LESSON SCENARIO 01: GRAPH IN MATH

Topic: Graph in maths

Level: Age 14 -15

Foreknowledge: knowledge of eu countries

Correlation: geography, social sciences and economics

LEARNING OUTCOMES

- Know the vocabulary related to graphs
- Model a map
- Solve a graph

TEACHING METHODS

- VR technology
- Individual work and pair work

KEY WORDS

- Graph
- Edge
- Verice
- EU

RESOURCES

- VR headsets

ACTIVITIES

RULES OF CONDUCT WHEN USING VR IN THE CLASSROOM (5 min)

The teacher starts discussion with the students asking them about the use of VR and their expectations in using VR in classroom.

After the discussion the teacher defines the work methods and rules of conduct for students regarding safety precautions for using VR headsets in the classroom and learning in virtual environment:

- listen to the teacher carefully
- remove physical obstacles before using VR
- always work in pair - never alone
- keep the device clean.

INTRODUCTION TO CONCEPT OF GRAPHS (10 min)

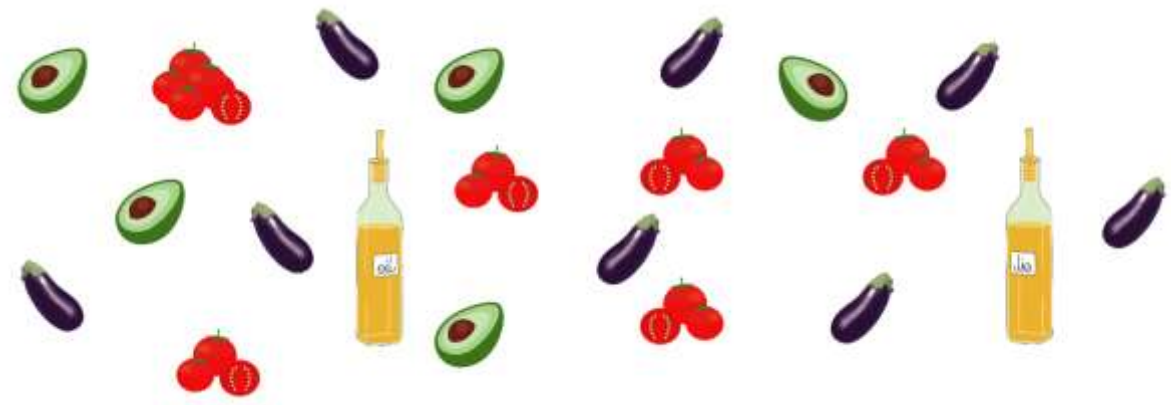
The teacher explains the definition of a graph and its vocabulary.

Question 1: What is a graph?

Example of definition: In math, a graph can be defined as a pictorial representation or a diagram that represents or values in an organized manner.

Short introduction example

Here, for instance, we can represent the data given below, the type and number of ingredients used by chef in a restaurant, on a graph. We begin by counting each ingredient and representing the data in particular colours in a systematic order in a table.



Avocado	Tomato	Eggplant	Oil
			

Type of ingridient	Number of ingridient
	
	
	
	

Question 2: Why do we need graphs? Could you give any examples from real life?

A discussion can follow on concrete cases of the use of graphs in daily life.

Computer, Family tree, metro map....

There are currently several types of applications, but the main one can be found in computer science. Graphs are a mathematical structure that is particularly well suited to computers: they serve as a data structure, i.e. they make it possible to

organize sets of objects (names, numbers, sequences of operations, etc.) in a way that is simple and practical to use.

Introduction to VR exercise:

In 1852, Francis Guthrie, an English cartographer, discovered that it only took four colours to colour the map of the cantons of England so that two neighbouring cantons would not be the same colour.

After many episodes, and more than 120 years later, two American mathematicians provided a mathematical proof thanks to the demonstration of the *4-colour theorem* which states that "whatever the complexity of a geographical map, four colours are sufficient to colour it without two border regions being the same colour".
For the first time, a computer was used to complete a demonstration.

To check if that demonstration is really true your task will be to colour the map of Europe, from 4 different colours.

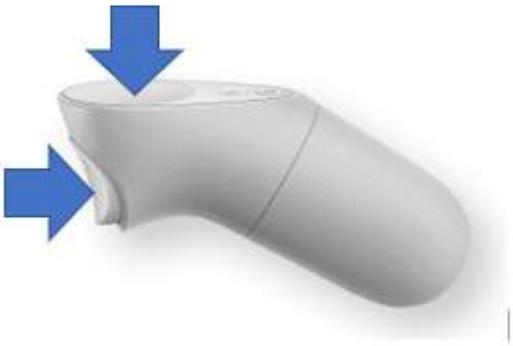
Remember: Bordering territories must not be the same colour.

