GOSTEAM Hands-on Activity Template *(Classroom-Formal)*

Title:

Map projections

Short Description (Max 500 words):

Map-projections (What would be the best projection of Finland?)

a) Practical exercise where students try to project a country (Finland) from an illuminated earth globe to four different types of forms made of paper: cylinder (vertical and horizontal), cone and a plane paper.
b) Comparison and discussion of the result of the different projections of Finland What are de advantages and disadvantages with each projection.
c) Compare some world map projections at: https://map-projections.net/compare.php?p1=a4-projection&p2=albers-equal-area-conic&w=0

Keywords (Up to 5):

Map, projection, globe, Earth

Information about the Implementation

Age and language of the students: 9-12 12-15 15-18 18+

Language: English Age: ☐ ☐ ☒ ☐

Number of Lessons – Duration (per lesson):

Number of Lessons: 3 Duration per Lesson: 45

Subjects

For which subject(s) the activity is usable, is it an interdisciplinary activity?

Science ☐

Physics ☐ Chemistry ☐ Biology ☐ Geosciences ☒ Environmental ☐ Other ☐

Technology ☐

Engineering ☐

Arts ☐

Mathematics ☐

Information about the Scenario

Curriculum and country:

Link of the current activity to the curriculum:

Country:	Sweden	Class: geography	Grade: 10-12
Topic:	Cartography		

Objectives (Max 100 words):

Description of the learning objectives

Knowledge of geographical concepts, theories, and models.

Materials (Max 100 words):

Which resources and materials (software, hardware) are needed?

paper pen, tape, scissors, earth-globe, illuminated model of the earth, computer with internet connection.

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Spatial concepts, skills and abilities:

Which spatial concepts and skills are covered by the activity?

Spatial concepts:

Primitives: Identity/Name ☐ Location ☐ Space/Time ☐

Simple: Distance ☐ Direction ☐ Connectivity ☐ Movement ☐

Boundary ☐ Shape/Area ☒ Adjacency ☐

Difficult: Overlay ☐ Buffer ☐ Topology ☐ Coordinate ☐
Map ☒ Scale ☒ Shortest Path ☐ Navigation ☐
Surface ☐ Slope/Gradient ☐ Aspect ☐ Contour ☐

Complex: Interpolation ☐ Map Projection ☒ Spatial Dependency ☐

Other:

Spatial skills:

- ☒ Map literacy
- ☐ Navigation/orientation
- ☐ Estimating distances and directions
- ☐ Recognizing and understanding patterns/Understand and identify models of spatial organization
- ☐ Select an ideal location based on the given spatial features
- ☒ Visualization
- ☐ Understand and identify spatial correlations/ dependencies
- ☐ Categorize spatial entities/ geographic features and identify hierarchies
- ☒ Compare spatial entities and draw analogies among them
- ☐ Identify/determine connections/relations
- ☐ Understanding scale in space and time
- ☐ Delineation of spatial regions/ zones based on given features/ properties

Short Description

Navigation/orientation: Finding one's way in unfamiliar environments, interpreting and giving walking and driving directions.
Estimating distances and directions: Measure paths, weighted distances, angles.
Map literacy: Using, interpreting/understanding, learning from, and communicating acquired spatial knowledge from maps, comprehension of geographic features represented as points, lines, or polygons.
Recognizing and understanding patterns/Understand and identify models of spatial organization. Delineation of spatial regions/zones based on given features/properties: Regionalization processes, pattern recognition and clustering identification in the 2d and/or the 3d world.
Select an ideal location based on the given spatial features: Single or multi-criteria siting and optimal areas identification.
Visualization: Visualizing spatial entities from written/oral verbal descriptions, from their 2d or graphical representations or through mental transformations; such as axis rotation or perspective taking.
Understand and identify spatial correlations/ dependencies: The ability to realize, identify and explain patterns, clusters and relevant spatial dependencies.
Categorize spatial entities/geographic features and identify hierarchies: Identify the hierarchical form of data and gradients between spatial entities.
Compare spatial entities and draw analogies among them: Calculate and compare different geometric objects' shapes, area and, boundaries.

