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METHODS OF STUDYING AND TEACHING TRIANGLE SIMILARITY PROBLEMS FROM THE PERSPECTIVE OF DIGITAL PEDAGOGY

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Abstract: This article explores the effectiveness of using digital pedagogy tools in solving problems related to triangle similarity. The main objective of the study is to ensure that students learn the topic in an engaging and efficient manner through digital tools and interactive technologies in geometry classes. The methodology involves teaching the properties of triangles visually through interactive applications, simulations, and digital graphic software. The research results reveal that digital technologies significantly contribute to enhancing the effectiveness of teaching, enabling students to participate more actively in the learning process and gain deeper insights into the topic. This article highlights the prospects for the development of digital pedagogy and the importance of widely implementing innovative approaches in the educational process.
Keywords: digital pedagogy, geometry education, triangle similarity, interactive technologies, teaching methodology, learning efficiency, virtual teaching, educational innovations.

Introduction

Digital pedagogy is rapidly developing in today's education system. Especially in teaching exact sciences such as mathematics and geometry, the use of digital tools and technologies facilitates the teaching process for educators and helps students learn topics in greater depth and with more interest. This article highlights the methods of solving problems related to triangle similarity using digital tools and discusses the prospects for the development of digital pedagogy.

Main Part

1. Teaching with Digital Technologies: Explaining the concept of triangle similarity through interactive applications, simulations, and graphic software allows students to visualize and study geometric properties. This approach enables educators to simplify complex geometric concepts.

2. Virtual Laboratories and Independent Problem-Solving: Providing students with opportunities to independently solve problems related to triangle similarity and proportions in virtual laboratories develops their logical thinking and independent working skills while improving their digital literacy.

3. Visual Materials and Visualization: Explaining the properties of triangle similarity to students using interactive visual materials and animations. For example, illustrating the concept of proportionality of corresponding linear measures of triangles through digital animations makes the topic more engaging and easier to understand.

4. Online Learning Platforms and Distance Education: Offering students additional materials on solving problems related to triangle similarity through online platforms enhances their understanding of the topic. This method provides an opportunity for students to gain broader knowledge of the subject.

5. Future Prospects: With the advancement of digital pedagogy, the ability to use advanced technologies in teaching triangle similarity and other geometric topics is increasing. This improves teaching quality, strengthens students' interest in lessons, and makes education more efficient.

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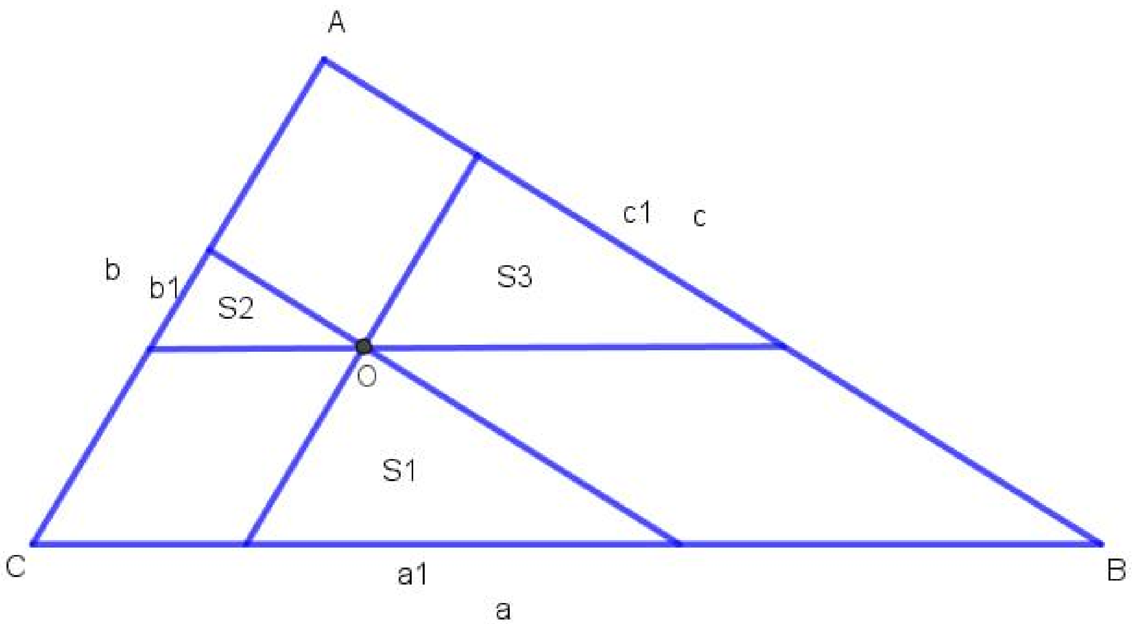
Example: If triangles are similar, their corresponding linear dimensions are proportional. The areas of similar triangles are proportional to the squares of their corresponding linear dimensions. Corresponding linear dimensions refer to the sides opposite equal angles.

