

# INTEGRATED STEM TEACHING FOR SECONDARY SCHOOLS

TEACHMEET

Start: **Thursday 19 November, 17:00 CET**

Host: European Schoolnet Academy

Rehearsal: Monday 16 November, 17:00 CET



## MEET THE TEACHMEET PRESENTERS!



Maria Eleftheriou  
Greece

- Physics, Geography, Biology, (Science)
- High school of Hersonissos, Crete
- Using EO (Earth Observations) browser in the class!

## SLIDE 1

EO browser is a free spatial data visualization tool which allows users to search and study a vast amount of satellite imagery.

What data can we found in this platform?

How is it possible to search the data?

How is it possible to visualize the data?

## SLIDE 2

Introduction of EO browser and many more:

<https://www.sentinel-hub.com/explore/eobrowser/>

Information for each Sentinel: <https://www.sentinel-hub.com/explore/data/>

Esa lessons: <https://eo4society.esa.int/resources/eo-browser/>

Let's go! <https://apps.sentinel-hub.com/eo-browser/>





EO Browser Hello, Maria Eleftheriou

Discover Visualize Compare Pins

Dataset: Sentinel-2 L2A Show L1C

Date: 2019-02-07 Timespan

True Color  
Based on bands 4,3,2

True Color + IR highlights  
Based on bands 4, 3, 2 enhanced by bands 12 and 11.

False color (urban)  
Based on bands 12,11,4

Powered by [Sentinel Hub](#) with contributions by [ESA](#)  
v3.0.64

**SENTINEL HUB CUSTOM SCRIPT CONTEST**  
CONTRIBUTE YOUR IDEAS! ONGOING UNTIL NOVEMBER 30<sup>TH</sup> 2020

attribution | Carto © CC BY 3.0, OpenStreetMap © ODbL © Sentinel Hub

Go to Place

Create a timelapse of this area

[About EO Browser](#) | [Contact us](#) | [Get data](#)

Lat: 38.78895, Lng: 15.21667 | 500 m

# Integrated stem teaching for Secondary schools

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## Meet the teachmeet presenters!



Emine ERTAŞ  
TURKEY- TR

- School Manager-(Vice Principal), English teacher
- Teaching English and coordinating EU projects (Comenius/Erasmus+/eTwinning) at school.
- Teaching in Toki Ortaokulu ( lower Sec. School in Turkey)
- Integrated STE(A)M in English language classes



# My 1st published and rewarded steam learning scenario

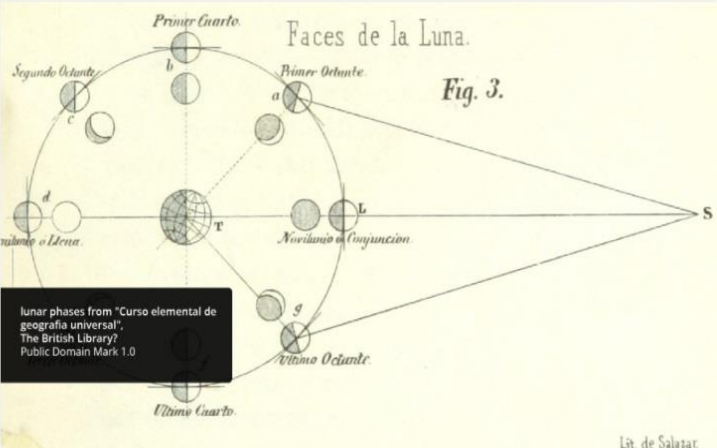
**Teaching with EUROPEANA**

HOME OUR PROJECT LEARNING SCENARIOS STORIES OF IMPLEMENTATION UPDATES COMPETITION

Home » Learning Scenarios » A Sky Full Of Stars (LS-TR-91)

## A Sky Full Of Stars (LS-TR-91)

emineertas August 2, 2019 English, History, Language subjects, Learning Scenarios, Lower secondary, STEAM



This learning scenario has been created by Emine ERTAŞ, a Turkish User Group Teacher. It was implemented for secondary school students aged between 11-13. This is an interdisciplinary lesson dealing with Science, Art, Technology which is integrated into an English lesson.

Search this website...

How can I contribute to the blog?  
The Teaching with Europeana blog is a space for all teachers to share their experience. For this reason, any interested teacher can submit stories of implementation to be published on the blog.

We would be happy to hear more about your suggestions!

Please use our online submission form to suggest a story of implementation.

To guide you through writing your first story of implementation, you can download the guidelines for writing a story of implementation for the Teaching with Europeana blog.

Looking for something specific?  
Search per category!

School level:

Pre-primary

Primary

Lower secondary

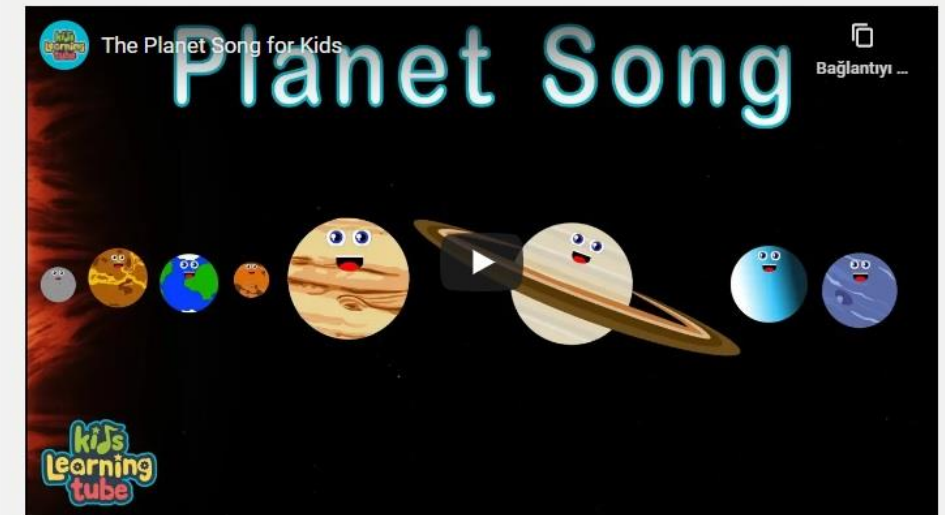


## Students inspired by astronomy

Students created QR codes and stuck them on the posters. As a result, they created interactive posters about both Europeana and Astronomy in old ages. In addition, they painted sheets from Quiver, (3D Augmented Reality colouring apps) and stuck them on the posters as well. Students also created content such as online games (3D puzzle and word cloud)

“ All these activities improved their ICT skills. We used VR goggles to create a real environment for learning process. By means of VR, they watched the planets in Solar System live.

Students listened to *The voices of Space* from Nasa resources. After that, they sang songs about our solar system together in class. In fact, this made learning fun and improved their listening and speaking skills in English.



## Planets in our Solar System

At the end of the lesson, students got information from Google about the famous Turkish and Muslim scientists who lived in Anatolia and who made important researches on Astronomy and Space. Students collected their tasks and turned them into pdf files and created an e-book in joomag. They named their e-book 'A Sky Full of Stars'.

# A sky full of stars; integrated steam ls in english lesson



## Europeana Learning Scenario

<b>Title</b>	
A Sky Full of Stars	
<b>Author(s)</b>	
Emine ERTAS	
<b>Summary-</b>	
<b>Table of summary</b>	
<b>Subject</b>	English, Science, Technology, History, Art
<b>Topic</b>	Astronomy in science and in history. (integrated in English language teaching)
<b>Age of students</b>	12-13
<b>Preparation time</b>	1 hour
<b>Teaching time</b>	7 hours
<b>Online teaching material</b>	<p>Online teaching materials of the lesson:</p> <ul style="list-style-type: none"> <li>-Podlet: <a href="https://podlet.com/emilourdes/wwwrco235v">https://podlet.com/emilourdes/wwwrco235v</a></li> <li>-Videos for singing: <a href="https://www.youtube.com/watch?v=mQ9qH97v94">https://www.youtube.com/watch?v=mQ9qH97v94</a></li> <li><a href="https://www.youtube.com/watch?v=xQjTl9y_g">https://www.youtube.com/watch?v=xQjTl9y_g</a></li> <li>-Making the videos: <a href="https://www.youtube.com/watch?v=nqkhCjC3pK0">https://www.youtube.com/watch?v=nqkhCjC3pK0</a></li> <li>: <a href="https://www.youtube.com/watch?v=xQjTl9y_g">https://www.youtube.com/watch?v=xQjTl9y_g</a></li> <li>-Online magazine: <a href="https://oom.ag/i8ze">https://oom.ag/i8ze</a></li> <li>-Wordcloud generator: <a href="https://wordart.com/uvz05s86c3yo/word-art">https://wordart.com/uvz05s86c3yo/word-art</a></li> <li>-qr code generator: <a href="http://www.qrcodegenerator.com">www.qrcodegenerator.com</a></li> <li>-Mobile applications for interactive, VR materials Solar AR by Aura-interactive</li> <li>-Making puzzles: <a href="https://www.jigsawplanet.com/?rc=play&amp;pid=2f4fac83019">https://www.jigsawplanet.com/?rc=play&amp;pid=2f4fac83019</a></li> <li>-researches: <a href="http://www.google.com">www.google.com</a></li> </ul>
<b>Offline teaching material</b>	Crayons, art paper's, scissors, ruler, marker, whiteboard, cardboards, glue, pictures, stickers
<b>Europeana resources used</b>	<p><a href="https://www.europeana.eu/portal/en/record/2022362/Royal_Museums_Greenwich_http_co_lections_rma_co_uk_collections_objects_11222.html?q=astronomy#d=1555011754282&amp;p=3">https://www.europeana.eu/portal/en/record/2022362/Royal_Museums_Greenwich_http_co_lections_rma_co_uk_collections_objects_11222.html?q=astronomy#d=1555011754282&amp;p=3</a></p> <p><a href="https://www.europeana.eu/portal/en/record/200579/np7ncwt.html?q=astronomy#d=1555011754282&amp;p=4">https://www.europeana.eu/portal/en/record/200579/np7ncwt.html?q=astronomy#d=1555011754282&amp;p=4</a></p> <p><a href="https://www.europeana.eu/portal/en/record/2022362/Royal_Museums_Greenwich_http_co_lections_rma_co_uk_collections_objects_19747.html?q=astronomy#d=1555011754282&amp;p=4">https://www.europeana.eu/portal/en/record/2022362/Royal_Museums_Greenwich_http_co_lections_rma_co_uk_collections_objects_19747.html?q=astronomy#d=1555011754282&amp;p=4</a></p> <p><a href="https://www.europeana.eu/portal/en/record/200579/hpwSee7l.html?q=astronomy#d=1555011754282&amp;p=58rp=1">https://www.europeana.eu/portal/en/record/200579/hpwSee7l.html?q=astronomy#d=1555011754282&amp;p=58rp=1</a></p>



