Co-funded by the
Erasmus+ Programme
of the European Union

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

Title:

Optical illusions

Short Description (Max 500 words):

- Get to know different optical illusions an their biological and psychological background
- Design optical illusions with students
- Recognize top view and bottom view of figures (till pictures)

Keywords (Up to 5):

Optical illusions, geometry, top view, bottom view

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: 3 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 or 4 Grade: 7 or 8

Topic: Get to know an draw optical illusions

Objectives (Max 100 words):

Description of the learning objectives

The students can...

... recognize optical illusions.

... construct/draw optical illusions.

... switch from top to bottom view and vice versa.

Materials (Max 100 words):

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

Pencil, paper, ruler

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:

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect 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.

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

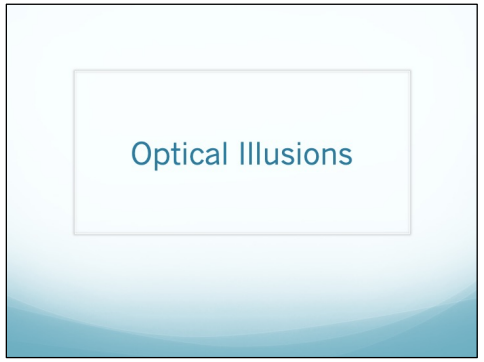
Short Description

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



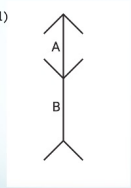
GOSTEAM Hands-on Activity Template

- Our senses are deceived
- "our perception and not our thinking is affected by the deception" (Deception does not disappear even if we realize our impression is wrong)

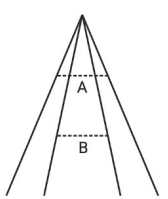
Optical Illusions 2

Which line is longer?

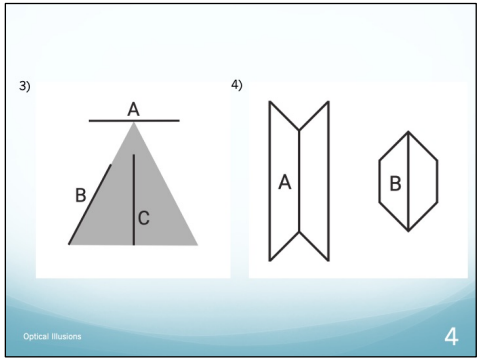
1)

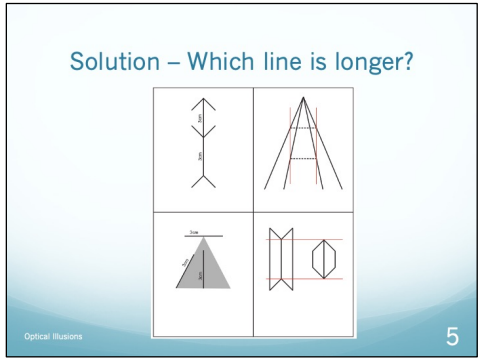


2)



Optical Illusions 3



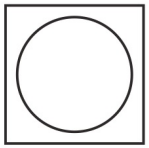


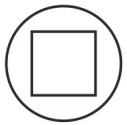
The solution is that all lines in the corresponding figures have the same length. If you don't believe it, the best thing to do is to measure with a ruler.
The illusion of the different lengths arises in many people because our brain puts the depicted lines in relation to the surrounding lines and figures.

Which of the two middle circles is larger?

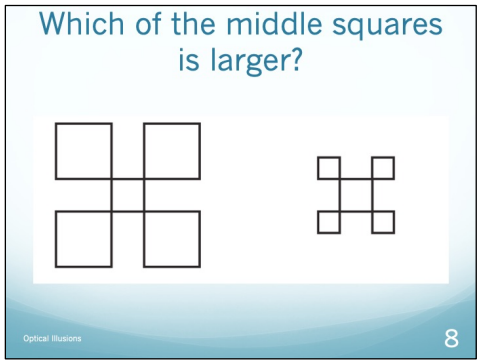
Optical Illusions 6

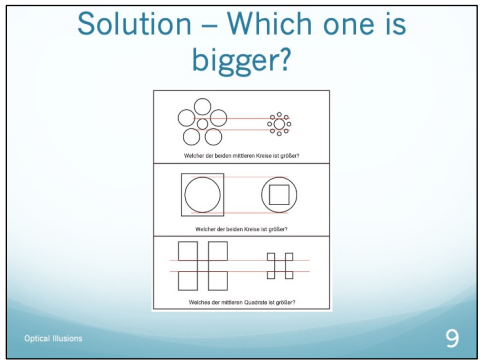
Which of the two circles is bigger?