$$\frac{A_1B_1}{A_2B_2}=\frac{B_1C_1}{B_2C_2}=\frac{A_1C_1}{A_2C_2}=\frac{m_{b1}}{m_{b2}}=\frac{l_{a1}}{l_{a2}}=\frac{P_{A_1B_1C_1}}{P_{A_2B_2C_2}}=\frac{h_{A1}}{h_{A2}}=\text{.........}$$

$$\frac{S_{A_1B_1C_1}}{S_{A_2B_2C_2}}={\frac{A_1B_1}{A_2B_2}}^2={\frac{B_1C_1}{B_2C_2}}^2={\frac{m_{b1}}{m_{b2}}}^2={\frac{h_{A1}}{h_{A2}}}^2=\text{.........}$$

To find the area of a triangle when the areas of the smaller triangles formed by drawing lines parallel to its sides from an arbitrary point inside the triangle are given. Let the area of the given triangle be S_{ABC} The areas of the resulting smaller triangles are S_1, S_2, S_3 Here: S_1 S_{ABC} > юS_2 S_{ABC} > юS_3 S_{ABC} , The sides of the given triangle are a,b,c The base and height of the smaller triangles with area S_1 are a_1,h_1 , The base and height of the smaller triangles with area S_2 are b_1,h_2 , The base and height of the smaller triangles with area $\triangle S_3$ are c_1,h_3, The point O is the common vertex of the smaller triangles.



$$\frac{S_1}{S_{ABC}} = \frac{a_1}{a}^{2} \qquad \frac{a_1}{a} = \sqrt{\frac{S_1}{S_{ABC}}} \qquad a_1 = a\sqrt{\frac{S_1}{S_{ABC}}}$$

$$S_1 = \frac{a_1\ h_1}{2} \qquad S_1 = \frac{a\sqrt{\frac{S_1}{S_{ABC}}}\ h_1}{2} \qquad \sqrt{S_1\ \ S_{ABC}} = \frac{a\ h_1}{2} = S_{BOC}$$

$$\frac{S_2}{S_{ABC}} = \frac{b_1}{b}^{2} \qquad \frac{b_1}{b} = \sqrt{\frac{S_2}{S_{ABC}}} \qquad b_1 = b\sqrt{\frac{S_2}{S_{ABC}}}$$

$$S_2 = \frac{b_1\ h_2}{2} \qquad S_2 = \frac{b\sqrt{\frac{S_2}{S_{ABC}}}\ h_2}{2} \qquad \sqrt{S_2\ \ S_{ABC}} = \frac{b\ h_2}{2} = S_{AOC}$$

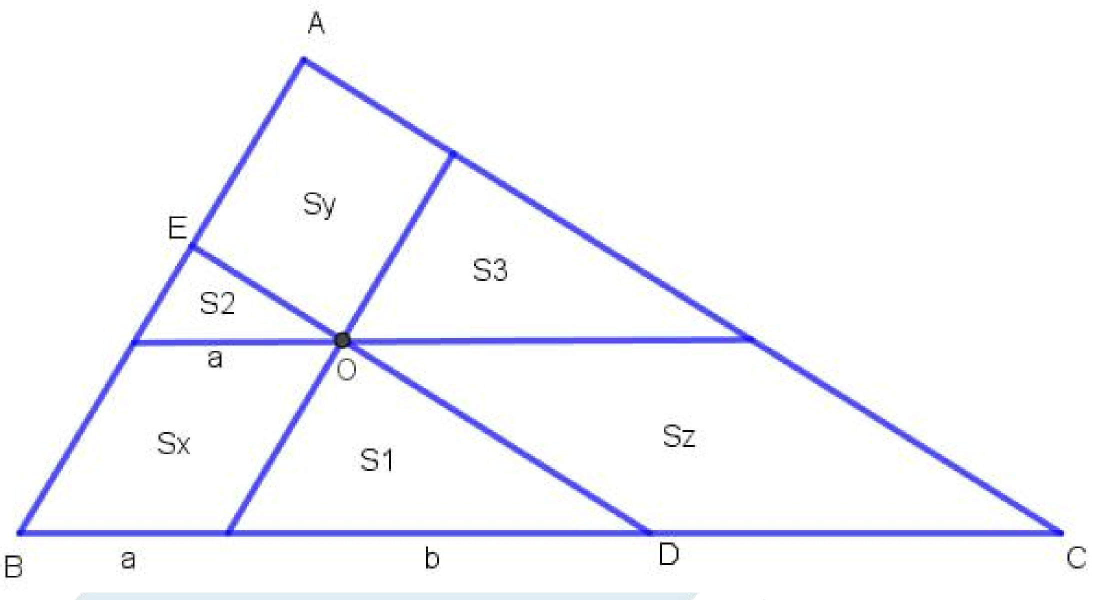
$$\frac{S_3}{S_{ABC}} = \frac{c_1}{c}^{2} \qquad \frac{c_1}{c} = \sqrt{\frac{S_3}{S_{ABC}}} \qquad c_1 = c\sqrt{\frac{S_3}{S_{ABC}}}$$

