

Geometry Cartoon figure with Tilt Brush – VEGA Teaching Scenario

Topic: Students create a cartoon figure with at least 5 shapes and measure the area, volume and surface area of each space of the figure.

Subject(s): Geometry, creation and art

Age / Grade: 14+ / grade 9+

Introduction to the scenario

In this geometry assignment students work with volume, area, surface area, 3D shapes, drawing and design. Students get to know and learn to use the mathematical formulas of geometry, draw pictures in three dimensions, use VR glasses, design a sculpture of a cartoon figure and present an assignment to other students in their class.

This assignment is easy to adjust to all students with simpler or more difficult examples. It's also easy to change the requirements of design and type of the cartoon figure.

Short description of the VR game in this scenario:

- Tetris is an old computer game where students arrange shapes into lines and blow them up. The game continues, the lines of blocks that are not completely filled will not blow up but the blocks will keep coming down and it will be more difficult for the player to arrange blocks into lines. The game has levels of difficulty which rises as the game is being played. In this game the goal is to learn the name of the shapes, perceive and evaluate distances. [Tetris info](#)
- Cubism is a puzzle game where students assemble increasingly complex shapes out of colored blocks. This game trains students in reasoning and spatial intelligence. [Cubism info](#)
- Tilt Brush is a toolkit that allows you to draw and create anything you want in a 3D space with virtual reality. [Tilt Brush info](#)

Learning outcomes:

A student is able to

- Find the volume of three-dimensional forms prisms and cylinders
- Find the surface area of three-dimensional forms (squares, prisms and cylinders)
- Measure and calculate the area of common geometrical forms
- Draw three-dimensional forms, both on paper and in computer
- Create an actual replica of a figure based on a three-dimensional drawing
- present an assignment to fellow students and their teacher.

A selection of learning outcomes from the Icelandic Curriculum

- Work independently according to plan and working drawing
- Design a project based on material, aesthetics, technique and surroundings
- Draw an explanatory diagram and work with the drawings of others based on a presented criteria, explore, describe and evaluate the connection between an object and its drawing
- Used computers for drawing, exploring and arguing on geometrical drawings
- Use the basic concepts of the geometry, including concepts of scale and theoretical properties of two- and three dimensional shapes
- Cooperate with others towards solution of mathematical problems
- Use the concepts and the code language of math to put forward, symbolize and solve every day and theoretical problems, discuss solutions and use various mathematical aids, including IT
- Set up, interpret and critique a mathematical model of real-life situation like drawings, graphs, equations and functions

Formative assessment

Number of students: Duration (estimated time/number of lessons):

- 20 students. (3-4 students in group)
- 7 lessons 60 min each

Prerequisites (necessary materials and online resources):

- VR glasses with the game Tilt Brush, Tetris and Cubism
- Check that the Internet is working
- Formula sheet
- Information about the topic to mediate to the students (videos, books, pictures, etc.)

Before the program begins (preparatory work for teacher):

- Search and collect information and material about the topic
- Prepare and collect all things needed for the scenario
- Get familiar with the game
- Check in the VR - is the game there
- Create a task in Google classroom with project description
- Divide students into groups

The main part of the scenario (number of lessons):

Part one (two lessons 2x60min)

Lesson 1 & 2

- Teacher explain the assignment to the students [Students information](#)
- Students get formula sheet with the main formulas of geometry [suggestion of formula sheet](#)
- Admission from a teacher on how to calculate the volume and area of three-dimensional shapes
- Students work together in 3-4 students groups. Calculate geometry assignment from teachers about volume and area of three- dimensional shapes.

Debrief with students after the first two lessons.

- How is the assignment and cooperation going?
- Does everyone understand the assignment and know what to do?
- Are there things students don't understand?
- Is there something students want the teacher to begin to explain in the next lesson?

Part two (Two lessons 2x60min)

Lessons 3 & 4

If a teacher has received suggestions from students in lesson two, he begins lesson three talking about these suggestions.

After the suggestions students continue to work in groups and discuss and decide what cartoon figure they are going to make.

- Decide which cartoon figure to design
- Decide the size of the cartoon figure
- Decide what 3D form they will use
- Decide how to implement the figure

3D drawing

- Exercise drawing - students find a simple 3D drawing on youtube and draw it
- Students draw a three-dimensional image of the cartoon figure on paper and assume size ratios.
- Students go to cubism & tetris in the VR glasses to learn how the glasses and controllers work before they draw their cartoon figure in Tilt brush.
- Students draw their cartoon figure in Tilt brush and download it. Students can create an environment for the figure if they want.

Debrief with students after lesson three and four.

- How is the assignment going?
- Do you have enough time to work on the project in each lesson?
- Is there something students want the teacher to begin to explain in the next lesson?

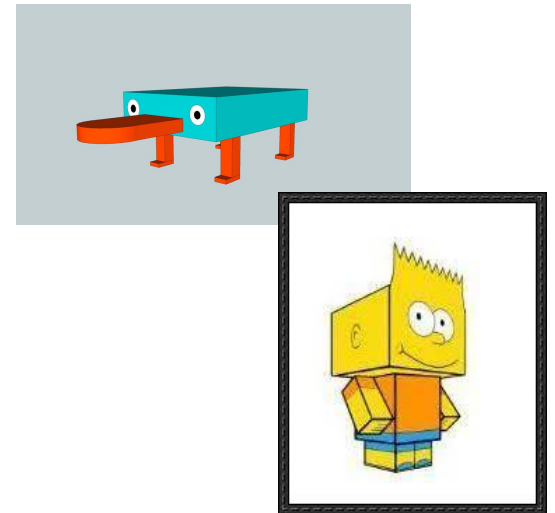
Part three (two lessons 2x60min)

Teacher preparation:

- Have cardboard, glue, ruler, etc. craft supplies ready for students to create the cartoon figure.

