Educating secondary students about climate change through Art

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References

Post Questionnaire

Science

 a branch of knowledge or study dealing with a body of facts or truths systematically arranged and showing the operation of general laws

Art

- Art contributes to the comprehension of the real world (Aristotle, Poetics)
- Art is the space where the ideas are realized (Dewey, 1958, Art as Experience)
- Within Art emotions operate cognitively (Nelson Goodman, 1976, Languages of Art: an approach to a theory of symbols)



Science - Art

Both relate to knowledge (cognition) and tie in with educational procedures

Interdisciplinary curriculum

Interdisciplinary/cross-curricular teaching involves a conscious effort to apply knowledge, principles, and/or values to more than one academic discipline simultaneously. The disciplines may be related through a central theme, issue, problem, process, topic, or experience (Jacobs, 1989)

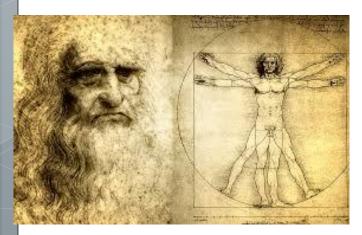


STEM: Science, Technology, Engineering, and Math

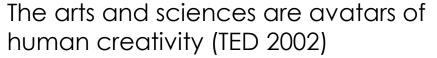
Jolly, Anne (2014).

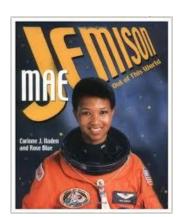
"STEM vs. STEAM: Do the Arts Belong?".

STEAM: Science, Technology, Engineering, Arts and Math



Mae Jemison







Butterflies, Insects, and Currants, Jan van Kessel, 1650

http://www.getty.edu/museum/





Emperor's Mosque, Sr. John Murray, 1857

http://www.getty.edu/museum/





Victorious Youth, Greek, 300–100 B.C.

http://www.getty.edu/museum/



Science - Art

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Environmental studies, Selective Lesson (1st grade of Upper High School)

