



Creating a weather station

STEM4inclusive schools
WP2 – Toolbox



Chair of Business and Human Resource Education II
Prof. Dr. Marc Beutner

-1-



The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.





Structure of the activity

A Introduction

about the topic

What ´s the weather like?

Measurement devices at weather stations

B Training phase

about the training

Create your own simple weather station



A: About the topic



What's the weather like? Measurement devices at weather stations

-3-



The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.



Definition!



What is climate change?

Climate change refers to significant and lasting changes in the Earth's climate patterns, particularly those that have occurred since the late 19th century due to human activities. While the Earth's climate has always experienced natural fluctuations, the term "climate change" today is most commonly associated with the recent, rapid changes driven by human activity, especially the burning of fossil fuels, deforestation, and industrial processes.

Climate change is a long-term change in the average weather patterns that have come to define Earth's local, regional and global climates. It is not the change of the weather from day to day. And it is becoming more challenging these days.





Let's have a look at this
youtube video!

The climate change Video

-5-



<https://www.youtube.com/watch?v=dcBXmj1nMTQ>



The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.





Climate change and weather observation

- Weather observation helps us to forecast the weather for the next day.
- Moreover, weather observation with weather stations collects the necessary data to have also a closer look at the weather and the climate over longer time, e.g. over many years to provide information on climate change.



The easiest weather station

- | | |
|--------------------------|------------------|
| Stone wet | – Rain |
| Stone white | – Snow |
| Stone steaming | – Hot after rain |
| Stone not visible | – Fog |
| Stone moving | – Storm |
| Stone fallen to earth | – Earthquake |
| Stone not there any more | - Theft |

-7-



The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.



Pixabay photo by Boke9a
– Haide – free licence



Pixabay photo by Kapa65
– Karsten Paulick – free licence



Definition!



What is a weather station?

A weather station is a site, located on land or at sea. Usually, it is equipped with instruments and tools to measure atmospheric conditions. These measurements are used to generate weather forecasts.

The idea is to analyse weather patterns and climate. Data are collected, analysed and stored.





What sort of data do we collect in a weather station?

- temperature,
- atmospheric pressure,
- humidity,
- wind speed,
- wind direction and
- precipitation levels.

-9-



The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.



Different types of weather stations – Part I



Pixabay photo by Pix1861
– Csaba Nagy – free licence



Pixabay photo by Irina Kukuts
– Irina – free licence



Pixabay photo by hpgruesen
– Erich Westendarp – free licence

-10-



The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.



Different types of weather stations – Part II



Pixabay photo by Ralphs_Fotos –
Ralph – free licence



Pixabay photo by geralt –
Gerd Altmann – free licence



Pixabay photo by Elsemargriet
– free licence



Different types of weather stations – Part III



-12-



Pixabay photo by susnpics – Susanne Stöckli – free licence



Zugstize - Pixabay photo by Meli1670 – Melanie – free licence



Pixabay photo by Hans – free licence



The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.





What sort of instruments belong to a typical real weather station?

- Thermometer measuring air and sea surface temperature
- Barometer measuring atmospheric pressure
- Hygrometer measuring humidity
- Anemometer measuring wind speed
- Pyranometer measuring solar radiation
- Rain gauge measuring liquid precipitation over a specific period of time.
- Wind sock measuring general wind speed and wind direction
- Wind vane showing which way the wind is blowing.
- Evaporation pan measuring evaporation.





Let's have a closer look at:

Wind vane

Thermometer

Barometer

Hygrometer

Rain gauge



-14-



The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.



A wind vane (also called weather vane or weathercock)



Pixabay photo by Antranias –
Manfred Antranias Zimmer–
free licence

-15-



The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.



Weather vane Video

-16-



The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.



Have a look at this
short youtube video!



<https://www.youtube.com/watch?v=-rQc4uYnBe8>

The Thermometer Video

-17-



The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.



Let's have a look at this
youtube video on
temperature
measurement!



**HOW DO YOU MEASURE
AIR TEMPERATURE?**

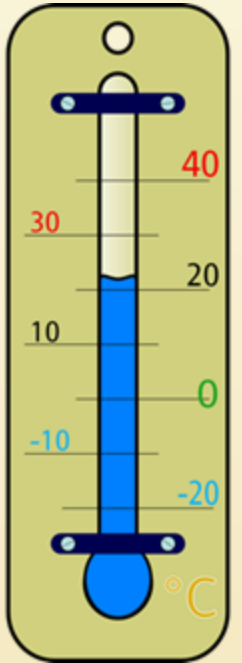
<https://www.youtube.com/watch?v=rARnTIPax8E&t=28s>



How does a thermometer work?