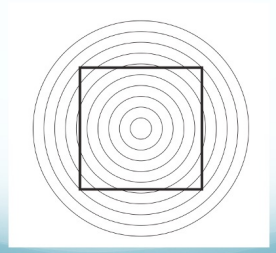
Optical Illusions 7





The solution is: All figures are the same size.
The illusion of different sizes arises in many people because our brain puts the figures depicted in relation to the surrounding figures. Thus, a circle appears larger when small circles surround it. And it appears smaller when large circles surround it.

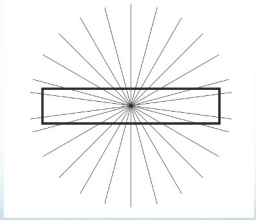
Lines appear to be curved



Optical Illusions

10

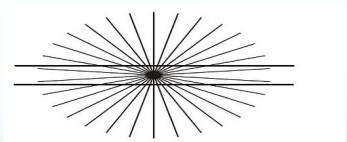
Lines appear to be curved



Optical Illusions

11

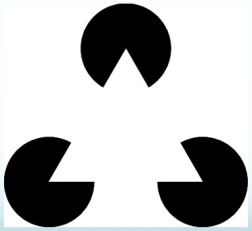
Lines appear to be curved – or are they parallel after all?



Solution – Why do the lines appear to be curved?

Diese Täuschungen ergeben sich, da sich unsere Wahrnehmung nach rechten Winkeln sehnt und sie daher die Linien entsprechend kippt.

Amodal Figures



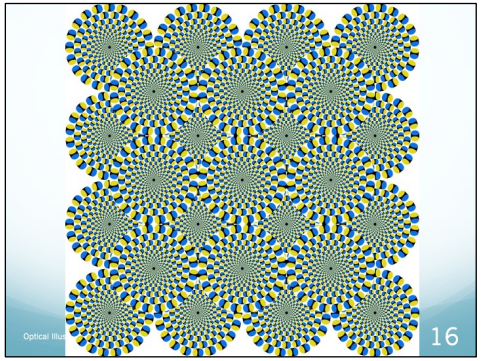
Optical Illusions 14

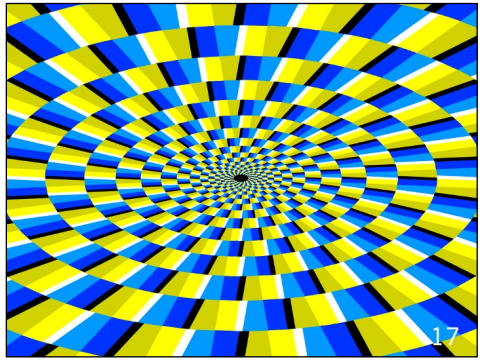
Our brain tries to interpret something into existing shapes to make it easier for us to perceive the world. In doing so, the brain measures what it perceives against what it already knows. To get as close as possible to what it knows, the brain sometimes even simply adds what is missing. The amazing thing about this figure is that there is no white triangle at all. There are only three circles, each with one corner missing.

Motion Perception

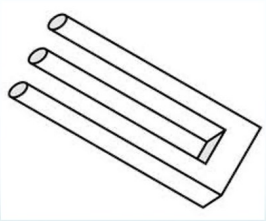
Motion perception results solely from the movement of the image on the retina.

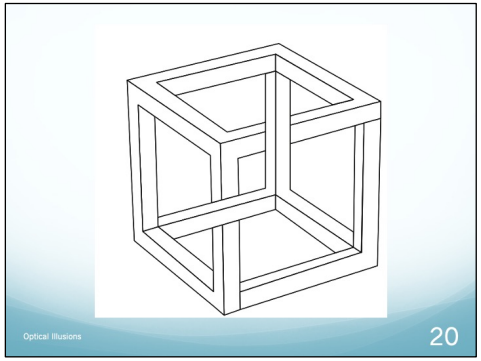
Optical Illusions 15

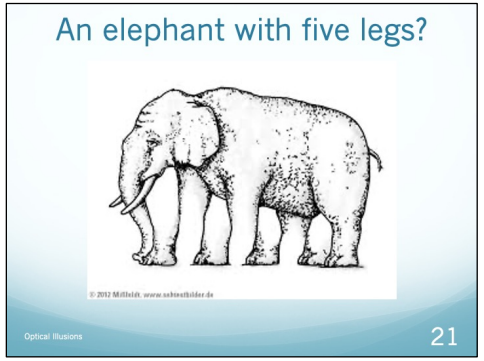

16


17

Impossible Figures



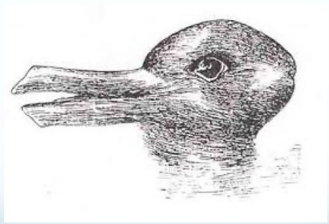




The elephant with the - how many? - legs is a popular example of optical illusion. In such cases, the information processing in our visual center is overzealous at work - and creates something that is not actually there. Like the elephant's seemingly too many legs. A phenomenon that has more to do with our brain - because it simply adds a leg here.