Teamwork

Worksheets

Computer Lab



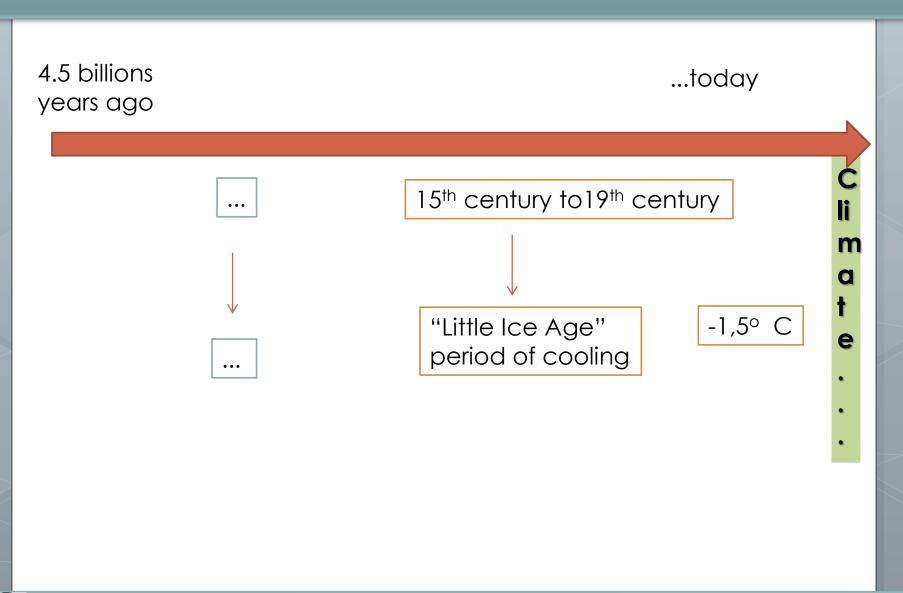
2.7. Climate change

El Nino

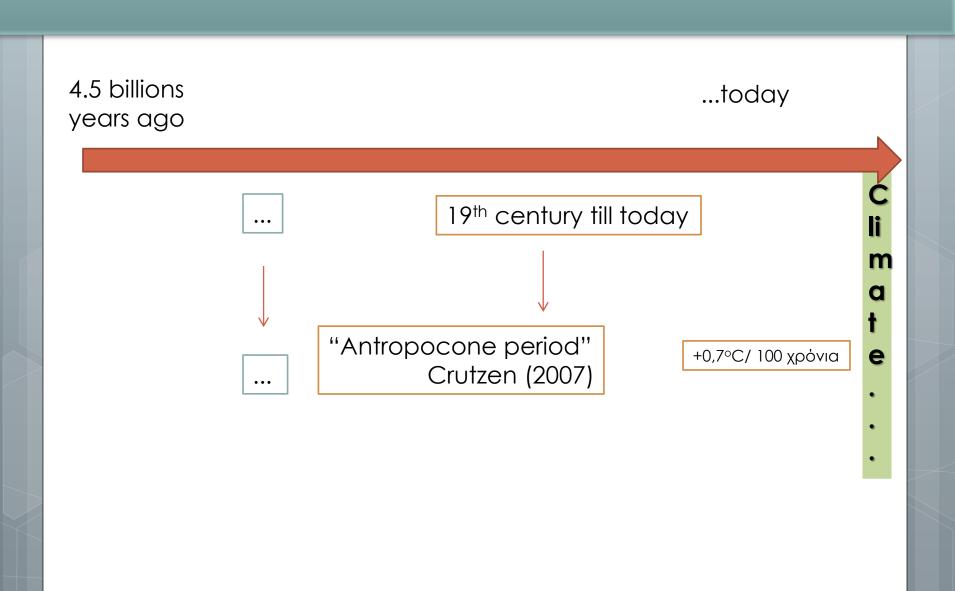
- Greenhouse Effect
- Stratospheric Ozone Depletion (Ozone Hole)

No reference to natural factors on climate change











External and internal factors shape the climate

External factors

- orbital variations
- solar output

Internal factors

- volcanic eruptions
- the fluctuations of the volume of the glaciers
- changes in the sea currents
- changes of the greenhouse gases (i.e. CO₂, CH₄)
- anthropogenic factors



NASA - Atmospheric Chemistry and Physics

http://earthobservatory.nasa.gov/GlobalMaps/view.php?d1=MOD14A1 M FIRE&d2=MODAL2 M AER OD

Webpages of well known painters

http://www.pieter-bruegel-the-elder.org/

http://www.nationalgallery.org.uk/artists/aert-van-der-neer

- Fortner, R.W. (2001) Climate change in school: Where does it fit, and how ready are we? Canadian Journal of Environmental Education 6:18-31.
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 Knowledge concerning Environmental Studies:

A. How the aerosols particles affect the aerosol optical depth (AOD) indicator

B. The climate change is more often related to man-made intervention but there is always the component of natural factors...



1st section: Knowledge about daily life

2nd section: Knowledge about (environmental) Science

The 3rd section includes activities in order for students to:

recall, identify, compare, interpret phenomena, conclude, verify assumptions...



Students' (mis/pre) conceptions

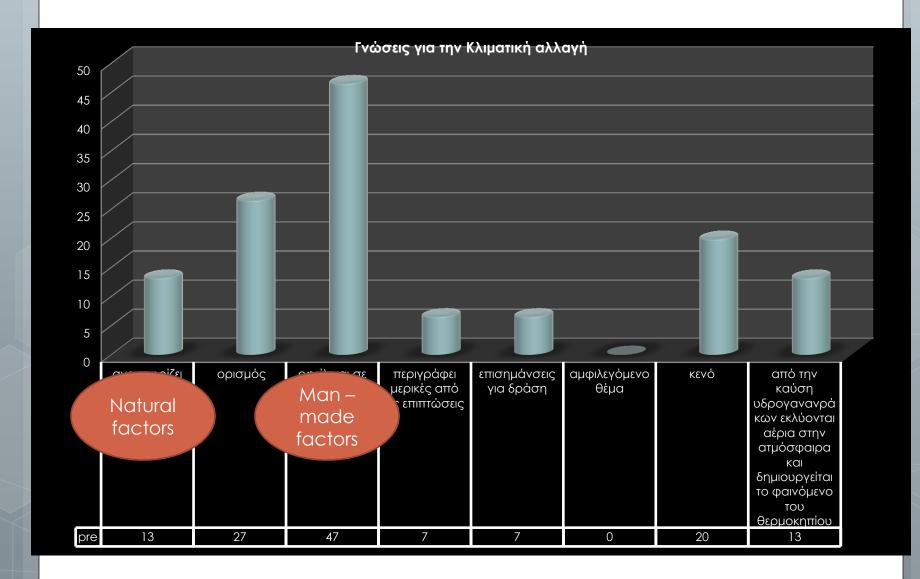
Sample: 1st grade students (25) of Upper High School

