Progress Annals: Journal of Progressive Research
Volume 1, Issue 1, April, 2023
ISSN (E): 2810-6466
Website: https://academiaone.org/index.php/8

Methodology of Teaching the Topic of Cylinder, Its Surface and Volume Using Problem-Based Learning Technology

Ismoilov Elmurod Olloberdi o'g'li
Teacher of Tashkent State Pedagogical University named after Nizami
E-mail: elmurodismoilov170191@mail.ru

Annotation. The article describes how to teach the theme "Cylinder, its surface and volume" using problem educational technology. In addition, in the article provides a number of suggestions and methodical recommendations for teachers on how to use pedagogical technology.

Key words: cylinder, surface, volume, stereometry, circular body, pedagogical technology, method, problem education, modified lecture, independent learning

Studies show that the knowledge of the topic "Cylinder, its surface and volume" among vocational colleges and school graduates is very shallow. Some of the graduates do not even have an idea about this topic. On the one hand, this is due to the lack of interest of students in learning geometry, on the other hand, the inability of geometry teachers to adequately explain this topic using pedagogical technologies, and the fact that they are unable to explain the essence of the topic to students in a demonstrative manner by connecting it to life. From this point of view, it is necessary to fundamentally improve the quality of education based on the creation and implementation of the modern methodology of teaching subjects in general educational institutions.

The large production of cylinder-shaped equipment and products in the automotive industry, textile industry, shipbuilding, and in general production requires personnel working in these fields to have in-depth knowledge of calculating the cylinder, its surface and volume. For this reason and taking into account the fact that the teaching of the theme of the cylinder, its surface and volume is currently not carried out at the level of modern requirements, this article describes the methodology of teaching the theme of the cylinder, its surface and volume using problem-based educational technology.

When teaching the topic "Cylinder, its surface and volume" using the problem-based learning technology, the teacher should first set the students the problem of determining what geometric shape the objects in the picture below (Figure 1) belong to. For information, it should be said that such shapes are studied in the stereometry section of geometry:

ACADEMIA ONE
PEER REVIEWED JOURNALS
Progress Annals: Journal of Progressive Research
Volume 1, Issue 1, April, 2023
ISSN (E): 2810-6466
Website: https://academiaone.org/index.php/8

Figure 1. ***Daily objects.***

Students will look at pictures and look for information about what shapes are studied in the stereometry section of the geometry textbook. As a result of the search, they find information about the cylinder, and after reading the following definition of the cylinder, they say that all the objects in the given picture are in the shape of a cylinder:

The definition. A body formed by rotating a rectangle around one side is called a cylinder (more precisely, a right circular cylinder) (Figure 2).

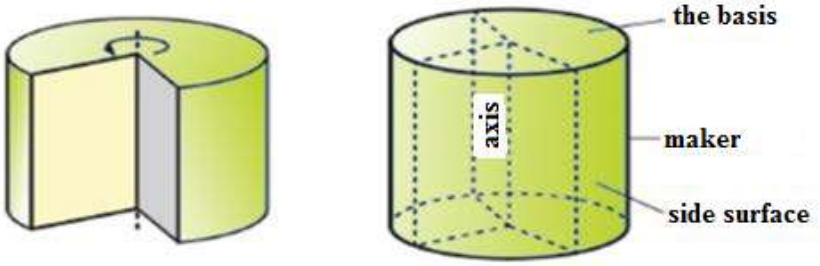

Figure 2. ***Cylinder.***

A cylinder is one of the rotating bodies. Rotational bodies are one of the important classes of spatial forms. A surface of revolution is created by rotating a curve or a straight line around a straight line. If it is cut by two parallel planes perpendicular to the straight line called the axis, a rotating surface and a rotating body bounded by a circle are formed.