<b>Licenses</b>	
<ul style="list-style-type: none"> <li>• <b>Attribution CC BY.</b> This license lets others distribute, remix, tweak, and build upon your work, even commercially, as long as they credit you for the original creation. This is the most accommodating of licenses offered. Recommended for maximum dissemination and use of licensed materials.</li> </ul>	
<b>Integration into the curriculum</b>	
<p>This LS allows to work several subjects such as:</p> <p>English: In the curriculum of Middle Secondary School, 7<sup>th</sup> grades, the last unit is 'The Planets'</p> <p>Science: In the curriculum of Middle Secondary School, 5<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup> grades Astronomy and Space educations are included. They are: The relation between Sun and The Earth, the Moon, Our Solar System, Famous Turkish and Muslim Astronomers in history.</p> <p>Technology: Common usage of QR codes, Augmented Reality, ICT tools in learning, smart board, digital education applications integrated with the curriculum.</p> <p>History: Famous Astronomers in Turkish history and Muslim History, Astronomy in history(general), (oriental collections, Astronomic devices in very early times)</p>	
<b>Aim of the lesson</b>	
<p>The aim of this interdisciplinary project is:</p> <ul style="list-style-type: none"> <li>- To allow children to develop basic information on Space and Astronomy by discovering and communicating basic knowledge about our Solar System, the Sun, the Moon, the Earth and other planets, as well as other celestial objects (such as Galaxy, meteors, comets, stars, satellites)</li> <li>-Incentivize children to search for the famous astronomers in the history and increase the use of digital cultural heritage in education, particularly in STEM and foreign language education</li> <li>-To do fun activities in class by using AR and create posters with QR codes that allow the viewer to further expand the info via reading content from the Europeana platform.</li> </ul>	
<b>Trends</b>	
Project Based Learning and Inquiry based learning. Augmented Reality, Collaborative Learning, Learning by Doing.	
<b>21<sup>st</sup> century skills</b>	
<p>a. Creative thinking: The students will have to come up with effective solutions to the problems that may arise throughout the project</p> <p>b. Collaboration: They will be working in groups of 4,5 students in each team.</p>	



- c. Communication: Both oral and written communication will be used in the project to present the findings and also to interact with peers
- d. Media and technology literacy: Several ICT tools, digital education applications and AR will be used in the project and the students have to learn how to use them correctly.
- e. Productivity: At the end of the scenario implementation, several products will be delivered, like interactive posters, online books, 3D paintings.

<b>Activities</b>		
Name of activity	Procedure	Time
<b>Explore the Space with NASA</b>	The teacher introduces the topic by presenting a poster of Solar System on the smart board from NASA sources, and asks students to talk about what they are perceiving. Students will make researches on NASA by using tablets.	40'
<b>What's happening Above us</b>	Students get general information on our space from NASA and sum it up briefly. After that, they share it with their friends in native language. Students learn the facts about the Solar System. They classify the planets by; -the order of the planets, -the length of the planets to the sun, -the size of the planets, -the hottest and coldest planet in Solar System, -the weird and similar ones, -the satellites of each planets, -other famous stars in our galaxy -the sounds of the galaxy <a href="https://youtu.be/xlQjTl9y_g">https://youtu.be/xlQjTl9y_g</a> <a href="https://youtu.be/ngkhCjC3pK0">https://youtu.be/ngkhCjC3pK0</a>	40+40'
<b>Singing Sun</b>	The students watch a cartoon mp4 video of Sun, telling the feature of the planets around her. They sing together with the video in second repetition. The song is in English. The song is a simple one to understand and repeat. Students repeats the song together more than once so that they improve their English skills in listening and speaking. They also learn more about the facts of our Solar System and the planets Here are the links of the videos: <a href="https://www.youtube.com/watch?v=mQ9qH97v94">https://www.youtube.com/watch?v=mQ9qH97v94</a> <a href="https://www.youtube.com/watch?v=BZ-qLUj_A0">https://www.youtube.com/watch?v=BZ-qLUj_A0</a>	40'
<b>The history of Astronomy</b>	The section where the students meet with Europeana Cultural heritage part of the plan. The teacher opens the page of Europeana and tells the students what is this platform for and how it is used. The teacher creates 4 team and	40'+40'

## The aim of this interdisciplinary project is;

- To allow children to develop basic information on Space and Astronomy by discovering and communicating basic knowledge about our Solar System, the Sun, the Moon, the Earth and other planets, as well as other celestial objects (such as Galaxy, meteors, comets, stars, satellites)
- -Incentivize children to search for the famous astronomers in the history and increase the use of digital cultural heritage in education, particularly in STEM and foreign language education
- -To do fun activities in class by using AR and create posters with QR codes . After calculating the distances of each planet to the sun and identifying their temperature differences, students will design their own learning materials such as model of 'Our Solar System' in different shapes and with different materials.
- We studied this LS with Project Based Learning and Inquiry based learning methods. Augmented Reality, Collaborative Learning, Learning by Doing are also included in our lesson.

## What is **STEAM**?

STEAM stands for:



