about the importance of community gardening in promoting environmental sustainability, biodiversity, and the benefits of green spaces in urban areas.
- Teach students the basics to create their own community garden.
- Identify and show the students platforms related to community gardening in their communities.
- Develop students' understanding of the role community gardens play in strengthening local communities, fostering a sense of social responsibility, and encouraging civic engagement.

LEARNING OUTCOMES:

- Students will learn about the importance of acting against the dangers of climate change and global warming and will integrate this knowledge in their decision making daily.
- At the end of the lesson, each student will know about the local groups and associations dedicated to community gardening and which are the online platforms and the physical locations where this practice is executed.
- The students will identify which plants and implements are suitable and needed to begin with a community garden.
- Detecting
- Classifying
- Building

LEARNING METHODS AND TECHNIQUES:

- Feeding methods:
- Problem-solving methods:
- Methods of practical activity:
- Valorising and exposing methods:



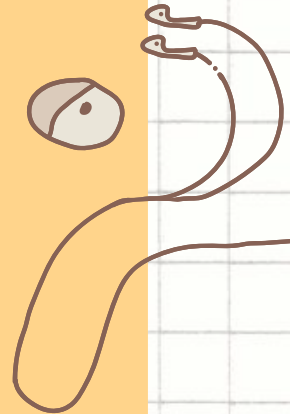
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ACTIVITIES:

- Use of slides introducing community gardening and its positive impact on the fight against global warming.
- Show the students the local websites that contain information about the community gardens in their local communities.
- Play a video about community gardening.
- Round of questions and opinions from students.
- Asking them about their own experience in the topic, which plants they would like to grow and why.
- Distribution of a PDF brochure with the basic step by step to start a community garden with a specific selection of plants and soil adaptable to the local environment.





Lesson plan



NAME: Climate Change

LESSON 21

DURATION: 50min

TOPIC: Community Science Projects

TOOLS: Computer and electronic devices, projector, interactive whiteboard, pens, markers, white papers, etc.

MAIN GOALS:

- Educate students on what climate change is, what impact it has on us currently and what changes await the humanity and the planet Earth in the future.
- Students learn about greenhouse gas emissions, and how their own carbon footprint impacts the environment.
- Students will be introduced to the UN's SDG goals and how they can contribute to these goals on a collective but as well on a individual level.
- Students learn how to reduce their carbon footprint when traveling.
- Aim at developing skills such as problem-solving, collaboration and perseverance.

LEARNING OUTCOMES:

- Climate Change: Students learn what climate change is, who are it's biggest drivers and how EU aims to be climate neutral by the year 2050.
- Carbon footprint: Students learn what greenhouse gass emissions are, how to calculate their own carbon footprint. It will also be explained to them why carbon footprint is bigger in more populous countries in comparison to less populous countries.
- Contribution to the SDG Goals: Introduce the students to the SDG goals and put emphasis on the 13th SDG which states to "take urgent action to combat climate change and its impacts.
- Problem solving
- Critical Thinking
- Collaboration

LEARNING METHODS AND TECHNIQUES:

- Feeding methods:
- Problem-solving methods:
- Methods of practical activity:
- Valorising and exposing methods:



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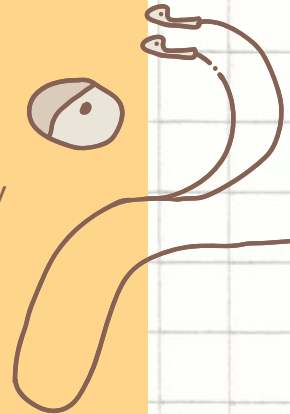
ACTIVITIES:

Step 1: Informative and educational part

- Show students the following video: <https://www.youtube.com/watch?v=7vnzKPq390Q> After the video has been viewed by the students, they will reflect upon the words of David Saddington and share their opinions on what they know about climate change, do they see it and how they perceive it today.
- After the discussion and through the following video: <https://www.youtube.com/watch?v=sTvqIijgvTg>, students will be introduced to the greenhouse gas emissions and how they are being produced .
- After viewing the previous video, let students calculate their own carbon footprint via this link <https://www.footprintcalculator.org/en/quiz/0/food/category>
- Once the students have calculated their own footprint, ask if someone wants to share their result. After this, ask students if they like to travel and let them talk about their favorite destination and why they liked their time spent there. When the discussion is over, show them this video: <https://www.youtube.com/watch?v=slanYx2dmnc>
- Let the students be further actively engaged in the climate change topic by having them calculate their carbon footprint when traveling. Here is the link to that calculator: <https://sustainabletravel.org/our-work/carbon-offsets/calculate-footprint/>
- Introduce them to the UN SDGs through this you tube video: https://www.youtube.com/watch?v=M-iJM02m_Hg after which they will learn more in detail about the SDG 13(Climate change) via this video: <https://www.youtube.com/watch?v=TPGH-i29myA>

Step 2: Discussion part

- Have students reflect upon all the video material reviewed and their calculated carbon footprints and encourage them to discuss in groups what actions they could implement in their lives immediately to fight against the climate change. Together with the teacher, students will exchange their own opinions and in that way, will inspire one another with new solutions and proposals on how to protect their environment and their own lives and those of the future generations.





ACTIVITIES:

Step 3: Group work

- Teacher will divide students in groups, give them papers, pens and markers with the task to make their own short “Action lists” on how they would fight against the climate change. Students will then exchange ideas and opinions with their peers, write, underline and color their papers- they will be creative and inspired through this group work. Once the students have completed their lists, they will then present their “Action lists” to the other groups in the class. After every group has presented, let the whole class vote for the top 5 climate change actions that they believe should be implemented by them immediately.

