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

Title:

Create spatial figures with CAD Software

Short Description (Max 500 words):

Students should design their own fantasy object with cubes, blocks and wedges, where the wedges must be rotated at least 2 times or mirrored 2 times. Before they start, they have to sketch their idea on a sheet of paper. If they like they can build it later with building blocks.

Keywords (Up to 5):

CAD Software, creativity, geometry drawing, 3D coordinates, building blocks

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: 1-2 Duration per Lesson: 50 min

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: 3 Grade: 7

Topic: Using CAD Software, Spatial figures, geometry drawing

Objectives (Max 100 words):

Description of the learning objectives

Handling the CAD Software

Promotion of the spatial imagination

Creativity promotion

Perform displacements and rotations in three-dimensional space

Materials (Max 100 words):

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

CAD Software like MicroStation, FreeCAD, AutoCAD, SketchUp,...

We use the free program GAM

Paper, Pens

Building blocks (optional)

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

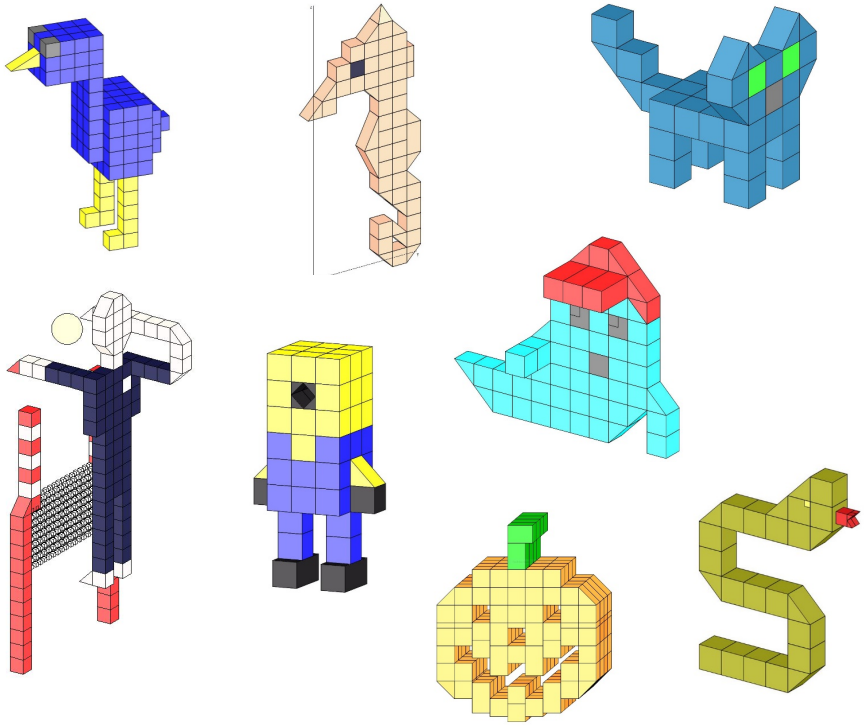
Prior knowledge: basis spatial objects (cube, cuboid, blocks, wedge,…)

3D coordinate system

Basis applications of CAD software

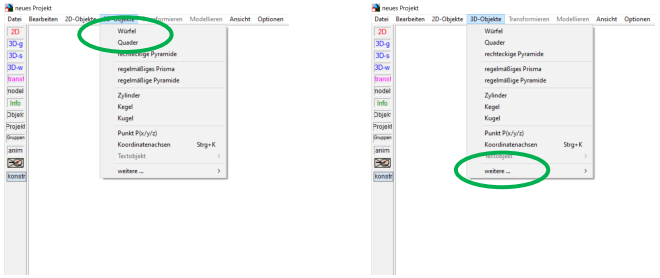
1st worksheet (Task)

Design your own object with cubes, blocks and wedges, where the wedges must be rotated at least 2 times or mirrored 2 times. Before you start sketch your idea on a sheet of paper. Here are some examples:

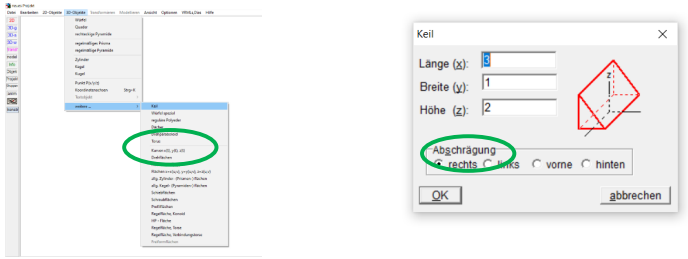


2nd worksheet (Manual of using GAM)

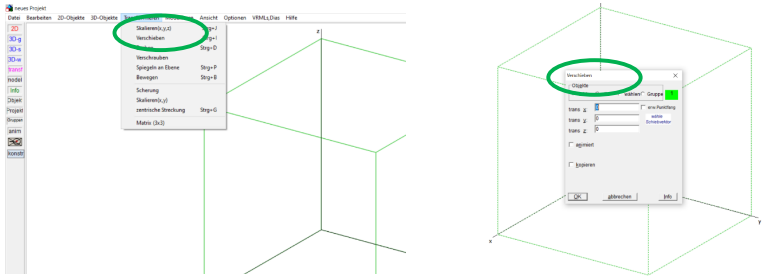
In order to train your spatial imagination, you will need a computer-assisted 3D software for this lesson. In this case it is the free program GAM.



For the task you need the 3D Objects command, because there you can find the terms cube, cuboid and wedge. There are several alignment options for the object wedge (cut infront, side,..)



After that, the figures must be moved, rotated or mirrored. For this, it is recommended to create a manual sketch before starting.



After that you just have to color the objects and create a jpeg data.

Task 2 (optional)

Build your figure with building blocks (like Lego)

Online activities

You can do the activity also in home schooling, if the kids have the software.

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References (if any):

Assessment (if any):

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