Science



Technology



Engineering



Arts

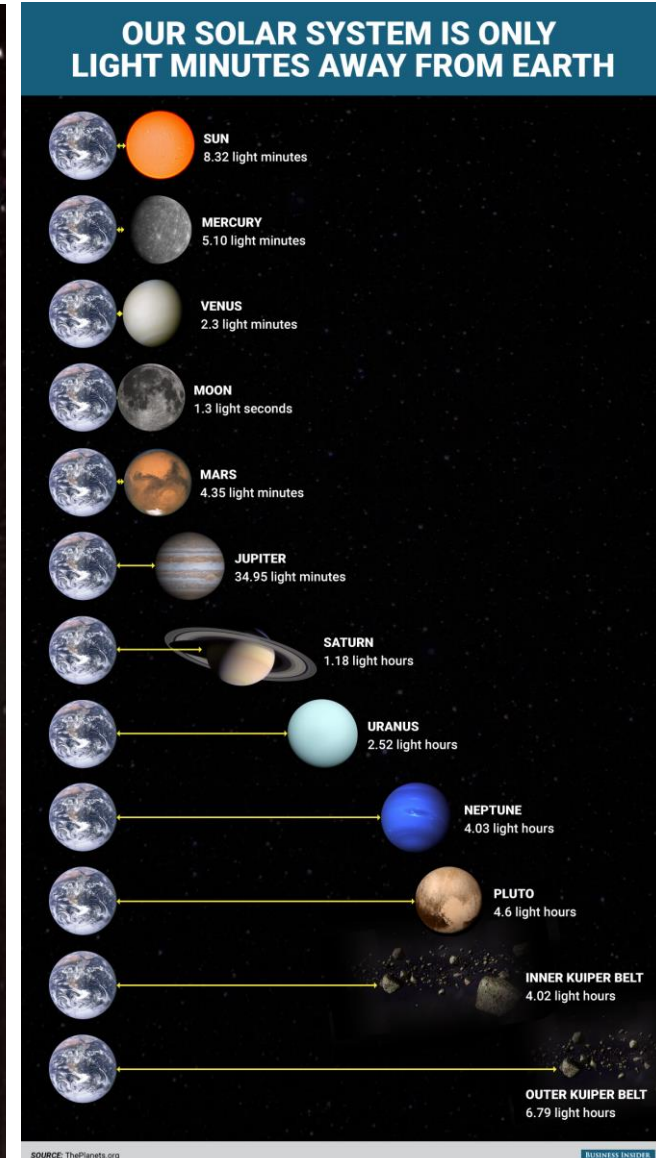


Math



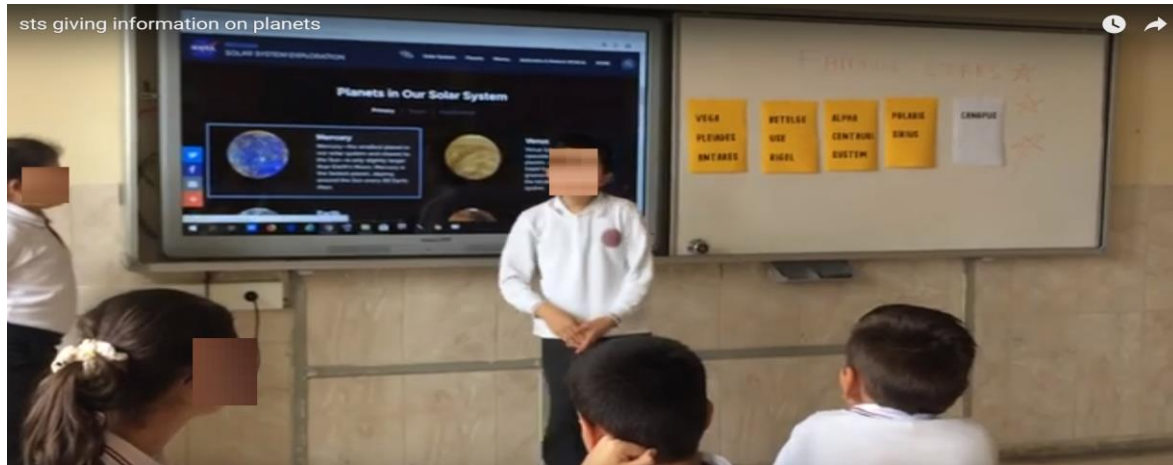
# The process

- In the national curriculum of 'Science and English lesson' we have 'The planets' unit.
- So the chosen subjects for this learning scenario are ,science, math, history ,technology,English language ,art and music. Students gathered information about our solar system , the planets and other celestial objects.
- With this scenario you will have the chance to introduce our solar system and other celestial subjects both in science with mother language and in English as second language.The students will improve their translation , communication, reading and writting skills. **In the subject of Math** students will calculate the distances of each planets to the sun and to each other. **As for Science students** will have opportunity to learn about the planets in solar system ;
- the temperature differences, rotation of speed ,from which substance the planets consist of .



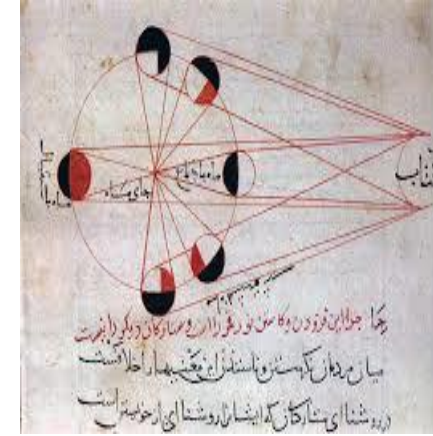


## Students are on work



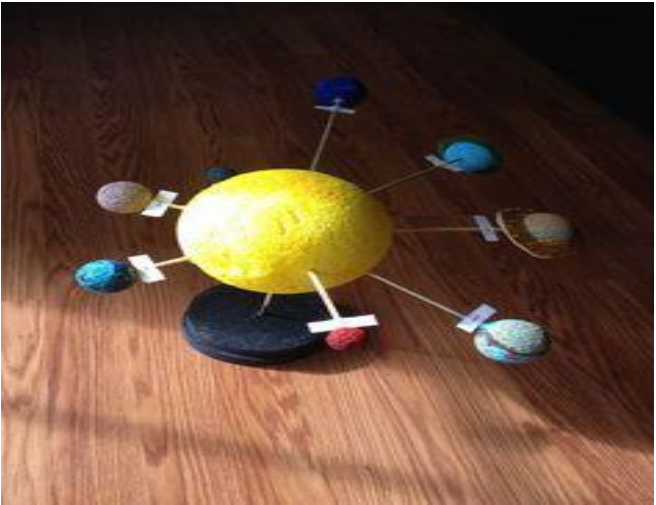
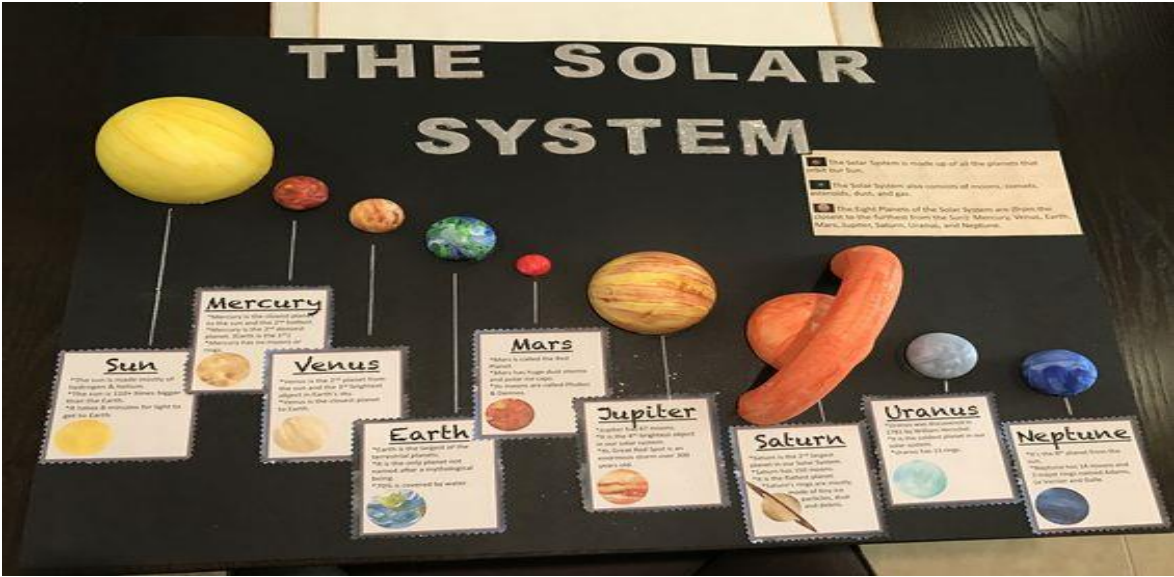


- As for history , the students searched for the researches of both eastern and western scientists. For cultural diversity ,we focused on Muslim scientists who achieved great works in the field of astronomy.
- In technology part we compounded works of these scientists and created an e-book with joomag digital tool.



- We also brought new technology in our lesson,.
- We used tablets for searching and gathering information.
- We created QR codes to design interactive posters ,which we collected resources from Europeana, Nasa and Esa .
- We used goggles to see the planets in 3d view with smart phone applications. For Agumented Reality we used Quiver application.
- At the stage of production, we got help from Art and designed models for our solar system and created puzzles ,played and sang English song 'the Planets'.






# How and where am I inspired from?


Moocs organized by EUN play a vital role for me to start integrating Steam and in my English lessons.

← → ↻ 🏠 europeanschoolnetacademy.eu/dashboard




Integrated STEM Teaching for Primary Schools  
STEMU (1-4) (Primary)  
Started: Oct 20, 2020

0 [Resume Course](#)




Digitally Competent Teachers for Creative Digital Students  
EDU4go - Digital Competence  
Started: Oct 19, 2020

0 [Resume Course](#)



Integrated STEM Teaching for Secondary Schools  
STEMU (1-4) (Secondary)  
Started: Oct 20, 2020


0 [Resume Course](#)



STEM is Everywhere! Rerun  
ScienTix - STEM Everywhere  
Rerun: Oct 15, 2020

0 [View Archived Course](#)


Your final grade: 100% [View Certificate](#)



Schools Tune Into Mars  
STEM - Mars Mission  
Rerun: Jun 11, 2020

0 [View Archived Course](#)


Your final grade: 100% [View Certificate](#)



Our Fragile Planet  
ScienTix - Climate Change  
Rerun: Apr 9, 2020

0 [View Archived Course](#)

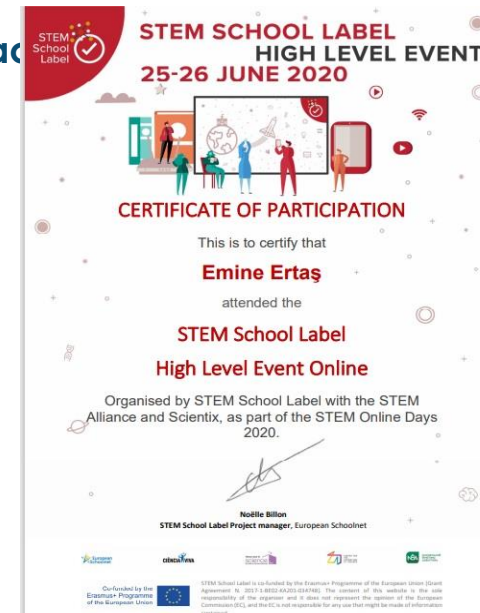
Your final grade: 100% [View Certificate](#)



Learning Leadership for Change  
L4C - Learning Leadership  
Rerun: Mar 11, 2020

0 [View Archived Course](#)

