

__ Physics laws and climate change

Slavica Bernatović | 01/02/2022

** The modern world lives in a time of great change. Almost every day, in some part of the world, in some part of our beautiful planet Earth, there are floods, fires, disappearing ice masses, extreme weather conditions. ** Knowledge of the laws of physics has enabled human civilization to progress. Starting from the invention of the wheel, through internal combustion engines, to the use of renewable energy sources. ** The laws of radiation for the absolute black body, which encompasses the physics curriculum, understandably illustrate the factors that contribute to climate change. Organized in small groups, by considering the law of radiation for the absolute black body, the Stefan-Boltzmann law, and the Wien law, students develop an awareness of climate change and the contribution of modern human life. ** Student activities during classes are organized using different social forms of work: 1. frontally, 2. individually, 2. in pairs, and 3. in small groups, such as Think-Pair-Share.

LEARNING OBJECTIVES

Connect the laws of physics with real phenomena and facts

Raise awareness of the impact of climate change on everyday life

Improve 4 C skills

To connect the educational contents and outcomes of the Physics curriculum with real phenomena

Use of new technologies, such as Augmented Reality_AR

Application of new digital tools, such as Padlet, Mentimeter

C'S OF EDUCATION

COLLABORATION

COMMUNICATION

CRITICAL THINKING

CREATIVITY

AGE GROUP

From 17 to 19

SCENARIO LANGUAGE

English

TOTAL DURATION

1 hour 55 minutes

SUBJECTS

NATURAL SCIENCES

ACTIVITY I_CONSEQUENCES OF CLIMATE CHANGE

10
MINUTES

Interactive video

EXCHANGE & DISCUSS

C'S OF EDUCATION

COLLABORATION

COMMUNICATION

CRITICAL THINKING

TOOLS

Interactive video tool

SPACE FORMAT

Public

POSITION OF LEARNERS

Small groups

ROLE OF TEACHER

Teacher at the side

DESCRIPTION

** In the introductory part, the teacher encourages students to think about climate change. We live in a time where we are witnessing very frequent and severe weather disasters. What factors contribute to this? Students answer the question individually. Students answered via Mentimeter, the questions: 1. What are the most important factors influencing climate change? I show the result of the students' activities visibly to everyone, in the form of a cloud presented by the Mentimeter. ** Each student, by answering in the Mentimeter, expresses his opinion and knowledge. By directly displaying the answers of all students, in the form of clouds, students receive feedback, automatically and almost instantly. The next step of the activity is the introductory part: Frontally, the students review the video together and at the same time. ** Frontally, review a video, augmented reality for the example of climatic disasters: Hurricane Florence Augmented Reality: The video is on the link: <https://youtu.be/URnLuSrlNA8> ** In the first round, students individually think and argue what they saw in the video. For example: 1. What did they notice in the video? 2. What are the consequences for human life and nature? ** Then, the students join in groups of 2. After explaining their individual thoughts, they try to reach a consensus. In the third round, the opinions of individual groups and discussions at the level of the whole class are presented. ** Observing AR presentations enables students to collaborate and communicate, first by discussing each other in pairs, then by exchanging their ideas and thoughts in small groups.

ACTIVITY II_NATURAL PHENOMENA ACCORDING TO PHYSICAL LAWS



Physics around us

EXCHANGE & DISCUSS

C'S OF EDUCATION

COLLABORATION

COMMUNICATION

CRITICAL THINKING

TOOLS

** Demonstration experiment: The simplest and most ordinary flame of a lighter. ** The flame of fire is visible on the link: <https://drive.google.com/file/d/1CgOhDoOxcCDn29pAzu4sTtZ4Zh3ITXLR/view?usp=sharing>

SPACE FORMAT

Private, limited distraction

POSITION OF LEARNERS

Small groups

ROLE OF TEACHER

Teacher at the side

DESCRIPTION

1. To observe the flame of a lighter from the aspect of color: The flame of fire is visible on the link: <https://drive.google.com/file/d/1CgOhDoOxcCDn29pAzu4sTtZ4Zh3ITXLR/view?usp=sharing> 2. To connect their previous knowledge about the connection between a particular color and wavelength. 3. In which parts of the flame are the temperatures higher? In parts closer or farther from the flame source itself? 4. Which wavelength colors, larger or smaller, are in the area with higher temperature values? 5. After the discussion in small groups, one member from each group moves to another group, and exchanges observations and conclusions. 6. Students argue the phenomenon. 7. Student notes their arguments in the padlet.



Wien`s law

INTERACT & INSTRUCT

C'S OF EDUCATION

COMMUNICATION

CRITICAL THINKING

TOOLS

Computer_laptop, projector, prepared working materials.