factors of climate change

- What do you know about climate change?
- Which are the factors that cause climate change?

Natural factors
vs
Man-made interventions







1st section «Knowledge about daily life»:

The **climate change** is more often related **to man-made intervention** but there is always the component of **natural factors**...



In the section ((Knowledge about daily life)) there is:

Reference to paintings of the 16th and 17th century, showing winter landscapes within the Little Ice Age period of Europe where there was a decline of temperature...



The section «Knowledge about daily life» includes:

a painting of

Pieter Bruegel the Elder

1525/1530 - 1569

Flemish painter







The section «Knowledge about daily life» includes:

a painting of

Pieter Bruegel the Elder

- Winter Landscape with Skaters and Bird Trap,
- Brussells 1565
- Musées Royaux Des Beaux-Arts, Brussels, Belgium

http://www.pieter-bruegel-the-elder.org/





Educating secondary students about climate change through Art





2nd section

3rd section

The section «Knowledge about daily life» includes:

a painting of

Aert van der Neer

1603/4 - 1677

Dutch painter

http://www.nationalgallery.org.uk/artists/aert-van-der-neer



2nd section

3rd section

The section «Knowledge about daily life» includes:

a painting of

Aert van der Neer

- «Sports on a Frozen River»
- 1660
- The Metropolitan Museum of Art



http://www.pieter-bruegel-the-elder.org/



Educating secondary students about climate change through Art

1st section 2nd section

3rd section





In the section «Knowledge about daily life» students:

- make hypotheses on whether the climate change phenomenon existed in previous eras.
- Observe two paintings which cover a 70-year-period, a part of the Little Ice Age.
- Answer the question on whether climate change is a contemporary phenomenon or not.



All these function as:

- trigger for starting the lesson.
- Starting point for introducing the concept of the aerosol optical depth (AOD) indicator.
- Motive for correlations, comparisons and categorizations.



1st section 2nd section 3rd section

2nd section: Knowledge about (environmental) Science

- Aerosols and Aerosol Optical Depth (AOD) indicator
- Climate change and natural factors
- How do we get information of the atmosphere of the previous years?



2nd section

3rd section

Observe the photos... Spot on the similarities and differences.

If you were painting the landscape which color (s) would dominate the sky of the first and which one of the second?







2nd section

3rd section

These are the photos of the same landscape. Why are there differences on the colors of the sky? (Keep in mind that the photos are taken at the same time but in two different days...)







2nd section

3rd section

Paintings show the landscapes of the photos and are part of an experiment.
These are the work of a Greek painter, Panagiotis Tetsis.









• C. S. Zerefos, , V. T. Gerogiannis, D. Balis, and A. Kazantzidis. (2007) Atmospheric effects of volcanic eruptions as seen by famous artists and depicted in their paintings, *Atmospheric Chemistry Physics*, 7, 4027–4042



Educating secondary students about climate change through Art

1st section 2nd section 3rd section

Panagiotis Tetsis

1925 – today





2nd section

3rd section

Observe the painting... Which are the colors that dominate the atmosphere?

Why do you believe these colors are those that dominate the sky?



