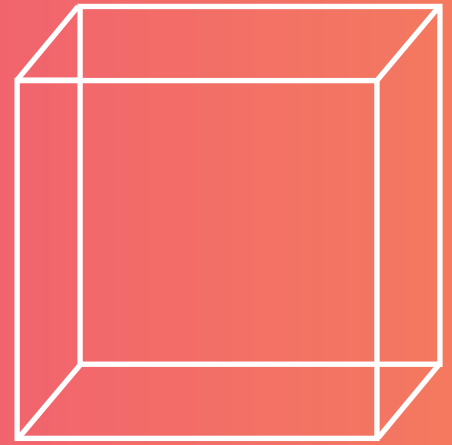# LESSON SCENARIO 05: EXPLORING VOLUME

Topic: Volume

Level: Age 14 -15

Foreknowledge: Measure unit for distance, squaring and cubing

Correlation: Physics, Geography, Architecture, Construction

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

- **Practical work**
- **Hands-on activity**
- **Group work**

KEY WORDS

- **Volume**
- **Cube**
- **Measure units**

RESOURCES

- **1cm**
- **3 volume cubes**
- **A ruler**
- **Millimetre paper**
- **Scissors**

ACTIVITIES

INTRODUCTION TO VOLUME (15 min)

EXERCISE 1:

Teacher divides students into groups of 4. Each group gets a set of 24 cubes and a worksheet defined below. They arrange cubes and make cuboids.

<u>Worksheet for students:</u>

You have got a set of 24 cubes.

Arrange cubes and make a cuboid.
Complete a worksheet, count cubes in all cuboids you can make.

	CUBOID LENGHT (a)	CUBOID WIDHT (b)	CUBOID HEIGHT (c)	V=a·b·c
1. OPTION				
2. OPTION				
3. OPTION				
4. OPTION				
5. OPTION				

After the completion of the task by students, teacher and students discuss the results of all groups and then discuss the next question:

Does the shape of the cuboid affect the volume?

ANSWERS:

	CUBOID LENGHT (a)	CUBOID WIDHT (b)	CUBOID HEIGHT (c)	V=a·b·c
1. OPTION	1	1	24	24
2. OPTION	1	2	12	24
3. OPTION	1	3	8	24
4. OPTION	1	4	6	24
5. OPTION	2	2	6	24
6. OPTION	2	3	4	24

Shape of cuboid does not affect the volume.

Students remember the definition of volume and the cuboid volume formula. The teacher writes it on the board.

Volume is the size of space occupied by the body.

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

*If students of one group finish earlier, they can do the same task using

36 cubes

48 cubes

32 cubes

THE MAIN PART (25 minutes)

EXERCISE 2:

Students continue working in the same groups. The teacher gives the necessary resources to each group
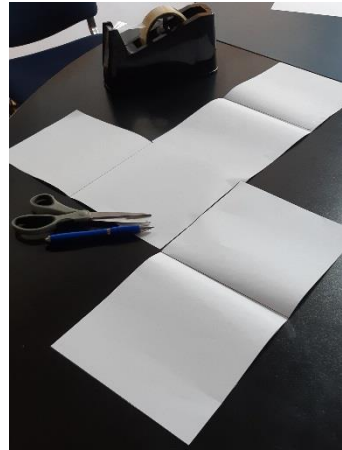
- a ruler

- millimetre paper

- scissors

The teacher gives instructions on what to do:

TASK I:
Make a cube net that has volume of 1dm³ using millimetre paper.

TASK 2:
Make a cube using the cube net from task 1.

TASK 3:
Determine the volume of one cube (that you use in exercise 1) using a ruler.

TASK 4:
Arrange small cubes into big cube andexplore how many 1cm³ volume cubes (that you used in exercise 1) could fill the 1dm³ volume cube you made at task 2.

Students conclude that 1n 1dm³ volume cube there is 1000 1cm3 volume cubes.

Teacher writes down their conclusion:

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

Teacher gives another task to students:

TASK 5:

How many 1 cm³ volume cubes we need to fill a 8 dm³ volume cube.

ANSWER: 8 dm³ = 8000 cm³

TASK 6:

How many 1 cm³ volume cubes do we need to fill a 1 m³ volume cube?

ANSWER: 1 m³ = 1000000 cm³

Students solve the tasks and discuss the results with the teacher.

EVALUATION

FINAL PART (5 minutes)

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1. Convertmeasureunits:

$7\ m^3 =$	cm^3
$200\ dm^3 =$	m^3
$0.45\ cm^3 =$	mm^3
$2\ dm^3 =$	cm^3

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2. Calculate a volume of the cube if the length of the edgeof the cube is $6cm$.

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3. How many cubes with $2cm$ lenght of the edge do we need to fill the box which is $6dm$ long, $5dm$ high and $4dm$ wide?

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4. Can we put 2 liters of water in a $1000\ cm^3$ volume container?

   YES   NO

ANSWERS:

1.

$7\ m^3 =$	$7000000\ cm^3$
$200\ dm^3 =$	$0.2\ m^3$
$0.45\ cm^3 =$	$450\ mm^3$
$2\ dm^3 =$	$2000\ cm^3$

2.

$$V = 6cm \cdot 6cm \cdot 6cm = 216\ cm^3$$

3.

$$V_{cube} = 2cm \cdot 2cm \cdot 2cm = 8\ cm^3$$

$$V_{box} = 6dm \cdot 5dm \cdot 4dm = 120\ dm^3 = 120\ 000\ cm^3$$

$$\frac{V_{box}}{V_{cube}} = \frac{120000cm^3}{8cm^3} = 15000$$

We can put 15000 cubes in the big box.

4.

$$2l = 2dm^3 = 2000cm^3$$

NO, we can´t put $2l$ of water in a $1000\ cm^3$ volume container.

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 from 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.