Identify/determine connections/relations: The ability to identify links and common characteristics among spatial entities and between humans and spatial entities.
Understanding scale in space and time: The understanding of changes/transitions through space and time for different spatio-temporal scales.

Geospatial concepts and spatial abilities documentation (see Section 3.2):
http://www.gosteam.eu/wp-content/uploads/2021/05/GOSTEAM_IO1_A1_final.pdf

Description of the activity in detail

Classroom activities

Lesson 1 (45 minutes):

Short introduction of the activity with the help of physical earth-globes in the classroom and a digital picture of Earth on Google Earth.

The teacher presents the problem to the students while showing Finland on a globe and on Google Earth.

How would you do a 2D-map of Finland?

The students write individual solutions and thoughts on a paper (5 min) whereafter they present their ideas on a whiteboard.

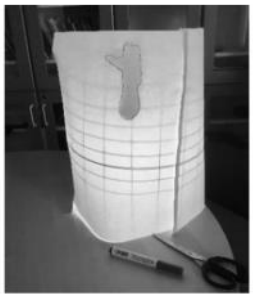
Divide the student into different groups whereafter they can try their ideas.

If the students agree on an idea, they can go for it. They can make any shape by cutting paper and taping it together. The teacher can support some groups to try cylinder, cone or flat paper.

The teacher has prepared a template of Finland that is placed upon the illumined earth globe.

Each groups places their paper- form over the globe and draws the contours of Finland on to the form.

Save all the forms to the next lesson.

Lesson 2 (45 min)

Start the lesson by cutting out the different “Finland”s from the forms.

Let the students compare and discuss the differences between the shape and areas of Finland.

Let them draw a conclusion of the experiment.

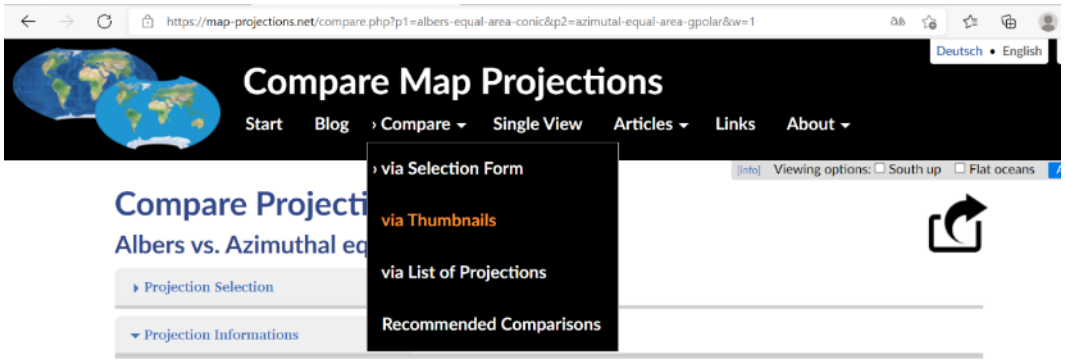
The teacher concludes the lesson and presents three common models of map-projections, with advantages and disadvantages. The three common models can be Albers (conical), Lamberts (cylindrical), and azimuthal equal-area projection. See the examples above as examples.

Lesson 3. (45 min)

Let the students compare different projections on this website:

https://map-projections.net/compare.php?p1=a4-projection&p2=albers-equal-area-conic&w=0

(The easiest way is to start with “Compare” and choose “via Thumbnail”.)



Prepare questions to the students such as:

- Which projection shows the most accurate size of Greenland if you compare the Lamberts- to the Albers-projection?
- What happens with the shape and size of an area if you compare the equator region to higher latitude regions?
- What are the advantages and disadvantages with each projection?

Try different projections and countries.

Finish the lesson by discussing and concluding the results. For example, there is no perfect projection. The choices depend on what the maps will be used for and if you want accuracy in shape or perpendicularity.

Description of activities for face-to-face teaching in the classroom

Online activities

Description of activities for distance learning in home-schooling

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References (if any):

Assessment (if any):

Not necessary