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

Title:

Geodesic dome

Short Description (Max 500 words):

Planning and production of geodesic domes from slatted frames and vegetation to create shadow caves for the school yard.

Keywords (Up to 5):

Geodesic dome

Information about the Implementation

Age and language of the students:

	9-12	12-15	15-18	18+
Language: Age:	☐	■	☐	☐

Number of Lessons – Duration (per lesson):

Number of Lessons: 12 Duration per Lesson: 50

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: Austria Class: Grade: 7

Topic: Platonic solids, frequency, theory and practice

Objectives (Max 100 words):

Description of the learning objectives

The aim is the planning and implementation of geodesic domes made of slatted frames for the school yard. Mathematical basics should prove their practical use. In addition to the theoretical base, technical knowledge and manual skills as well as dealing with material, plants for greening and irrigation are necessary for the implementation.

Materials (Max 100 words):

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

Slatted frames, screws, nuts, washers, plants, soil, plant containers, irrigation system, ...

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

Mathematics teaches the basics of Platonic solids and geodesic domes. Frequency and strut lengths are considered and calculated.

In the craft and technology lessons, a model is created and the individual parts of the real size dome are made from slatted frames in various work steps. Division of labor and organization are tested.

In a third phase, the construction is set up. Group dynamic aspects as well as problem-oriented action are in the focus.

The theoretical considerations and plans are checked for their practical use.

In a final phase, the project is presented and reflected.

Implementation examples:

Toothpicks and chickpeas, or even better sour worms (sweets), can be used to create the model. They harden over time, so that a stable model can be created.

*** with IKEA Luröy slatted frames**

2v dome:

Required slatted frames:

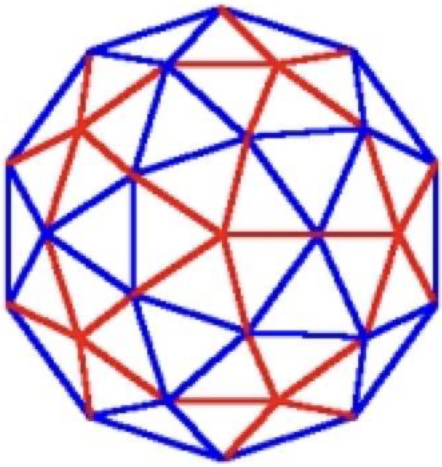
2 pieces Luröy 80cm

3 pieces Luröy 90cm

Required struts:

30pcs. 80cm -> red

35 pcs. 90 cm -> blue



The strut lengths are rounded.

The struts are screwed together with threaded screws / washers / nuts.

To do this, drill a 10mm hole at both ends of each strut, centered and offset 2.5cm inwards.

In order to have some space of movement during assembly, M6 threaded screws in the lengths of 60mm, 80mm, 100mm are used. Due to the great tension in the construction, it is not always possible for students to use the shortest possible screws. It is advisable to use long screws with a continuous thread and saw off the rest after completion. Only put on the nuts loosely during the construction phase and only tighten all of them at the very end, starting from below. In this way, the structure remains somewhat flexible during construction, by pushing and pulling.

The construction starts from the bottom, row by row up to the highest point.

Unmanageable struts can be pressed together using screw clamps.

3v 5/9 dome (Flatbase / Kruschke method)

Required slatted frames:

2 pieces Luröy 70cm

3 pieces Luröy 80cm

7 pieces Luröy 90cm

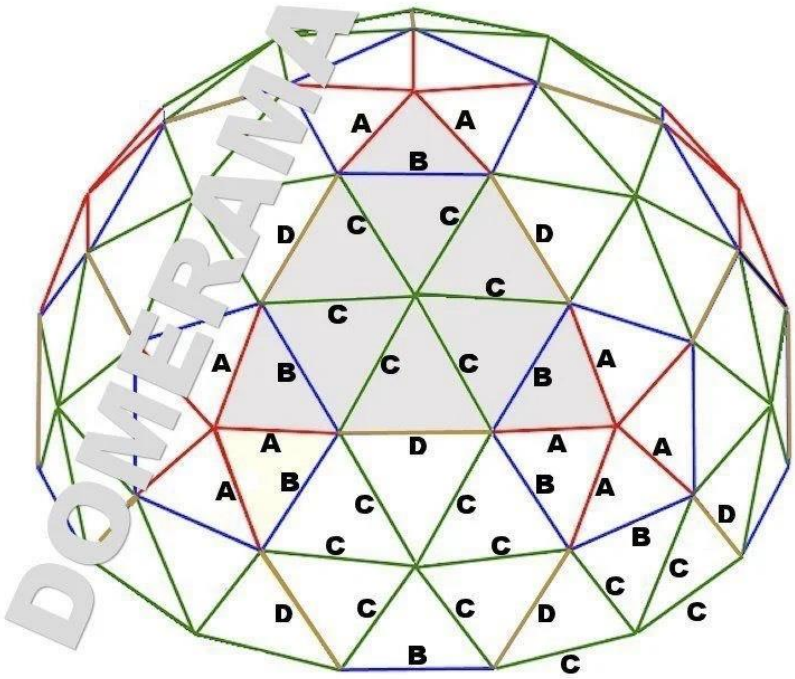
Required struts:

30 pieces "A" - 67cm

35 pieces "B" - 78cm

80 pieces "C" - 86cm

20 pieces "D" - 90cm



The strut lengths are rounded.

The struts are screwed together with threaded screws / washers / nuts.

To do this, drill a 10mm hole at both ends of each batten, centered and offset 2.5cm inwards

First, the slatted grates are dismantled and cut to the correct lengths. Then the 10mm holes are first marked, then drilled. An efficient division of labor is recommended so that all work steps can be carried out in parallel. (A group size of 10 people would be ideal.)

In order to have some space of movement during assembly, M6 threaded screws in lengths of 60mm, 80mm, 100mm are used. Due to the great tension in the construction, it is not always possible for students to use the shortest possible screws. It is advisable to use long screws with a continuous thread and saw off the rest after completion. Only put on the nuts loosely during the construction phase and only tighten all of them at the very end, starting from below. In this way, the structure remains somewhat flexible during construction, by pushing and pulling.

The assembly starts from the bottom, row by row up to the highest point.

Unmanageable slats can be pressed together using screw clamps.

*** with newspaper**

2V dome(see plan above)

30pcs. 62cm -> red

35 pcs. 70 cm -> blue

Material:

min. 130 double pages of newsprint (large format)

Round bars, 10mm

Round head clips,

tape

Perforator

Tape measure

Scissors

Construction:

1. Two pages of newspaper are rolled from the corner with the help of a round stick to stable sticks and fixed with adhesive tape. The wooden stick is pulled out and used again for the next stick of newspaper. 35 "blue" and 30 "red" sticks are required.

2. Cut the paper sticks to the correct length. 35 bars each 70 cm, 30 bars each 62 cm. To get the sticks stable, cut off both ends. If you have smaller newspapers you can cut the struts in the ratio 1: 0.88 to adjust the dimensions.

3. A hole is made in each end of the rod with an perforator. As centered as possible.

4. The assembly starts from the bottom and goes up row by row.

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References (if any):

Assessment (if any):