Liquid-in-Glass Thermometers

A thermometer is an instrument used to measure temperature. The liquid-in-glass thermometer is one of the most common types of thermometers, which uses a liquid (like mercury or colored alcohol) inside a glass tube. The liquid inside the glass tube expands when heated and contracts when cooled. The glass tube has a calibrated scale marked in degrees (Celsius, Fahrenheit, etc.). As the temperature increases, the liquid expands and rises in the tube. The level of the liquid indicates the temperature. When the temperature decreases, the liquid contracts and falls in the tube, again indicating the temperature on the scale.



Pixabay photo by
Clker-Free-Vector-
Images – free licence





How does a thermometer work?

Digital Thermometers

The digital thermometer is an electronic thermometer that measure temperature using sensors.

They use a thermistor, a type of resistor whose resistance changes with temperature. As the temperature changes, the resistance in the thermistor changes, which is detected by the thermometer's electronics. The thermometer converts this resistance into a temperature reading, which is displayed on a digital screen.



Pixabay photo by
Clker-Free-Vector-
Images – free licence



How does a thermometer work?

Infrared Thermometers

The infrared thermometers detect the infrared radiation emitted by an object. Every object emits infrared radiation, and the amount increases with temperature. The thermometer's sensor detects this radiation and converts it into an electrical signal.

The thermometer's electronics then translate this signal into a temperature reading displayed on the screen.



Pixabay photo by
www_InfoTimisoara_ro–
Viorel Vaşadi – free
licence





How does a barometer work? Part I

The Mercury Barometer is the traditional and oldest type of barometer, invented by Evangelista Torricelli in 1643. A mercury barometer consists of a glass tube filled with mercury, inverted in a dish (also containing mercury) called a reservoir or cistern. The tube is closed at one end and open at the other, with the open end submerged in the mercury in the reservoir. The weight of the mercury in the tube creates a vacuum at the top, and the atmospheric pressure pushes down on the mercury in the reservoir. This pressure forces the mercury up the tube.



Pixabay photo by Tom—
free licence





How does a barometer work? Part II

The height of the mercury column in the tube corresponds to the atmospheric pressure.

Atmospheric pressure is typically measured in millimeters or inches of mercury (mmHg or inHg).

Standard atmospheric pressure at sea level is about 760 mmHg. As atmospheric pressure increases, it pushes more mercury up the tube. If pressure decreases, the mercury level falls. 1 mmHg is the same as 133 Pascal and 1,33 Hectopascal (hPa).



Pixabay photo by Tom—
free licence





How does a hygrometer work?

Mechanical (Hair-Tension) Hygrometer

A hygrometer is an instrument used to measure the humidity, or the amount of moisture, in the air. Hair, especially human hair, changes length based on the humidity level in the air. It lengthens when the air is more humid and shortens when the air is drier. In a mechanical hygrometer, a bundle of hair is connected to a mechanical lever system. As the humidity changes, the hair length changes, which moves the lever. The lever movement is transferred to a needle that points to a calibrated scale, indicating the relative humidity (RH) as a percentage. These hygrometers are simple, but they need regular calibration and can be less accurate over time. The relative humidity is measured in percent (0 to 100%).



Pixabay photo by rschaller98 – Raphael Schaller– free licence





How does a rain gauge work? – Part I

A rain gauge is a simple instrument used to measure the amount of rainfall over a specific period. It collects and measures precipitation, providing data that is essential for weather forecasting, agricultural planning, and hydrological studies. It typically consists of a cylindrical container.

The gauge has a funnel at the top that directs rainwater into a graduated measuring tube inside the cylinder.

The funnel ensures that all the rain that falls into the gauge is funneled into the measuring tube, reducing evaporation losses.



Pixabay photoby
StillWorksImagery – Rebecca
Matthews – free licence





How does a rain gauge work? – Part II

The measuring tube is usually narrower than the outer cylinder, allowing for more precise measurements because the water level rises higher for a given amount of rainfall.

The tube is marked with a scale, usually in millimeters or inches, so that the amount of rainfall can be easily read.

After a rainfall event, the collected water is measured by observing the water level in the tube. The measurement represents the depth of rainfall that has fallen over the area covered by the gauge.

