The Developmental Role of Spatial Abilities in Predicting Science Achievement in Elementary and Middle School: A Cross-Sectional Study

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Abstract

Spatial abilities are relevant to scientific achievement, yet little is known regarding development of spatial abilities among adolescence. This study thus examines the development of spatial abilities during adolescence, and how different spatial abilities differentially predict science achievement. Over 1,006 students from grades 4, 6, and 8 were assessed with four different spatial abilities tasks, a science achievement test (TIMSS), and assessment of control variables. Significant grade differences in spatial abilities were observed. Spatial abilities account for about 14%, 13%, and 13% of variance in science achievement in Grades 4, 6, and 8. Extrinsic-dynamic abilities emerged as the strongest predictor of science achievement. The current findings showcased the development of different spatial abilities across Grades 4 to 8 and confirmed the significance of spatial abilities, particularly extrinsic-dynamic spatial abilities, in science learning. Interventions that target spatial abilities may be a potential way to prepare students for the science curriculum. Keywords: Spatial Abilities, Science Achievement, Cognitive Development, Spatial Cognition, STEM

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