The Lake, Petworth: Sunset, Fighting Bucks, by J. M. W. Turner, 1829



Educating secondary students about climate change through Art

1st section 2nd section 3rd section



The Lake, Petworth: Sunset, Fighting Bucks, by J. M. W. Turner, 1829



2nd section

3rd section

Study the following article...

When artists paint landscapes most of them try to capture what they see as best they can, including the colours of the clouds and the skies.

Christos Zerefos and his team of Greek and German researchers and a Greek painter have recently found that the colours of sunsets painted by artists as far back as 1500 can actually tell us how polluted the atmosphere was in the past! For instance, when volcanoes erupt they spew lots of polluting gas and ash into the atmosphere, making it more hazy. This effect can cause sunsets to appear more orange and red for several years, because of the way the volcanic particles scatter sunlight. A similar effect occurs when the air is polluted with dust from deserts, or from man-made industrial processes (eg. coal-fired power stations).

Christos and his team looked at hundreds of photographs of old paintings from the years 1500 to 2000, a period during which there were around 50 large volcanic eruptions across the world. They found that sunsets painted shortly after a volcanic eruption tended to show more red colours rather than green, indicating a more polluted atmosphere. By analysing many of these old works of art, the team found a relationship between the paintings' sunset colours and the amount of polluting particles in the past atmosphere, with more red indicating higher levels of pollution.



2nd section

3rd section

Study the following article and answer the questions...

- What is the natural cause which pollutes the atmosphere? Refer to the case of the painter Turner
- In what way does that pollution affect the sunlight?
- Is there any impact of that pollution on the climate change?
- What is the Aerosol Optical Depth indicator?



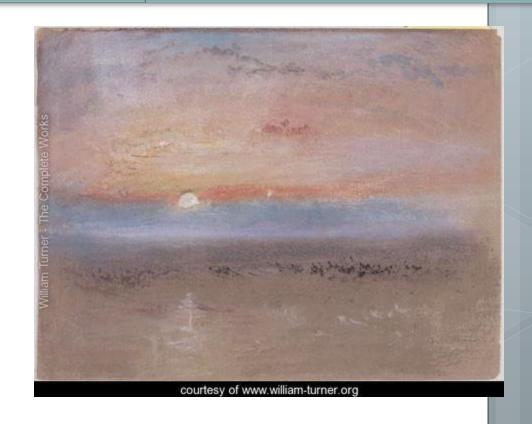
ln μικροενότητο

2η μικροενότητα

3η μικροενότητα

The writers of the article indicate that the eruption of Tampora volcano (1815) in Indonesia raised the aerosols on the atmosphere of the Earth.

a. How is it possible the volcanic eruption in Indonesia affect the Europe's atmosphere?



b. Compare the Turner's paintings of the following slide to the previous one. Consider the fact that all the paintings were created after a volcanic eruption. Which of these paintings is closer to the eruption?



2nd section

3rd section





Compare the two paintings. Which of the two is closer to the eruption of the Babuyan volcano (1831), in Philippines.



1st section 2nd section 3rd section

The 3rd section includes activities in order for students to:

- recall, identify, compare
- interpret phenomena
- conclude
- verify assumptions.



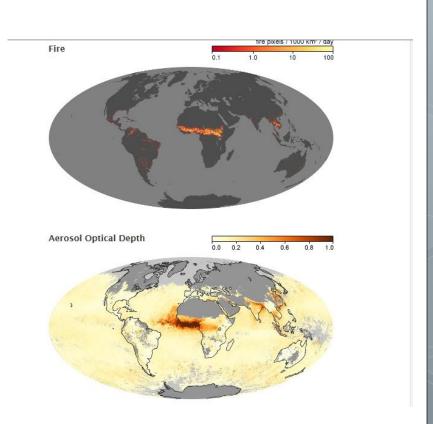
2nd section

3rd section

«Run» the video...

The raise of the AOD indicator is only due to the fires?
Observe the period between May and August above the Arabian Peninsula.
Why is there a raise of the AOD

Why is there a raise of the AOD indicator?

