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Types of reasoning in 3D geometry thinking and their relation with spatial ability.

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Summary: The aim of this study is to describe and analyse the structure of 3D geometry thinking by identifying different types of reasoning and to examine their relation with spatial ability. To achieve this goal, two tests were administered to students in grades 5 to 9. The results of the study showed that 3D geometry thinking could be described by four distinct types of reasoning which refer to the representation of 3D objects, spatial structuring, conceptualisation of mathematical properties and measurement. The analysis of the study also showed that 3D geometry types of reasoning and spatial abilities should be modelled as different constructs. Finally, it was concluded that students' spatial abilities, which consist of spatial visualisation, spatial orientation and spatial relations factors, are a strong predictive factor of the four types of reasoning in 3D geometry thinking.

Classification: C30 G40 D20
Keywords: 3D geometry; spatial abilities; visualisation; representation; 3D geometry thinking; 3D geometry types of reasoning. lower secondary; educational research
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