If the rainfall exceeds the capacity of the inner tube, the excess water overflows into the outer container, and the total is then calculated by adding the inner and outer readings.



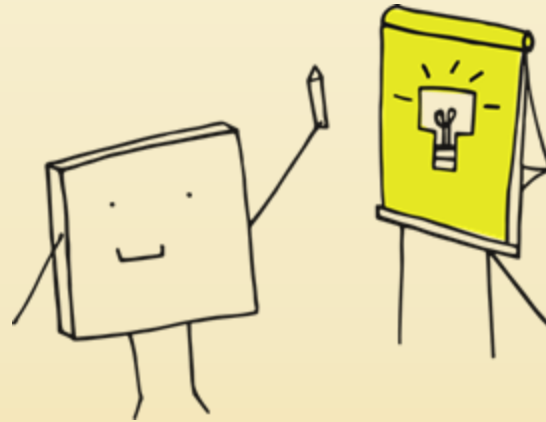
Pixabay photoby
StillWorksImagery – Rebecca
Matthews – free licence



B: About the training



Training phase



-26-



The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.





Task 1:

- Draw a plan for your weather station. Work together in groups of four persons and include also the learners who are not able to draw on their own by integrating their comments and ideas.
- You have 20 minutes for the creation. If you have people with special needs in your group you will get additional 10 minutes for the creation while the other groups have to check and improve their solutions
- Please, collaborate. Support learners with visual impairments or disabilities. Afterwards, everyone should share ideas



-27-



The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.





Task 2:

- Let's have a look at the following video:



<https://www.youtube.com/watch?v=sdxPTl8k9bl&t=18s>

-28-

- Describe what you saw in a short text.
If you are not able to write, please, work together with other persons or record an audio about your ideas with your mobile phone.



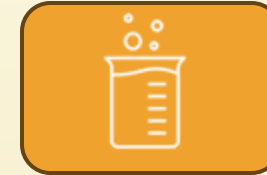
The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.





Task 3:

- Create your own simple weather station:
- Bring it outside and observe it for two week. Write down your observations in the observation protocol each day.
- Meet each other after the two weeks and share your observations and experiences. Everybody has to be involved according to discuss classroom norms and community agreements.





H5P- Tasks 1 about climate and the weather station – Climate change

Is climate change currently a crucial topic for Europe?

☐ True ☐ False

☒ Check

[Reuse](#) [Embed](#) H5P

-30-



The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.





H5P- Tasks 2 about climate and the weather station - Instruments

Find the correct names of the instruments at a weather station and use it in the crossword.

Across

3 Which instrument do you use to measure temperature? (11)

5 Which instrument shows the direction in which the wind is blowing (4,4)

Down

1 Which instrument measures the humidity? (10)

2 Which instrument measures air pressure? (9)

4 In which instrument do you collect rain water? (4,5)

[Check](#) [Show solution](#) [Retry](#)

[Reuse](#) [Embed](#)

-31-



The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.



Co-funded by
the European Union



H5P- Tasks 3 about climate and the weather station – Global climate

Drag the words into the correct boxes

Climate change is a in the average that have come to define Earth's local, regional and climates. It is not the change of the from day to day. And it is becoming more these days.

[Reuse](#) [Embed](#) H-9

-32-



The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.





H5P- Tasks 4 about climate and the weather station – Thermometers

An infrared thermometer uses a resistor whose resistance changes with temperature.

☐ True ☐ False

A resistor is used in digital thermometers.

0/1 [Show solution](#) [Retry](#)

[Reuse](#) [Embed](#)

-33-



The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.





H5P- Tasks 5 about climate and the weather station – What is climate change?

What is climate change?

- ☐ Climate change is the change of the weather from day to day. And it is becoming more challenging these days.
- ☐ Climate change is definately unimportant
- ☐ Climate change is a long-term change in the average weather patterns that have come to define Earth's local, regional and global climates.
- ☐ Climate change is a short-term change in the average weather patterns that have come to define Earth's local, regional and global climates.
- ☐ Climate change is a medium-term change in the average weather patterns that have come to define Earth's local, regional and global climates.
- ☐ Climate change is a long-termed action and it is important for the EU.

[Check](#)

[Reuse](#) [Embed](#) H5P

-34-



The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.





Congratulation!

You mastered the activity on climate and the creation of a weather station!

-35-



The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