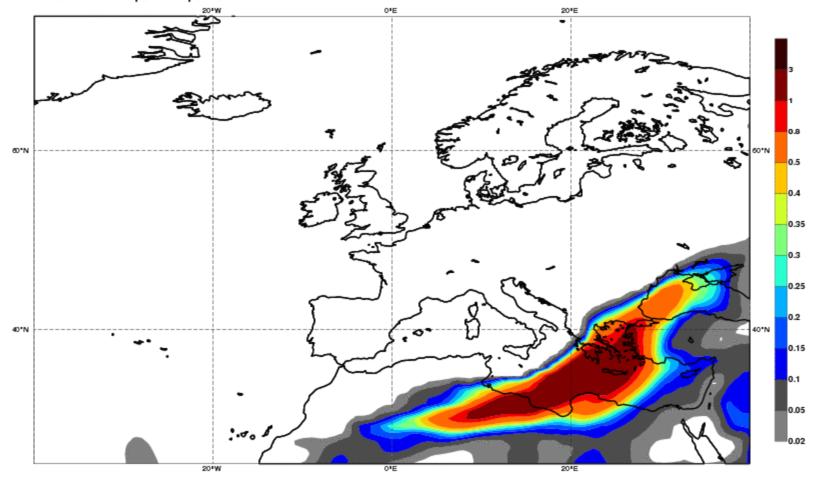


Recognise - Compare Interpret phenomena



1st section 2nd section 3rd section

Saturday 31 January 2015 00UTC MACC Forecast t+030 VT: Sunday 1 February 2015 06UTC Dust Aerosols Optical Depth at 550 nm



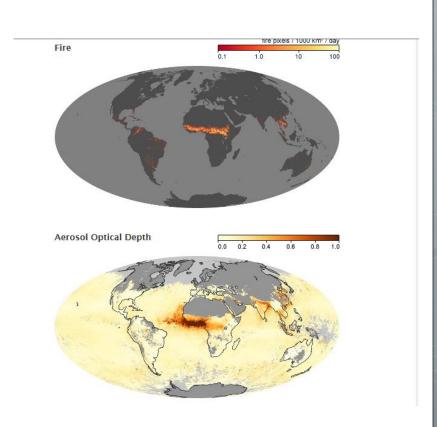


2nd section

3rd section

«Run» the video...

Why is there a raise of the AOD indicator on the North India and over China?



conclude



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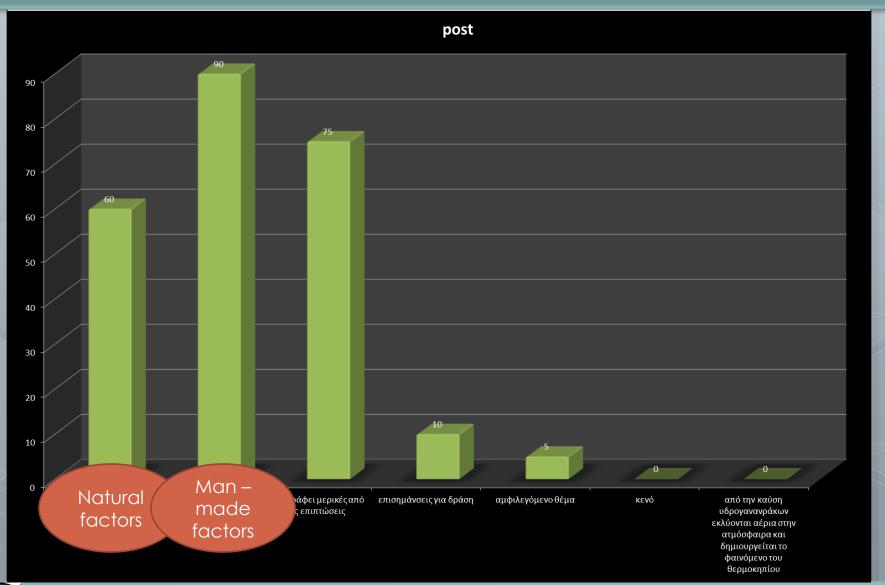
1st section 2nd section 3rd section



Conclusions



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