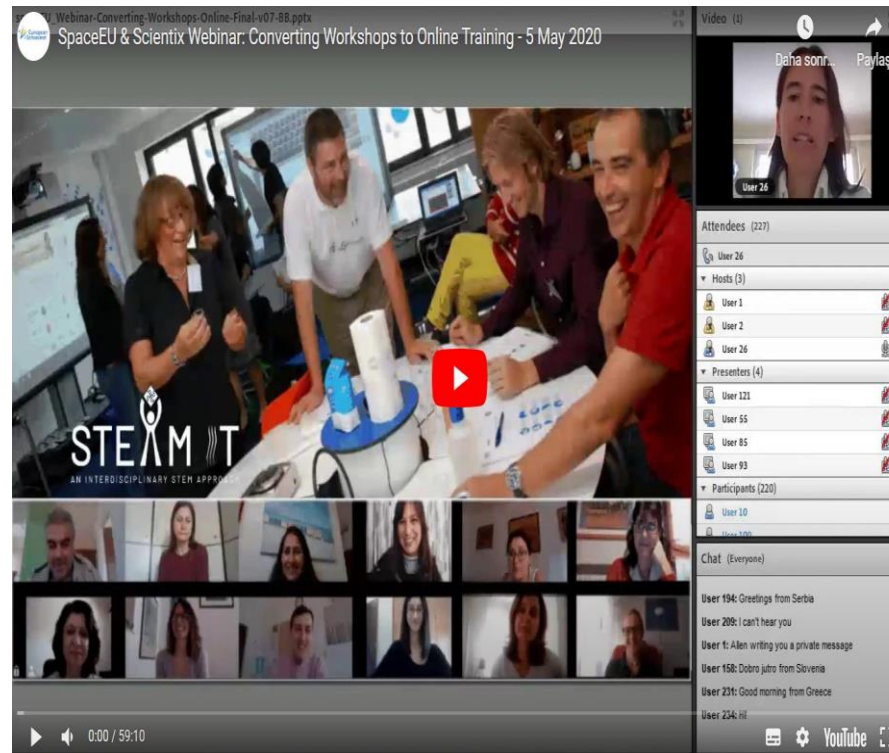
Your final grade: 100% [View Certificate](#)



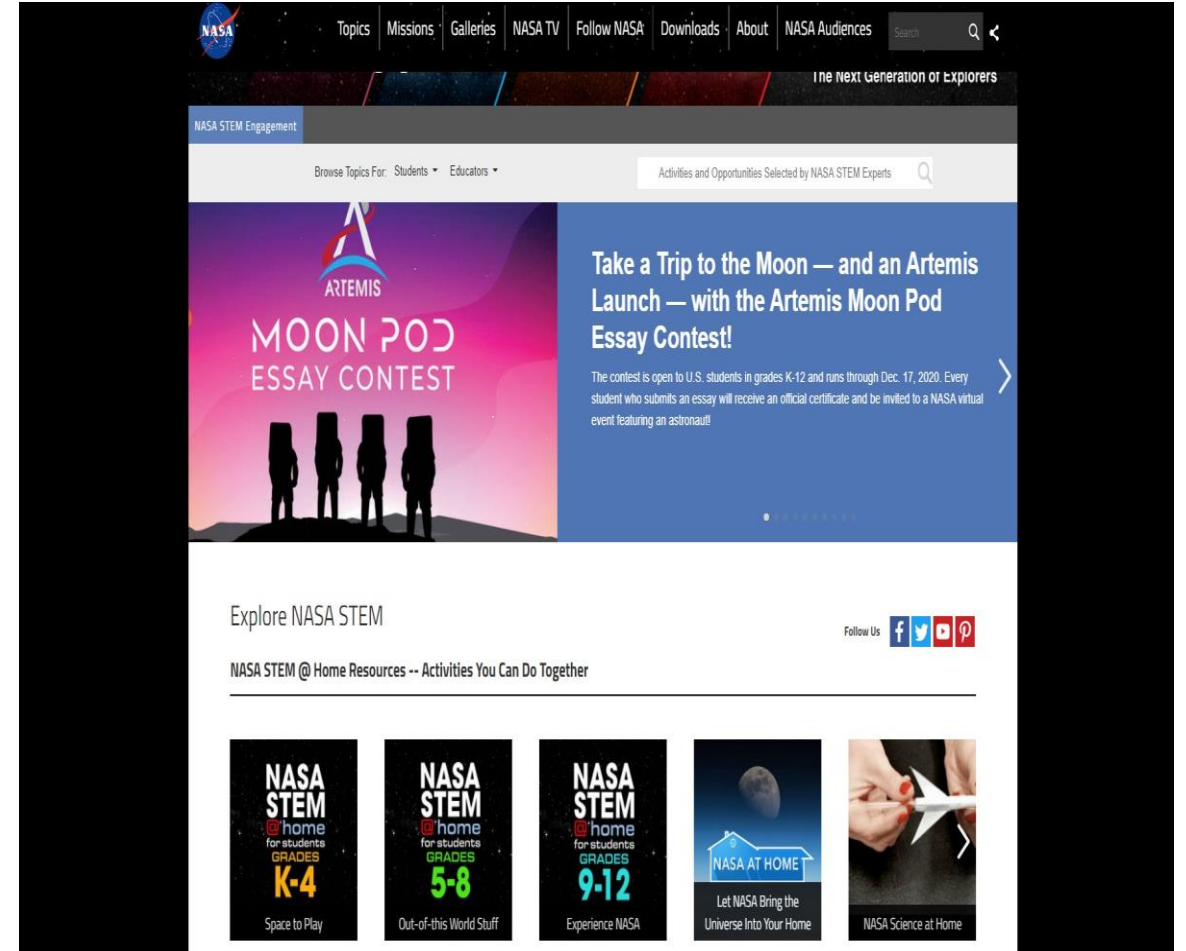
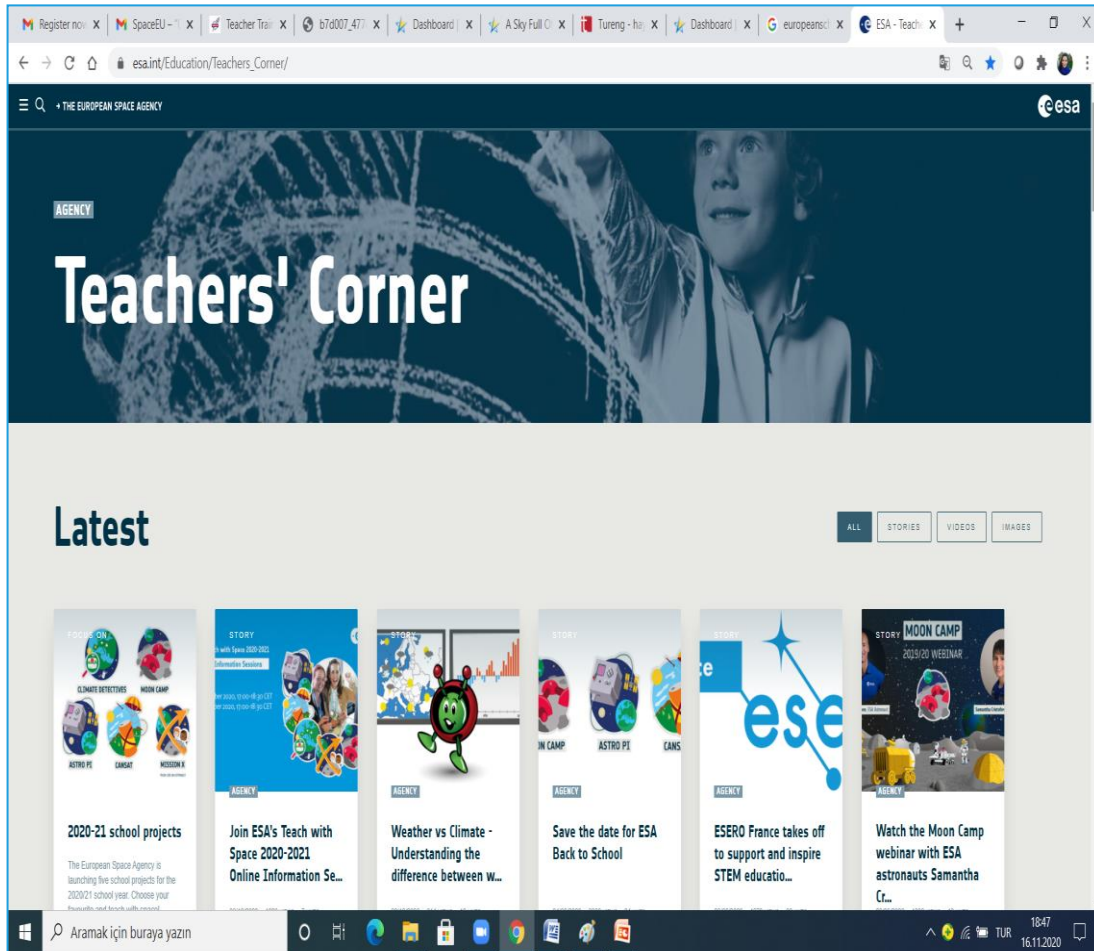


# Resources and webinars from space-eu

- <https://www.space-eu.org/teacher-training-programmes>




# Resources from esa and nasa





# Resources from europeana



What's new

**Create an account**

Save your favourite items and create your own galleries

**20th century**

Explore collections and stories from 20th century history and culture

**BLOG**

**Lonkero: Olympic-invent...**

Lonkero are Finnish long drinks invented for the 1952 Olympics

**GALLERY**

**Beethoven**

Explore this gallery and discover his life and works

**EXHIBITION**

**It was 30 years ago**

The European Parliament, the fall of the Berlin Wall and German reunification

**GIF IT UP 2020**

Your favourite annual GIF-making competition is back!