As a result of the first problem, the teacher forms students' initial ideas about cylinders and rotating bodies, and students learn the definition of a cylinder. After that, the teacher should convey the information about the cylinder, its surface and volume to the students using the modified lecture method. Taking into account that the use of the demonstration method is highly effective, it is necessary to show the pictures (Figure 3) related to the surface and volume of the cylinder to the students.

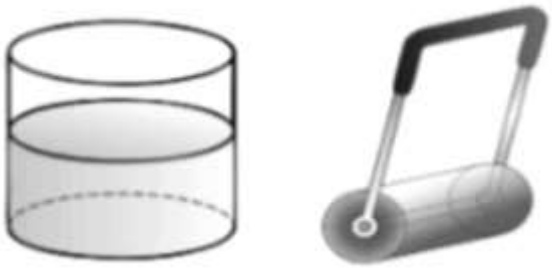

Figure 3. ***Equipment on the volume and surface of the cylinder.***

The use of visualization method will help students to distinguish cylinder-shaped objects and they will realize that there are many such objects in life. After that, they learn the following information about the calculation of the surface and volume of a cylinder:

Progress Annals: Journal of Progressive Research
Volume 1, Issue 1, April, 2023
ISSN (E): 2810-6466
Website: https://academiaone.org/index.php/8

Theorem. The side surface of the cylinder is equal to the product of the product of the circumference of the base and the length of the circumference: $S_{side} = 2\pi rl$.

The result. The total surface area of a cylinder is equal to the sum of its side surface and the surface area of its two bases:

$$S_{total} = S_{side} + 2S_{base} \text{ or } S_{total} = 2\pi rl + 2\pi r^2 = 2\pi r(l + r).$$

Theorem. The volume of a cylinder is equal to the product of the surface of its base and its maker: $V = S_{base} \cdot l$.

To find out how well the students have learned the shape of the cylinder, they can be asked to solve problems. Below are examples of such issues:

Issue 1. What is the number of cylinder-shaped buildings in the picture of the Registan complex in Samarkand (Figure 4) given below?

Figure 4. ***Registan complex.***

Issue 2. What geometric shapes do you see in the painting of Ichanqala in the city of Khiva (Figure 5)?

Figure 5. ***Ichanqala.***

By solving such problems, students will understand that the shape of a cylinder is widely used in architecture and construction, and they will learn that cylindrical bodies are of great importance in our lives. In general, teaching science by connecting it with life is highly effective in all subjects, especially geometry. The use of problems based on real life examples in teaching the topic "Cylinder, its surface and volume" is the basis for students to learn this topic better. For example, the use of the following problems forces the student to thoroughly

ACADEMIA ONE
PEER REVIEWED JOURNALS
Progress Annals: Journal of Progressive Research
Volume 1, Issue 1, April, 2023
ISSN (E): 2810-6466
Website: https://academiaone.org/index.php/8

study the formulas for finding the surface area and volume of a cylinder and read the topic of the cylinder in detail:

Issue 3. Figure 6 shows a cylindrical road leveler device. Using the information given in the figure, determine how many areas of the road it will level in one rotation.

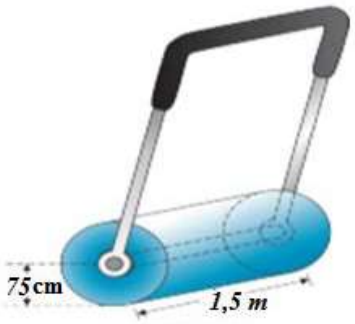

Figure 6. ***Road leveler.***

Figure 7. ***Rubber pipe.***

Issue 4. If the inner diameter of the rubber sprinkler pipe in Figure 7 is 8 cm, the outer diameter is 9 cm, and the length is 12 m, find how many liters of water will flow into it.

It can be seen that the use of such real-life problems not only invites the reader to study the topic "Cylinder, its surface and volume", but also encourages him to read more independently, looking for additional information on these topics. So, in teaching the topic "Cylinder, its surface and volume" using the problem-based educational technology, it is effective to refer to life problems. In this case, it is appropriate to choose the sequence of problems according to their complexity levels, that is, at first, it is necessary to use simple problems, and then gradually complicate the problems. Below are some examples of such issues:

Issue 5. Using the given data, find the volume of the piece of pie-shaped cylinder shown in Figure 8.

