

# climate chart puzzle



## 1. Name of the project:

climate chart puzzle

This task should encourage students to think about typical weather situations for specific locations. Students should think about impacts of locational differences, such as costal proximity, different climate zones or high altitudes of the city. By comparing these charts, the students use mathematical and geographical skills.

## 2. Subjects covered from STEAM areas:

Mathematics,  
Science,  
Arts,  
Technology,  
(Engineering – Perspective)

## 3. Target group (age range and size of the group):

Grade 8-13

## 4. Duration of the activity:

6 lessons (6\*45min)

## 5. Key words:

JupyterNotebooks,  
Epistemic Programming,  
Data Science,  
Arts-Project,  
Geography,  
climate

## 6. Key sentence describing context of the activity, followed by short description (200 words):

Within the project, learners elaborate and compare specific geographical occurrences of different climatically interesting areas by exploring and elaborating the specificities through epistemic programming and presenting the numerical differences aesthetically. Learners use a Jupyter Notebook in a data science context to retrieve geographical weather data. To do this, they explore various climatically interesting geographical points (coasts, mountains, forests, ocean) and select a specific area on the map based on a criterion of interest (rainfall, wind, temperature). This area (e.g. the west coast of California or Madagascar; larger areas such as Africa or the world map can also be selected) is then coloured using programming in the Jupyter notebook based on the criterion of interest. The colouring of the specific regions corresponds to a scale of the

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criterion (e.g. precipitation in the area > 5 litres per m<sup>2</sup> in red, from 3-5 litres per m<sup>2</sup> in orange, etc.). The colouring can be chosen freely, but the legend must be fixed. Series of graphs (e.g. looking at the area at different times) can also be generated and presented, e.g. showing the colouration of the area according to the characteristic at different times of the year, so that the differences can be contrasted. The graph is digitally captioned with the feature of interest (e.g. "Rainfall in Brazil" or "Wind speed in Antarctica") and a legend of the colours. The learners then present their graph(s) in plenary and explain the specific conditions of the region.

### 7. Description of the activity environment, including the list of materials and tools needed:

Computers,  
Internet,  
Prepared JupyterNotebook,  
Projector

### 8. Step by step, detailed description of the activity, including teaching and learning strategies:

Phase	Activity	Student-/Teacher-Activity	Didactical Comment
1	Problem statement: The learners are confronted in plenary with a coloured weather map of a geographical region and the teacher asks what can be seen.	Students discuss, teacher moderates	Activation of prior knowledge, diagnostic function, creation of interest
2	Task: The teacher presents the project and the necessary steps of the next lessons to the learners.	Teacher fixes the task and the goal (presentation of the learning product)	Transparency, commitment, target definition
3	Unit on climatic zones and climatic conditions, such as wind, precipitation, temperatures, humidity, etc.	Input (e.g. through video) on climatic zones and weather phenomena	Creation of the necessary knowledge for the selection of an interesting feature in the development process
4	Introduction of (prepared) JupyterNotebook; selection of specific geographical areas, representation of climatic feature and colouring. Brief brainstorming of ideas for representation by handing out small project sketch to students (What feature & geography am I interested in? How should the representation be coloured)	Teacher provides access and gives an introduction while students simultaneously prepare for programming in the JupyterNotebook.	Creating self-efficacy and positive expectations

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5	Development of the project in group work (groups of 2) in the Jupyter Notebook.	Teacher assists, pupils work on their project in pairs on the computer and label the created visualization with title and legend	Support through group work and social inclusion
6	Presentation of the results in the plenary via projector and discussion of the results	Teacher asks opening questions about the presentation for the other students and makes connections, students present their results at the front	appreciation of work, review of learning gain

### 9. Learning objectives/competencies:

- Operating and using
  - Digital tools (Jupyter Notebook)
  - Data organisation (transferring data into graphic representation)
- Informing and researching
  - Information evaluation (evaluating data via programming)
- Communicating and cooperating
  - Communication and cooperation processes (sharing media products and information → graphics contain information)
- Producing and presenting
  - Media production and presentation (graphics are end products)
- Principles of the digital world
  - Identify, understand and consciously use the principles of the digital world (recognise principles of such representations in media and recognise basing on data)

### 10. Evaluation/Assessment guidelines:

Evaluate the final product based on the linkage and meaningfulness of the presentation as well as the information content of the presentation method, divided into presentation type (labels etc.) and information content (classification of the presentation). Include creativity in the presentation or design, e.g.: Are the differences in the data graphically represented and delineated?

### 11. Lessons learned:

Thinking in terms of "STEAM dimensions" when planning lessons can lead to interdisciplinary aspects being taken into account, thus opening up lessons from a rather rigid computer science view and including other contents and disciplines. Furthermore,

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thinking in STEAM dimensions makes me aware of the useful contributions of computer science to other areas and thus the application reference.



### 12. Additional information/Links:

Possibilities of colouring maps in Python via Matplotlib, which enables implementation in JupyterNotebook:

- <https://www.earthdatascience.org/courses/scientists-guide-to-plotting-data-in-python/plot-spatial-data/customize-vector-plots/python-customize-map-legends-geopandas/>
- <https://towardsdatascience.com/how-to-use-python-to-obtain-the-temperature-of-any-place-on-earth-b92aae44b831>
- <https://nordicesmhub.github.io/climate-data-tutorial/03-visualization-python/>

### 13. Contact person:

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