**BLOG**

**Lanterna of Genoa**

The lighthouse of Genoa, a symbol for the city, is the oldest lighthouse in Europe

**Subscribe to our Newslett...**

Get the latest info about European digital cultural heritage with European's Newsletter

europeana

COLLECTIONS TEACHERS ABOUT US LOGIN

## Europeanana Classroom

If you are an educator, a learner or a parent interested in innovative learning, this is your place! Here you can find a selection of educational resources using digital culture

### Highlights

**Science**

Discover stories of science and scientists

**Distance learning**

Lesson plans and tools for remote learning activities

**#reinventingBeethoven**

A creative educational challenge

**GALLERY**

**Beethoven**

Explore this gallery and discover his life and works

### Learning scenarios organized by

**Methodology | trend**

STEAM, PBL, IBSE, CUL, Edutainment

**Cross curricula subjects**

Environment, citizenship, migration and more

**Other European languages**

Spanish, Portuguese, French, Italian

**Level of education**

Primary, Secondary, VET



## Useful links

- If you want to reach and implement my this LS and other integrated Stem English lesson LSs go to page :
- <https://teachwitheuropeana.eun.org/?s=a+sky+full+of+stars>
- And other useful links for your future LSs ;
- · [Scientix repository](#)
- · [SpaceEU repository](#)
- · [SpaceEU self-assessment tool \(pre-implementation questionnaire\)](#)
- · [SpaceEU self-assessment tool \(post-implementation questionnaire\)](#)
- · [Schools Tune Into Mars resources](#)

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## Meet the teachmeet presenters!



Carmelita Cipollone  
Italy

- I teach Mathematics and Physics
- Secondary School - Liceo Scientifico Corradino D'Ascanio
- Observe – Think – Predict - Inquiry, Peer-to-peer, toward STEM careers and 21<sup>st</sup> Century Skills

# Slide 1

## Laboratory Activity Practice - Jigsaw example : studying earthquakes

- Divide students in “groups of experts”

- Split “groups of experts” and forms new mixed groups

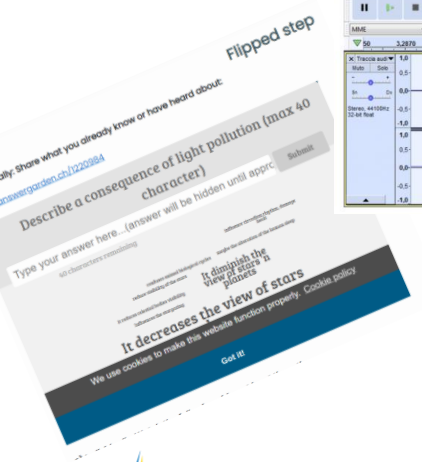
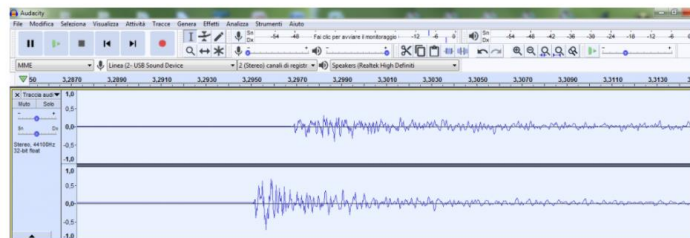
mechanical waves  
logarithms  
Earth structure

IT tools

E-learning platform

in presence laboratory activities

share – communicate – collaborate - cooperate



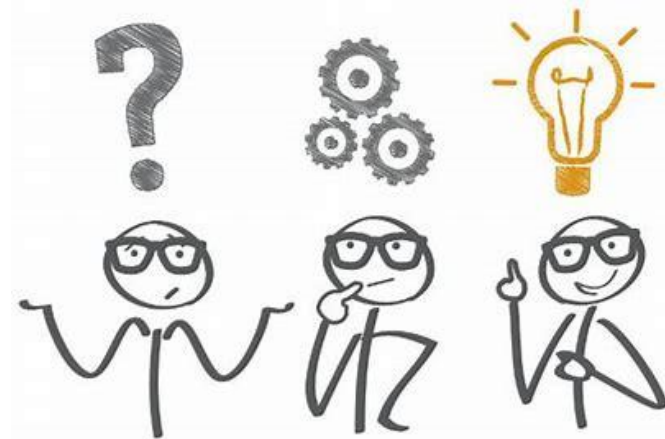
# Slide 2

## Observe – Think – Predict – Inquiry

Same earthquake, different stations; why do the seismograms look different?

[https://www.iris.edu/hq/inclass/animation/4station\\_seismograph\\_network\\_records\\_a\\_single\\_earthquake](https://www.iris.edu/hq/inclass/animation/4station_seismograph_network_records_a_single_earthquake)

- Face with problems, difficulties and efforts in order to achieve knowledge, became aware of acquired abilities and **21<sup>st</sup> century skills**.



**IRIS Incorporated Research Institutions for Seismology**

RESEARCH: Data, derived products, software, web services | EDUCATION: Lectures, lectures, videos, public displays | FACILITIES: Descriptors, programs, networks, centers | EARTHQUAKES: Recent earthquakes, in-situ moments | ABOUT IRIS: Organization, governance, news, jobs, annual reports | RESOURCES: Publications, webinars, posters, newsletters, proposals

Home / InClass / Animation / 4station seismograph network records a single earthquake

★ Resource 7 Related Resources ▾

### 4-station Seismograph Network Records a Single Earthquake

1min 31s Novice Chinese Greek Spanish

**Same earthquake, different stations; why do the seismograms look different?**

We use a cow and a tree in this narrated cartoon for fun and to emphasize that seismic waves traveling away from an earthquake occur everywhere, not just at seismic stations. A person would feel a large earthquake only at station A near the epicenter. Stations B, C, D, and the cow are too far from the earthquake to feel the seismic waves. Both the scale of the buildings (and cow) and the amplitude of the movements are exaggerated. The cartoonish amplified ground motions show the compressive (up-down in this case) P wave, the shearing (back-forth) S wave, and the rolling surface wave motions recorded by sensitive instruments. Notice that Station D does not record an S wave because shear waves cannot travel through Earth's liquid outer core. One seismic station can give information about how far away the earthquake occurred, but yields little other information. The cartoonish amplified ground motions show the compressive P wave, the shearing S wave, and the rolling surface wave motions recorded by many stations with their characteristic seismograms. See also Travel-time curves.

**CLOSED CAPTIONING:** A .srt file is included with the download. Use appropriate media player to utilize captioning.

**ANIMATED GIFS (MP4 FORMAT):** short segment of entire animation available as *Optional Download*.

**Keypoints:**

- Seismic stations at varying distances from a large earthquake have signature seismograms
- Seismic stations record the compressive, shearing, and rolling behavior of different seismic waves
- Seismograms indicate the travel time of P and S waves
- Seismograms yield information about the shadow zones

**Resource Files**

Download All 3MB

**Optional Files**

- Seismic Network Intro & Activity
- Text from the animation
- GIF 4-station (Excerpt from animation)

