The Importance of Spatial Thinking in Teaching Physics

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A vast literature in physics education has documented students' difficulties in reading, constructing, and interpreting graphs. As a result, students with strong spatial abilities outperform their peers because they can better cognitively represent information, visualize, and create concepts. The extensive use of visual reasoning in physics discoveries such as Galileo's laws of motion, Maxwell's laws, Faraday's electromagnetic field theory, or Einstein's theory of relativity has been implicated in research on the cognitive processes underlying these discoveries. The majority of physics problems require manipulating spatial representations such as graphs, diagrams, or physical models. Spatial ability refers to the perception of spatial information such as dimensions, distances, and shapes, as well as the mental representation of that information and the processing of that information through various transformations such as mental rotation, visualizing from another perspective, or spatial reasoning. In this literature review, we will focus on various studies that have been done on the relationship of spatial visualization to solving kinematics problems such as predicting 2D motion of an object, transforming through one frame of reference to another, or interpreting kinematics graphs.

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