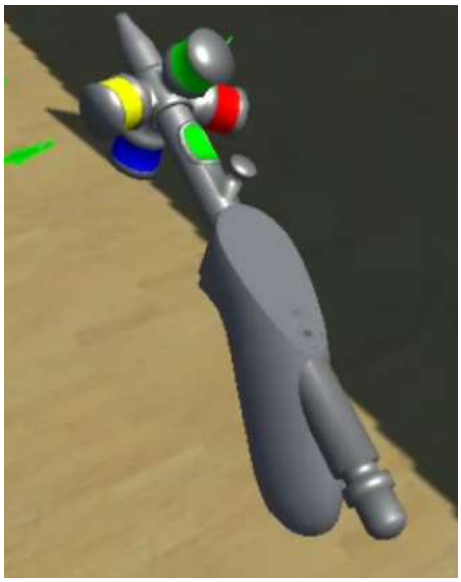
ACTIVITY:

- **the teacher divides the students into pairs - in each pair there is a student A and a student B; student A has a VR headset, and student B assists him.**
- **student A carefully puts on his VR headset and starts the task in the VR application**
- **student A finds and selects the 4 colour theorem exercise on the exercise shelf**
- **after completing the task, students A and B change roles**

VR ACTIVITY

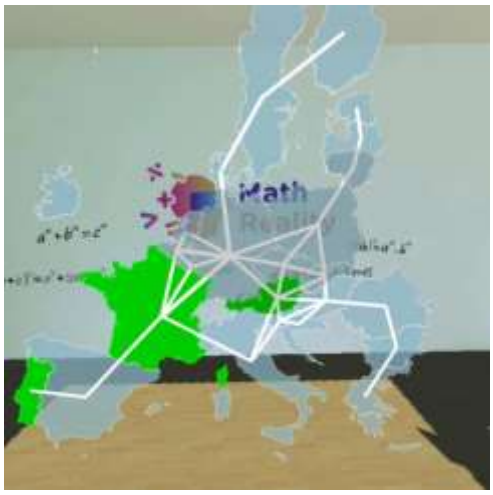
15 min: VR Task





In this exercise you will operate a spray gun. By pointing on the map and clicking the bottom buttons student can colour the country. To switch colour student needs to make circle move with the finger on top of the controller.

STEP 1: Task for student A (with the headset): Choose 1st colour and paint countries on the map. When you are finished switch with your colleague.



STEP 2: Task for student B (with the headset): Choose 2nd colour and paint countries on the map. After switch with your colleague.

STEP 3: Task for student A (with the headset): Choose 3rd colour and paint countries on the map. When you are finished switch with your colleague.

STEP 4: Task for student B (with the headset): Choose 4th colour and paint countries on the map. When you are finished switch with your colleague.

EVALUATION

1. I like the way of work in this lesson.	1	2	3	4	5
2. This lesson was interesting.	1	2	3	4	5
3. It is clear what I was supposed to learn in this lesson.	1	2	3	4	5
4. The subject matter was clearly explained.	1	2	3	4	5
5. I have learned the subject matter.	1	2	3	4	5
6. I think I actively participated in this lesson.	1	2	3	4	5
7. I was more active in this lesson than usually.	1	2	3	4	5
8. By being active I contributed to the quality of the lesson.	1	2	3	4	5
9. I was motivated for work in this lesson.	1	2	3	4	5
10. I prefer using VR in lessons.	1	2	3	4	5
11. Name two things you liked in this lesson.					
12. Name two things you didn`t like in this lesson.					

INCLUSIVENESS GUIDELINES

Every student is different and their needs for the material might vary. Below you will find several tips that could make mathematics lesson more inclusive for students who struggle with learning disorders.

- **When giving assignments to classroom try to break them into small pieces of information. Avoid the double tasks in the instructions. Remember that in case of operations/exercises with multiple steps, it is critical to help learners decompose the steps.**
- **You can use checklists for your students to make sure they have done all the steps**
- **Make sure the font, line spacing, and alignment of your document is accessible for students with learning disorders. It is recommended to use a plain, evenly spaced sans serif font such as Arial and Comic Sans. Others: Verdana, Tahoma, Century Gothic and Trebuchet. Spacing should be 1.5 and try to avoid justification in the text.**
- **At the end of each activity, take some time to ask the students what they have learnt to acknowledge every step in their learning process**
- **Make sure that the material the students manipulate is easy enough to grasp**
- **While using different media (paper, computer and visual aids) choose different background than white which can be too bright for students with learning disorders. The best choice would be cream or soft pastel but try to test different colours to learn more about student's preference.**
- **To stimulate short and long-term memory prepare for all the students in the classroom an outline describing what they are going to learn on this lesson and finish it with a resume of what has been taught. In this way they will strengthen the ability to remember information.**

EXAMPLE:

1. Start every lesson with a short "CHECK-IN"

- **Today, we will study the topic (name of the topic)**
- **I will tell you about: (name 3 keywords connected with the topic)**
- **Then I will present exercises: (name the exercises form the student book)**
- **Then we will do exercises (explain the way student will be working: ex. together with teacher / in pairs /individually)**
- **Once the exercises will be done [To continue]**

2. Then finish lesson with a short "CHECK-OUT"

- **During the lesson we learn about (topic of the lesson)**
- **The most important things were: (name 3 keywords connected with the topic)**

- **We were able to do… (tell about the work student done during the lesson)**
- **We will explore the topic next time when we will learn about (name the following topic)**

It is a small adjustment that will take 5 min from the lesson but can make a great difference in the way that the material will be remembered. Try to create this as a routine habit.