## Slide 3

Peer-to-peer

**Communication**

*share*

*interact*

**Technology literacy**

*IT tools*

**Collaboration**

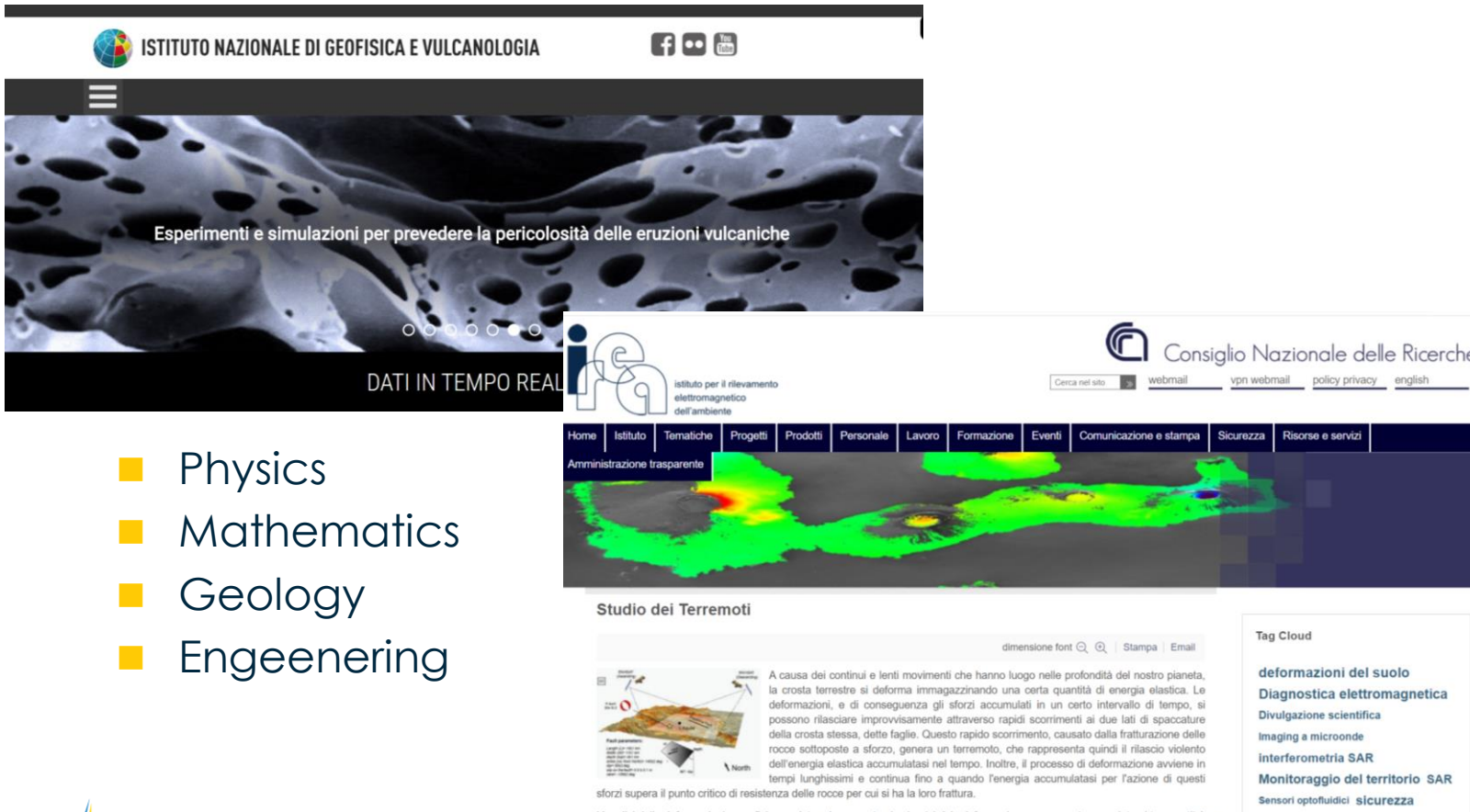
**Social skills**



# Slide 4

## Toward STEM careers and 21<sup>st</sup> Century Skills

Real phenomenon, real problem, look for solutions, gain awareness



The screenshot shows the website of the Istituto Nazionale di Geofisica e Vulcanologia. The top navigation bar includes the institute's name and social media links. The main banner features a video of volcanic activity with the text "Esperimenti e simulazioni per prevedere la pericolosità delle eruzioni vulcaniche". Below this, there is a section titled "DATI IN TEMPO REALE" (Real-time data) showing a map of seismic activity with a color scale from green to red. The website also includes a navigation menu with links to Home, Istituto, Tematiche, Progetti, Prodotti, Personale, Lavoro, Formazione, Eventi, Comunicazione e stampa, Sicurezza, Risorse e servizi, and Amministrazione trasparente. A sidebar on the right contains a "Tag Cloud" with terms like "deformazioni del suolo", "Diagnostica elettromagnetica", "Divulgazione scientifica", "Imaging a microonde", "Interferometria SAR", "Monitoraggio del territorio SAR", and "Sensori optofluidici sicurezza".

- Physics
- Mathematics
- Geology
- Engineering



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## MEET THE TEACHMEET PRESENTERS!



**Olha Doskochynska**  
**Ukraine**

- Computer science teacher  
Coordinator Ukrainian Future  
Classroom Lab
- Lyceum after Ivan Pulyuy
- Integrated STEM Teaching  
Computer Science, Biology,  
Geography, Mathematics in my  
practice

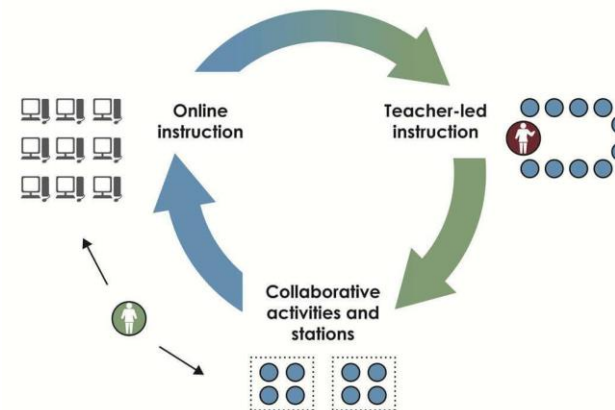
## Collaboration and cooperation of our school with the IT sector

We work with IT company and IT specialist to create STEAM teaching resources aimed at 14-16 year old. Our students attended a workshop at the IT company Symphony Solyushin. The co-founder of the company held a meeting in virtual reality glasses. During the pandemic, the company created such an innovation as holding a meeting in virtual reality



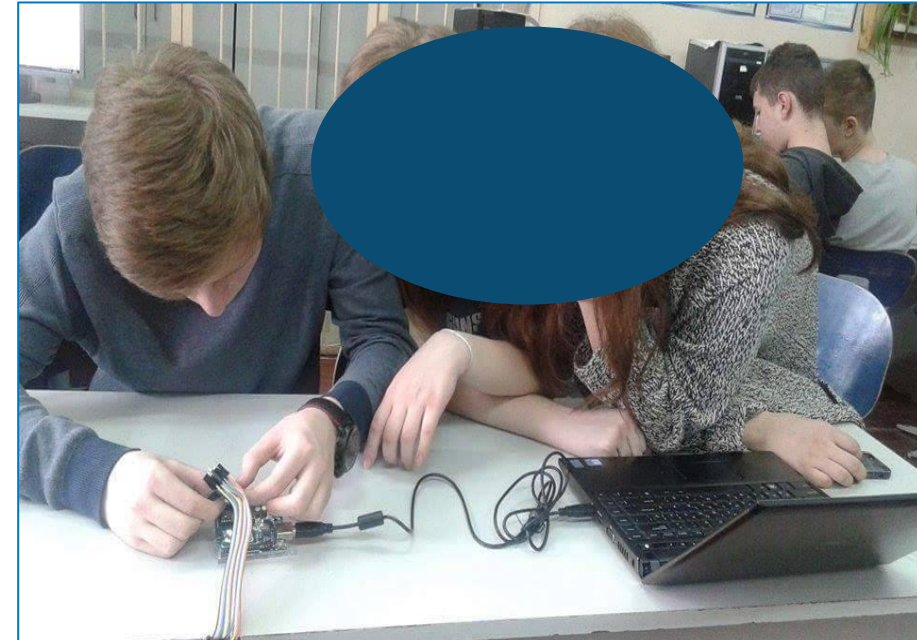
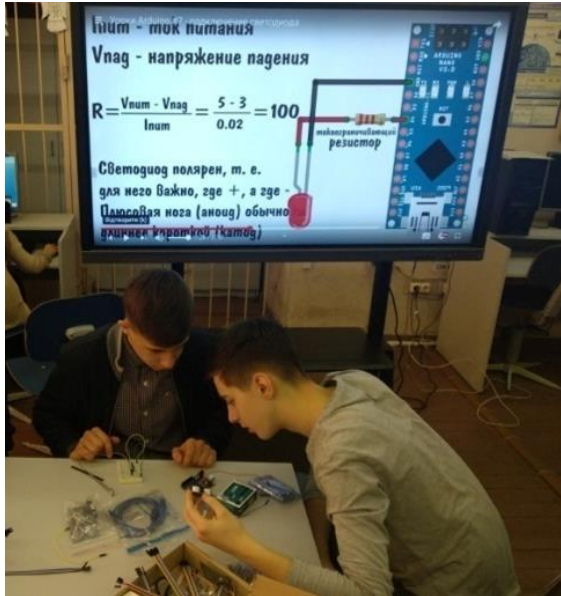


# Integrated STEM Teaching Computer Science, Biology, Geography

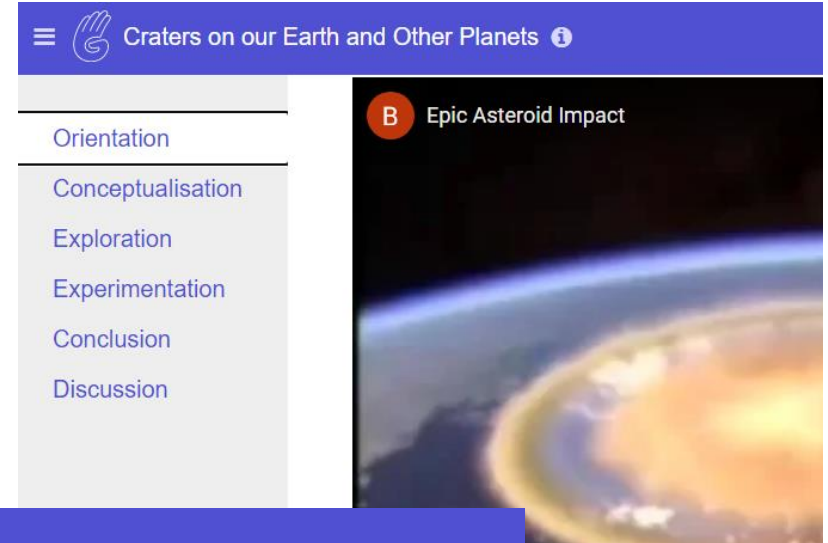
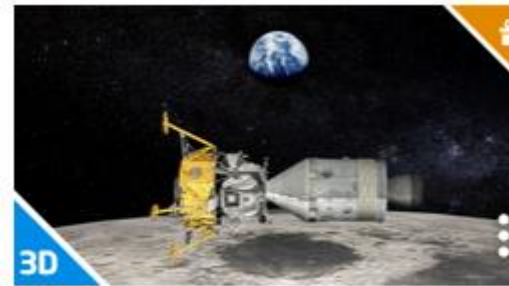




# Integrated STEM Teaching Computer Science, Biology, Geography



# Integrated STEM Teaching Computer Science, Astronomy(Go-lab,Mozaweb)



Robotics and coding

Orientation

Let's go to Moon!

Work with lego WeDo2.0

Create robot and coding

Conclusion

Is life on the Moon?

What are the challenges for people who plan to live on Moon?

We will build a base and create a Robotic that will help people with surviving the challenges!

Let's go to Moon!



