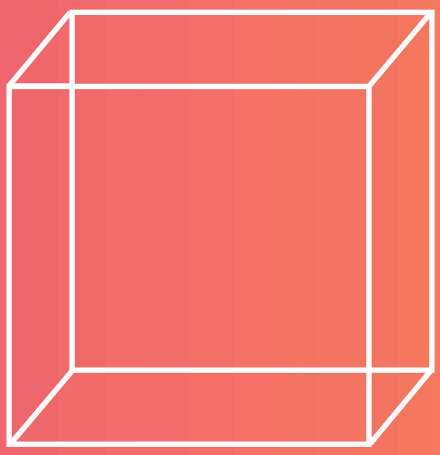
LESSON SCENARIO 05: EXPLORING VOLUME



Topic: Volume

Level: Age 14 -15

Foreknowledge: Measure unit for distance, squaring and cubing

Correlation: Physics, Geography, Architecture, Construction

Time: 45 minutes

LEARNING OUTCOMES

- Find out cube volume formula
- Discover relations between measure units for volume
- Convert measure units for volume Determine the prime numbers up to 150

TEACHING METHODS

- VR technology
- Individual work and pair work

KEY WORDS

- Volume
- Cube, cuboid
- Measure units

RESOURCES

- VR headsets

ACTIVITIES

INTRODUCTION: 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 VOLUME (35 MIN)

ACTIVITY 1:

- **the teacher divides the students into pairs - in each pair there is a student A and a student B; student A has a VR headsed, 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 Exploring volume exercise on the exercise shelf**
- **after completing the task, students A and B change roles**

WORKSHEET FOR STUDENTS

Task for student A:

Arrange the cubiod with the lenghts default in the table and read the amount of the volume of that cubiod. Student B (who does not have VR headset on) reads the cubiod lengths from the following table and writes down the result of student A.

	CUBIOD LENGHT (a)	CUBOID WIDHT (b)	CUBIOD HIGHT (c)	V
1. OPTION	$1cm$	$3cm$	$8cm$	
2. OPTION	$2cm$	$3cm$	$4cm$	
3. OPTION	$4cm$	$2cm$	$3cm$	

Student B (without VR headset) writes the result in the table. Students compare the results obtained and conclude that the volume of a cuboid is equal to the product of the lengths of its sides.

After that task, the students switch places.

Student B who now has VR headset solves the task in the following table:

	CUBIOD LENGHT (a)	CUBOID WIDHT (b)	CUBIOD HIGHT (c)	V
1. OPTION	$1cm$	$5cm$	$6cm$	
2. OPTION	$2cm$	$3cm$	$5cm$	
3. OPTION	$3cm$	$10cm$	$1cm$	

After the completion of the task by students, students discuss the next question:

Does the shape of the cuboid affect the volume?

ANSWERS:

Shape of cuboid does not affect the volume.

	CUBIOD LENGHT (a)	CUBOID WIDHT (b)	CUBIOD HIGHT (c)	$V = a \cdot b \cdot c$
1. OPTION	$1cm$	$3cm$	$8cm$	$24cm^3$
2. OPTION	$2cm$	$3cm$	$4cm$	$24cm^3$
3. OPTION	$4cm$	$2cm$	$3cm$	$24cm^3$

	CUBIOD LENGHT (a)	CUBOID WIDHT (b)	CUBIOD HIGHT (c)	$V = a \cdot b \cdot c$
1. OPTION	$1cm$	$5cm$	$6cm$	$30cm^3$
2. OPTION	$2cm$	$3cm$	$5cm$	$30cm^3$
3. OPTION	$3cm$	$10cm$	$1cm$	$30cm^3$

Students write the definition that the teacher wrote on the board.

Volume is the size of space occupied by the body.

$$V = a \cdot b \cdot c$$

A new task follows. Student A takes the VR headset again, and student B assists him.

TASK:

Solve the task given in the VR exercise:

How many $1cm^3$ volume cubes could fill the $1dm^3$ volume cube?

After the exercise, the students change places.

Students conclude that in $1dm^3$ volume cube there is 1000 $1cm^3$ volume cubes.

After the correct answer is marked, the students come to the square and the exercise is over.

The students turn off the VR headset, wipe them according to the teacher's instructions and put them in a box.

Teacher writes down their conclusion:

$$1dm^3 = 1000cm^3$$

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.