SPACE FORMAT

Private, limited distraction

POSITION OF LEARNERS

Alone

ROLE OF TEACHER

Teacher-led

DESCRIPTION

Teacher, frontally shows step by step:
1. Mathematical form of physical law that connects temperature and wavelength, known Wien's law.
2. Graphic representation of the distribution of radiation energy by wavelengths for individual body temperatures.

30
MINUTES

High temperature rise with small increase in greenhouse gases

CREATE

C'S OF EDUCATION

COLLABORATION

COMMUNICATION

CRITICAL THINKING

CREATIVITY

TOOLS

Infographic tool

SPACE FORMAT

Private, limited distraction

POSITION OF LEARNERS

Small groups

ROLE OF TEACHER

Teacher at the side

DESCRIPTION

** Students analyse data and create an infographic poster which visualizes and summarizes the core components as well as the logical relations between the components. ** By using relevant data on the intensity of solar radiation for different conditions, and by applying the physical law, Stefan_Boltzmann's law, students create a connection between real phenomena and content from the educational curriculum of Physics. By creating this task and implementing this activity, students are enabled to collaborate and communicate. The values of known and calculated intensity and temperature data are plotted graphically. ** The learning product can be viewed at the link: https://drive.google.com/file/d/1fPyVemVfupXzxHKli4qeqMlujyC_4RSI/view?usp=sharing, ** In this activity, students develop and apply their creativity. First of all, they argue and come to a conclusion, therefore, they develop critical skills.
I. In small groups, students analyze data on characteristic values of solar radiation intensity: a) which reaches the Earth, b) absorbed by the Earth's atmosphere without greenhouse gases, c) which the Earth's atmosphere absorbs in the presence of man-made greenhouse gases. II. From the known values of intensity, according to Stefan-Boltzmann's law, they calculate, for each example, the temperature. III. For comparison and analysis of data, students calculate the corresponding radiation intensity for the characteristic values of water freezing temperature 0 ° C and water boiling point 100 ° C. IV. The values of the pairs of temperature and intensity are plotted in a (t, I) graph. Graph showing the interdependence of intensity and temperature. ** The graph shows the exponential function. This means that at high-temperature values, only a small increase contributes to a huge increase in intensity. That is, with a slight further increase in greenhouse gases, there is a huge increase in intensity and temperature. ** The learning product can be viewed at the link: https://drive.google.com/file/d/1fPyVemVfupXzxHKli4qeqMlujyC_4RSI/view?usp=sharing

ACTIVITY III_FINAL ACTIVITY

25
MINUTES

Visible consequences of climate change

CREATE

C'S OF EDUCATION

COLLABORATION

COMMUNICATION

CRITICAL THINKING

CREATIVITY

TOOLS

Mind mapping tool

SPACE FORMAT

Private, limited distraction

POSITION OF LEARNERS

Small groups

ROLE OF TEACHER

Independent learning

DESCRIPTION

Students analyse and visualise the relations between concepts by creating a mind map. Mind maps or concept maps are visual representations of the relationships between concepts. In the final phase, the evaluation phase, students clearly present their observations on the topic, using cognitive maps. This activity allows the student to develop and apply creativity. Students, participating in pairs or small groups, collaborate and communicate with each other, and agree with each other. Students show the connection between physical laws and climate change, making a cognitive map, in pairs. The learning product can be viewed at the link: <https://drive.google.com/file/d/1qTbwpAd0uxTIOQDByjC1ueudOZ99td9z/view?usp=sharing>

PRESENT & SHARE



Sharing with a real audience

PRESENT & SHARE

C'S OF EDUCATION

COLLABORATION

COMMUNICATION

CREATIVITY

TOOLS

Presentation or web-conferencing tool

SPACE FORMAT

Public

POSITION OF LEARNERS

Small groups

ROLE OF TEACHER

Teacher at the side

DESCRIPTION

** Learners perform activities to share with an audience what they have created or prepared ** The learning product can be viewed at the link: <https://drive.google.com/file/d/1qTbwpAd0uxTIOQDByjC1ueudOZ99td9z/view?usp=sharing>

ASSESSMENT & FEEDBACK



Self-evaluation

ASSESSMENT & FEEDBACK

C'S OF EDUCATION

CRITICAL THINKING

TOOLS

Rubric maker tool

SPACE FORMAT

Private, limited distraction

POSITION OF LEARNERS

Alone

ROLE OF TEACHER

Teacher at the side

DESCRIPTION

Assessment & Feedback

Learners perform activities related to assessment or giving feedback.

When completing an assignment, students fill in a self-reflection sheet and they grade themselves according to rubric criteria.



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