# INTEGRATED STEM TEACHING FOR SECONDARY SCHOOLS

TEACHMEET

Start: **Thursday 19 November, 17:00 CET**

Host: European Schoolnet Academy

Rehearsal Monday 16 November, 17:00 CET



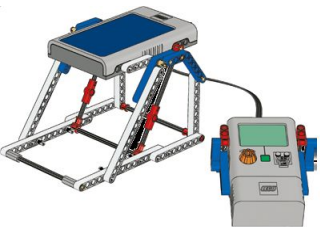


## MEET THE TEACHMEET PRESENTERS!

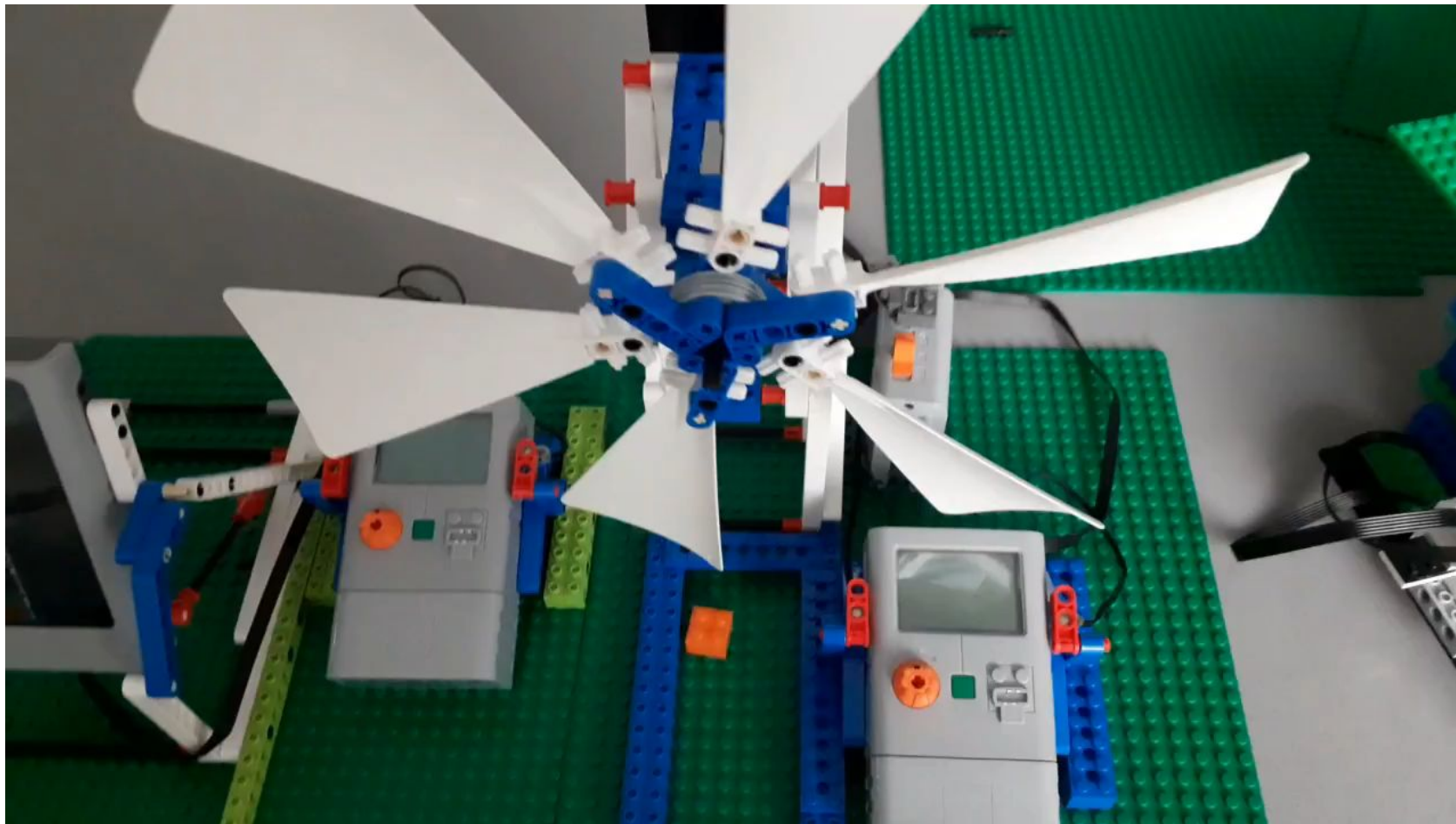
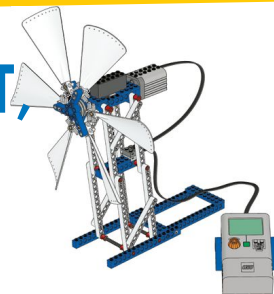


Efi, Dariou  
*Cyprus*

- Teacher, Civil Engineer, Environmental Engineer
  - Unit of ESD, Cyprus Pedagogical Institute
  - IPBL
- Which system would you choose, as the most efficient, in order to enable the energy autonomy of your school building: Wind turbines or Photovoltaics?



# WHICH SYSTEM WOULD YOU CHOOSE, AS THE MOST EFFICIENT, IN ORDER TO ENABLE THE ENERGY AUTONOMY OF YOUR SCHOOL BUILDING: WIND TURBINES OR PHOTOVOLTAICS?



1. **Education for Sustainable Development**
  - Energy
  - Urban Development
2. **Design and Technology**
  - Control systems technology
  - Energy
  - Electricity – Electronics
  - Mechanisms
3. **Natural Sciences**
  - Energy
  - Electricity Sources
4. **Geography**
  - Thermal Zones
5. **Geography**
  - Thermal Zones
6. **Mathematics**
  - Geometry

7 AFFORDABLE AND CLEAN ENERGY



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



11 SUSTAINABLE CITIES AND COMMUNITIES

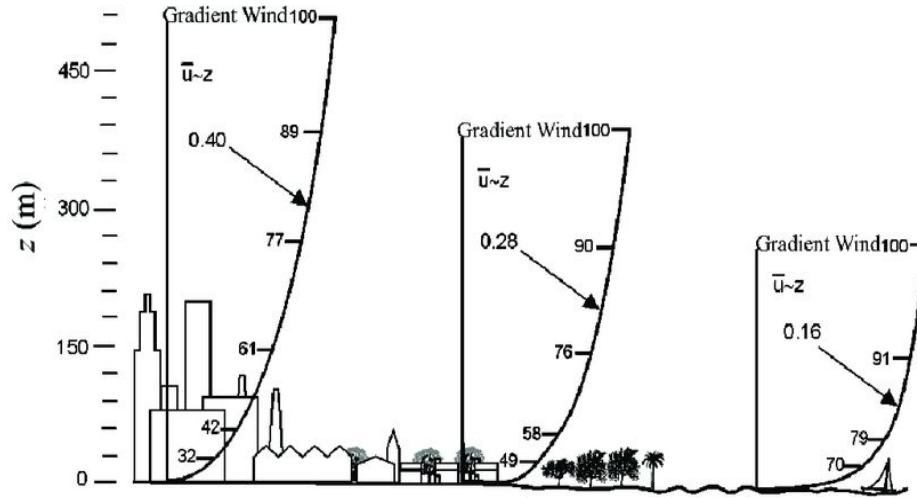


13 CLIMATE ACTION

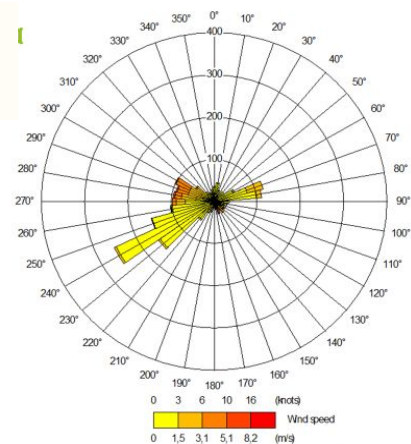




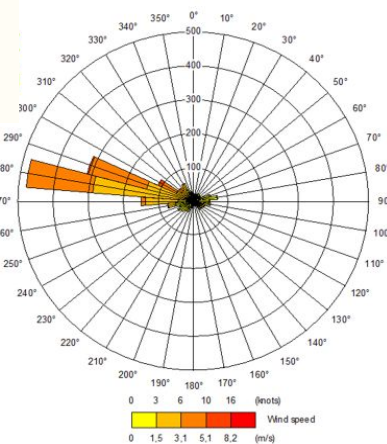
# HOW CAN I BOOST THE EFFICIENCY OF A WIND TURBINE?