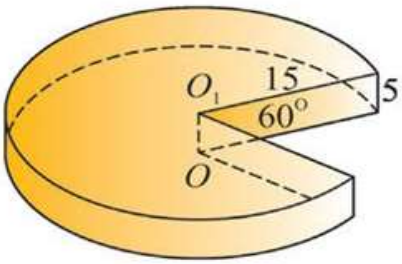

Figure 8. ***A piece of a cylinder.***

Figure 9. ***Orange juice container.***

Issue 6. The base of the cylinder-shaped orange juice container with a base radius of 5 cm and a height of 20 cm is made of metal, and the side surface is made of cardboard (Figure 9). If the price of 1 cm^2 of metal is 5 soums, and the price of 1 cm^2 of cardboard is 2 soums, how many soums worth of material will be needed to make this container? How much orange juice goes into a container?

Issue 7. One of the cylindrical vessels is twice as wide as the other, but three times lower (Figure 10). Which of these containers has the largest capacity?

Progress Annals: Journal of Progressive Research
Volume 1, Issue 1, April, 2023
ISSN (E): 2810-6466
Website: https://academiaone.org/index.php/8

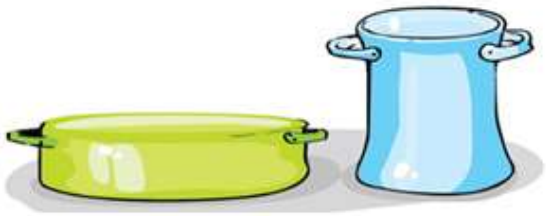

Figure 10. ***Cylindrical vessels.***

Figure 11. ***Canning jar.***

Issue 8. A cylinder-shaped canning jar with a base radius of 5 cm and a height of 12 cm is given (Figure 11). Find the total surface area and volume of the jar. If the price of 1 cm^2 of metal is 5 soums, how many soums worth of material will be needed to make this container?

Based on the above information, it can be said that teaching the topic "Cylinder, its surface and volume" using problem-based learning technology is highly effective and leads to the formation of students' strong understanding of the topic and skills. They consciously understand that it is necessary to read this topic well, and they independently search, find additional information on the topic, and study it. A good teaching of the topic "Cylinder, its surface and volume" will serve as a foundation for the development of skilled architects, engineers, technicians and technologists and for the development of the manufacturing industry in the future. In this case, the use of problem-based educational technology creates the basis for the effective transition of the educational process. When teaching using problem-based learning methods, there are no low-achieving students in the classroom. Almost all students are involved in the lesson process and their interest in the lesson increases. In the future, students will be given the opportunity to learn independently and learn a trade. Therefore, problem-based teaching methods are very necessary to improve the quality and effectiveness of education on the topic "Cylinder, its surface and volume".

References:

1. B.Q. Khaidarov. Textbook for students of the 11th grade of "Geometry" secondary educational institutions and secondary special vocational educational institutions. T. "Uzbekistan" 2018.
2. Saidahmedov N. "New pedagogical technologies". T. "Finance" 2003.
3. Farberman V. "Advanced pedagogical technologies." T. "Science" 2000.
4. Ishmatov K. "Pedagogical technology". Namangan 2004.
5. А.В.Погорелов “Геометрия 10-11”, учебник, Москва. “Просвещение”, 2009.
6. Daniel C.Alexander, Elementary geometry for college students, Canada, Brooks/Cole, Cengage Learning, 2011.
7. Yuldashev Z.Kh., Ashurova D.N. Innovative-didaktic program complex and new formalized model of education. Malaysian Journal of Mathematical Sciences 6(1), 2012, 97-103 p.