Reversible Figures

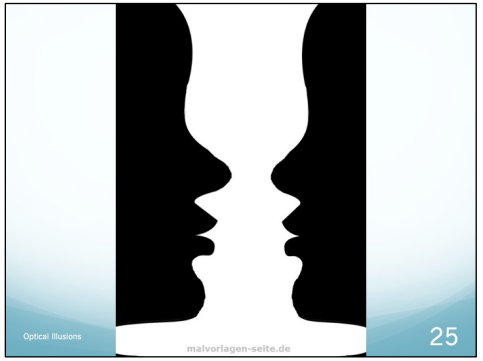
Optical Illusions 22

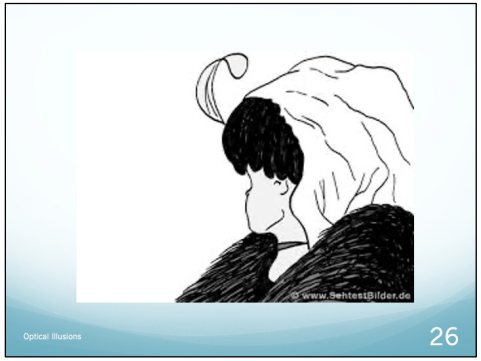


Optical Illusions 23

Duck or rabbit?

Indian or Eskimo?



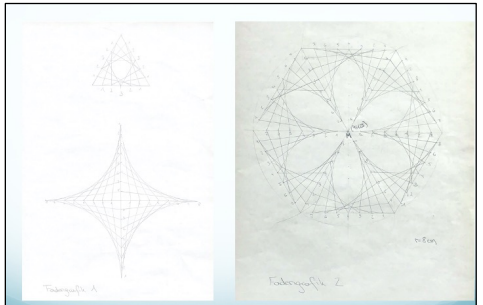


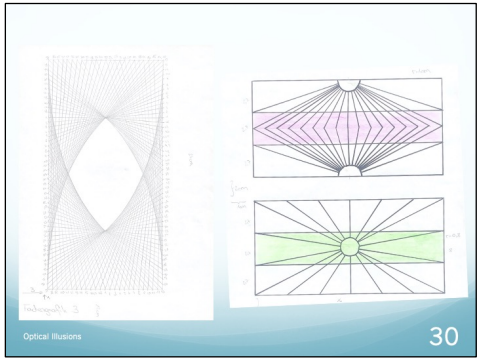
Old or young woman?

Explanation – Reversible Figures

Two completely different motifs are hidden in ambiguous drawings like these, and at first glance you usually only recognize one of them. Once you have grasped both, your brain can switch back and forth between the images. However, it is often quite tricky to change one's focus in such a way as to find both motifs in a tilted image - because every brain has certain preferences based on accumulated experience.

We draw optical illusions ourselves

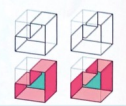




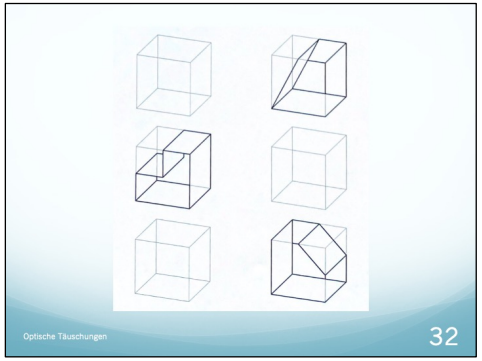
Optical Illusions 30

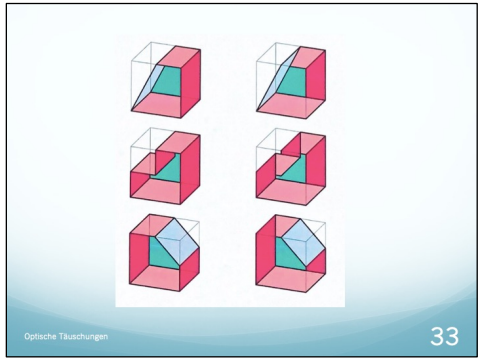
Extending knowledge

- You need to draw a bottom view (view from the front bottom left) to a top view (view from the front top right) and vice versa.
- Edit the wireframe models by tracing all visible edges thickly!
- For better visualization you can also use colours (see sample on the right).



Optische Täuschungen 31





solution

Online activities

With the help of the power point presentation you can do the activity also in home schooling.

Sustainable contact:

Mag. Nicole Riegler nicole.riegler@bildung.gv.at

Mag. Nicole Maurovich nicole.maurovich@bildung.gv.at

References (if any):

Assessment (if any):