Rose diagram  
Wintertime

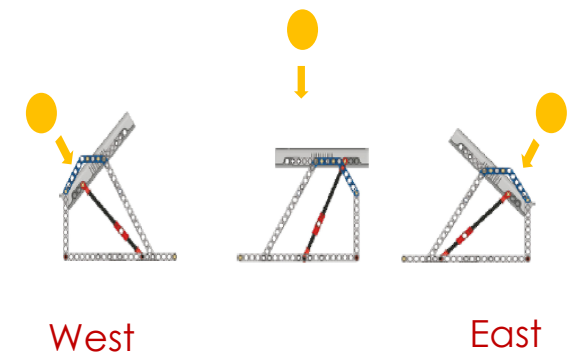
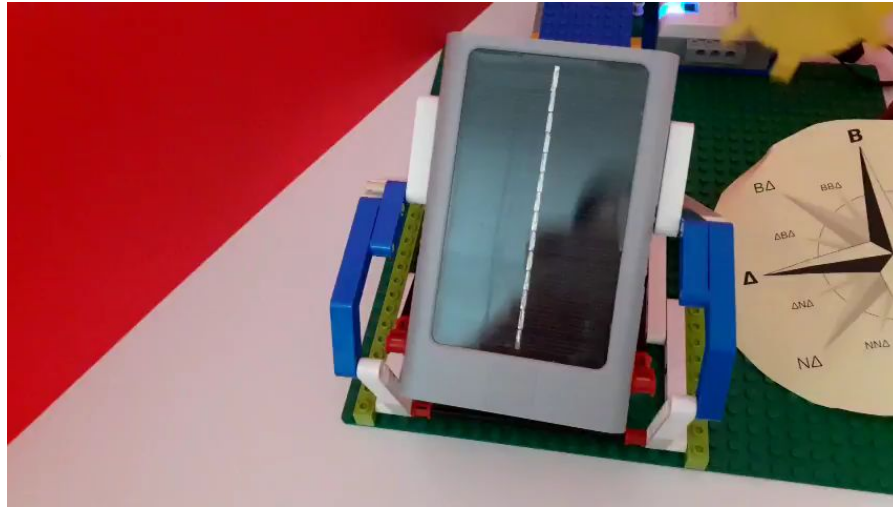
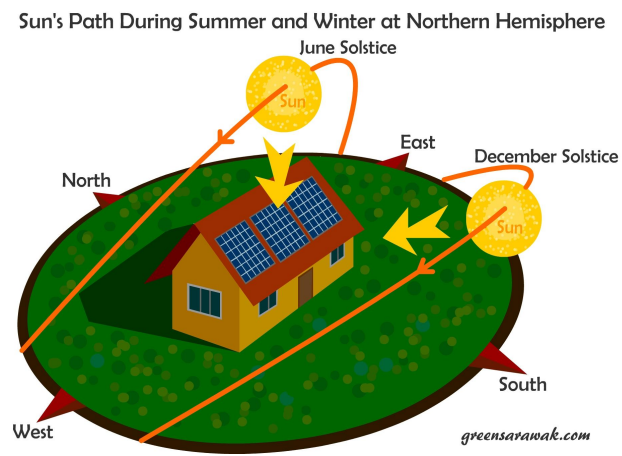


Rose diagram  
Summertime



- What is the best position for a wind turbine?
- What is its optimal orientation?
- **Entrepreneurship:** Can you design, build and program a wind turbine in such a way that it moves according to changes in wind direction?

# HOW CAN I ENHANCE THE EFFICIENCY OF A PHOTOVOLTAIC?



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



13 CLIMATE ACTION



7 AFFORDABLE AND CLEAN ENERGY



11 SUSTAINABLE CITIES AND COMMUNITIES



- What is the optimal orientation?
- What is the optimal slope?

## ■ Entrepreneurship:

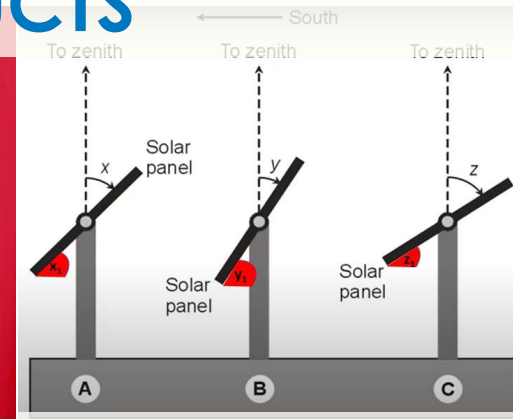
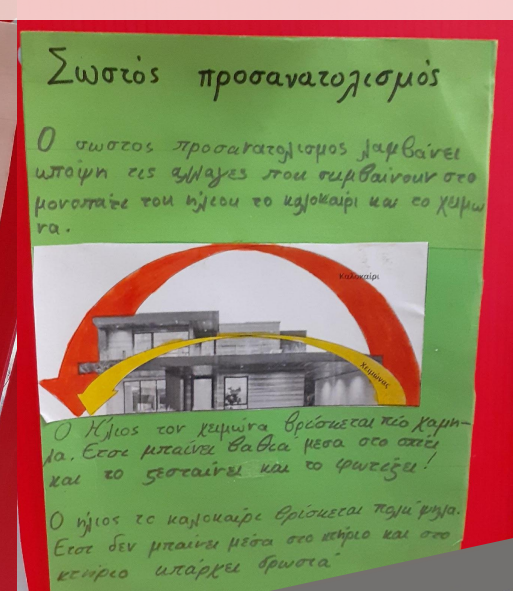
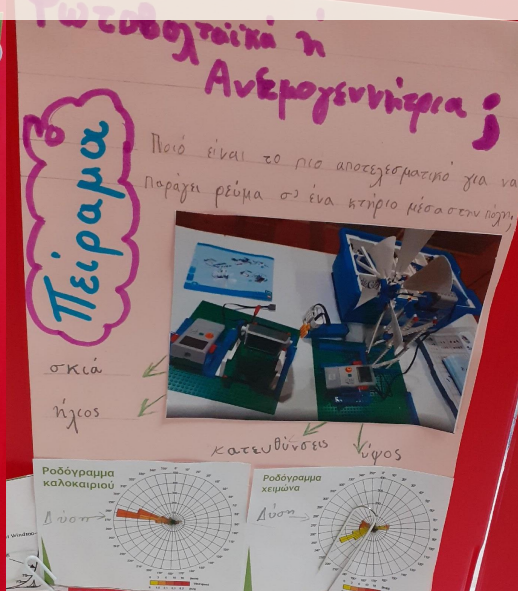
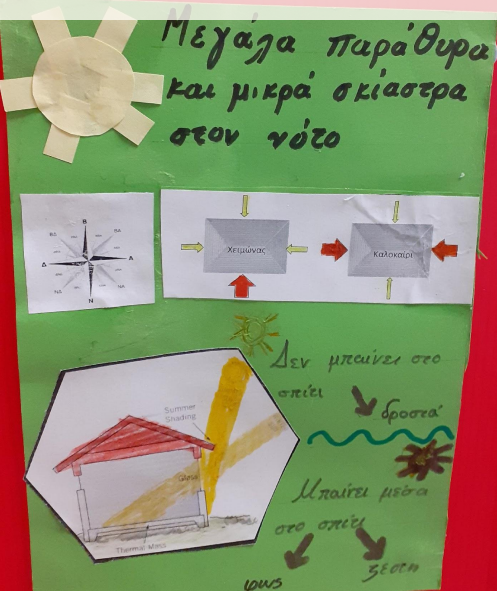
A photovoltaic system produces more energy when the sun's rays fall perpendicular to it.

Could you design and build a photovoltaic, which would be able to increase its inclination during the winter months when the sun is lower and reduce its inclination during the summer months, to ensure the verticality between the photovoltaic and the sun?

Could you design and build a photovoltaic system that follows the sun from east to west while maintaining a southerly orientation?



# LEARNING PRODUCTS

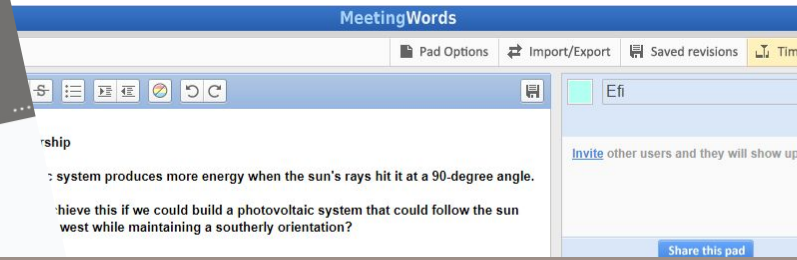


**Optimal slope of a solar panel all time a year**  
 $X = 90 - \text{latitude}$  (for Cyprus  $X = 90 - 35 = 55$ )  
 $x_1 = 180 - 90 - 55 = 35 = \text{latitude}$   
 $x_1 = \text{sum of triangles angles} - 90 \text{ degree angle} - X$  (ver

**Optimal slope of a solar panel at wintertime (from Sep 21<sup>st</sup> - Mar 21<sup>st</sup>)**  
 $Y = 78 - \text{latitude}$  (for Cyprus  $Y = 78 - 35 = 43$ )  
 $y_1 = 180 - 90 - 43 = 47$

**Optimal slope of a solar panel at summertime (from Mar 21<sup>st</sup> - Sep 21<sup>st</sup>)**  
 $z = 102 - \text{latitude}$  (for Cyprus  $Y = 102 - 35 = 67$ )  
 $y_1 = 180 - 90 - 67 = 23$

# DIGITAL TOOLS



# TEXTUAL SOURCES



**Solar power**  
 The sun is an inexhaustible source of energy. Solar energy is the most important Renewable Energy Source in Cyprus, as on our Island there is high annual solar radiation and intense sunshine that lasts for many hours.

**Photovoltaic systems**  
 Photovoltaic systems convert solar radiation into electricity. Photovoltaics are efficient even in cases of cloud cover. They do not need direct sunlight to work. They generate electricity even on cloudy days.

**Factors that affect the performance of photovoltaics**  
 A photovoltaic system has a high efficiency when it produces the maximum possible energy. The efficiency of photovoltaics depends on their orientation, their inclination and the climatic conditions of the area. The longer the sunshine days, the higher the power generation and therefore their higher efficiency. On cloudy days, less electricity is generated compared to sunny days.

**Optimal orientation of photovoltaic systems**  
 The efficiency of photovoltaics depends on their orientation. Photovoltaics perform best when located in a south-facing direction, due to the sun's course from east to west, especially during the winter months, which is too low.