Lesson 5 & 6

Students create a sculpture of their cartoon figure with all the measurements they decide to use in the 3D drawing they made in Tilt brush. They can choose whether the cartoon figure is made of cardboard, wood or something else. Students can bring items from home to use in the creation. Students also prepare a presentation of the assignment. Students are free to choose how they present their assignment (e.g. video, poster, slide presentation).



The presentation must state:

- The name of all three- dimensional shapes students use create the cartoon figure
- Students have to explain with words how they found the volume and surface area of the cartoon figure.
- Introduction to the cartoon figure. (name, age, home, history)

Part four (one lesson 1 x 60 min)**Teacher preparation:**

- Have access to network, computer, ipad, projector if students need it for their presentation
- Be prepared with a tick list to evaluate students' assignments.
- prepare an evaluation survey for the students in google forms.

Lesson 7

- Students introduce their cartoon figure to fellow students.
- Students evaluate the assignment and their work.

Teacher evaluate

- Students work and participation during the assignment
- Cartoon figure
- Sheet or poster with calculations of the total volume and surface area of the cartoon figure
- 3D drawing in tilt brush
- students presentation

Students evaluate - self - assessment

Evaluate your own work by putting an X in the appropriate frame

Name: _____

Respect	I listened to others and respected the arguments of others	I usually listen to others and tried to be considerate of others	I sometimes listened to others and think I have be considerate of others	I had a hard time listening to others. I was not very considerate of others
Interest	I was very interested in the project	I was interested in most things	I was interested in some things	I was not interested in the project
Work rate	I worked really well all the time	I worked well most of the time	I worked well when we finally started	I could have used my time better
Cooperation	I worked well with everyone in the group	I worked well with most of the group	I worked well with some in the group	I could have worked better with the group
Role	I had good ideas and I was listened to	I had ideas and most often I was listened to	I had few ideas and sometimes was listened to	I had no ideas

[Students self assessment](#)

Students evaluate - peer assessment

Put the name of your group members in the appropriate boxes.

	Always	Most often	sometimes	Never
Brought ideas in the project				
Was polite and considerate of others.				
Showed good cooperation				
Worked well/ took full part in the project and showed diligence				

Assessment prepared by: _____

[Students peer assessment](#)

Presentation - Evolution

Group:

	Outstanding	Very Good	Good	Need practice	Significantly deficient
Content of the presentation	The main points are highlighted. Calculation of a cartoon figure is very good. Very interesting presentation.	The main points are stated. Calculation of a cartoon figure is good. Good presentation.	The main points are stated. Calculation of a cartoon figure is deficient. Pretty good presentation	Not a good enough understanding of the main points. Calculation of a cartoon figure is very deficient. Fair presentation.	Difficult to identify the main points. No calculation of a cartoon figure. Presentation significantly deficient.
Preparation of presentation	Students are well prepared and very organized. All data available.	Students are prepared and organized. All data available. .	Students are quite well prepared and quite well organized	Students are not well prepared. The project is not organized.	Students are not prepared.
Appearance	Students are very confident and stand straight. Voices reach the audience very well. Very good usage.	Students are confident. Voices reach the audience well. Good usage and posture.	Students are quite confident. Voices reach the audience quite well. Body position is quite good.	Students are insecure. Voices reach the audience badly. Students need to improve posture.	Students are very insecure. Voices do not reach the audience. Students need to improve posture.
Introduction	Students present their project very well	Students present their project well	Students present their project quite well.	Students present their project badly.	Students present their project very badly

[Presentation assessment for teacher](#)

Teacher evaluate - each student

Name: _____

	Outstanding	Very Good	Good	Need practice	Significantly deficient
Responsibility and interest	Takes full responsibility of the subject and shows a lot of interest.	Takes responsibility for the subject and shows interest.	Takes some responsibility for the subject and shows interest.	Takes a little responsibility for the subject and shows a bit of interest.	Takes no responsibility for the subject and shows no interest.
Work rate	Activity in class exemplary	Activity in class was good.	Activity in class was quite good	Activity in class was not good enough.	No activity in class
Behavior	The student was always polite and considerate. Exemplary behavior.	Student was polite and considerate. Good behavior	Student was quite polite and considerate. Behavior was quite good.	Was quite rude and did not show other students considerate. Behavior was not good enough	Was rude and did not show other students considerate. Behavior was bad.
Knowledge and understanding	Very good knowledge and understanding of the subject.	Good knowledge and understanding of the project	Quite good knowledge and understanding of the project	Little knowledge and understanding of the project	Very little knowledge and understanding of the project
Documentation	Has searched for a variety of sources. Sources are reliable.	Has searched for good sources and relevant information.	Has searched for several sources and little information.	Has looking for little information and is having a hard time finding sources and processing them.	Has made little effort to search for sources and it's very difficult to obtain and process sources.
Organization and finishing	The content is well organized and the finishing is very good.	The content is organized and finishing is good	The content is organized and finished quite well.	The content is not well organized and the finishing is not good.	Layout and finishing are bad.
Self - assessment	Very good work put into self - assessment	Good work put into self - assessment	Quite good work put into self - assessment	Small work put into self - assessment	None work put into self - assessment

[Teacher evaluate](#)