$$S_3 = \frac{c_1\ h_3}{2} \qquad S_3 = \frac{c\sqrt{\frac{S_3}{S_{ABC}}}\ h_3}{2} \qquad \sqrt{S_3\ \ S_{ABC}} = \frac{c\ h_3}{2} = S_{AOB}$$

$$S_{ABC} = S_{AOC} + S_{BOC} + S_{AOB} \qquad S_{ABC} = \sqrt{S_1\ \ S_{ABC}} + \sqrt{S_2\ \ S_{ABC}} + \sqrt{S_3\ \ S_{ABC}}$$

$$^{*}\ S_{ABC} = \left(\sqrt{S_1} + \sqrt{S_2} + \sqrt{S_3}\right)^2$$

Now, let's consider the case where parallel lines are drawn from an arbitrary point inside the triangle to its sides, forming quadrilaterals (parallelograms), and the areas of these parallelograms are given. We aim to find the area of the triangle. Let the area of the given triangle be S_{ABC}, The areas of the smaller triangles are S_1, S_2, S_3, The areas of the resulting parallelograms (quadrilaterals) are S_x, S_y, S_z Let E, D be the points lying on sides AB, AC of the triangle. Let a be the side of the parallelogram, and S_x be the area of the parallelogram.



$$S_1 \quad S_2 \qquad \frac{S_1}{S_2} = \frac{b}{a}^{\;2} \qquad \frac{b}{a} = \sqrt{\frac{S_1}{S_2}}$$

$$S_{BED} \quad S_2 \qquad \frac{S_{BED}}{S_2} = \frac{S_x + S_1 + S_2}{S_2} = \frac{a+b}{a}^{\;2} \qquad \frac{S_x}{S_2} + \frac{S_1}{S_2} + 1 = 1 + 2\frac{b}{a} + \frac{b}{a}^{\;2}$$

$$\frac{S_x}{S_2} + \frac{b}{a}^{\;2} + 1 = 1 + 2\frac{b}{a} + \frac{b}{a}^{\;2} \qquad \frac{S_x}{S_2} = 2\frac{b}{a}$$

$$\frac{S_x}{S_2} = 2\frac{b}{a} \qquad \frac{S_x}{S_2} = 2\sqrt{\frac{S_1}{S_2}} \qquad S_x = 2\sqrt{S_1 \quad S_2}$$

$$S_x = 2\sqrt{S_1 \quad S_2}\;, \qquad S_y = 2\sqrt{S_3 \quad S_2}\;, \qquad S_z = 2\sqrt{S_1 \quad S_3}$$

$$\frac{S_x \quad S_z}{S_y} = 2 \;\; S_1\;, \qquad \frac{S_x \quad S_y}{S_z} = 2 \;\; S_2\;, \qquad \frac{S_z \quad S_y}{S_x} = 2 \;\; S_3\;,$$

$$S_{ABC} = \left(\sqrt{S_1} + \sqrt{S_2} + \sqrt{S_3}\right)^2 = \sqrt{\frac{S_x \quad S_z}{2 \quad S_y}} + \sqrt{\frac{S_x \quad S_y}{2 \quad S_z}} + \sqrt{\frac{S_z \quad S_y}{2 \quad S_x}}^{\;2}$$

$$^{*} \; S_{ABC} = \frac{1}{2} \quad \sqrt{\frac{S_x \quad S_z}{S_y}} + \sqrt{\frac{S_x \quad S_y}{S_z}} + \sqrt{\frac{S_z \quad S_y}{S_x}}^{\;2}$$

Conclusion: Digital pedagogy tools provide an effective and interactive way to teach mathematical and geometric topics, including triangle similarity. This not only broadens students' knowledge but also increases their interest in modern technologies and enhances their digital literacy. Furthermore, the prospects of digital pedagogy will significantly contribute to improving the effectiveness of education in the future.

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