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**First-graders' spatial-mathematical reasoning about plane and solid shapes and their representations.**

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Summary: The primary goal of the study was to explore first-grade children's reasoning about plane and solid shapes across various kinds of geometric representations. Children were individually interviewed while completing a shape-matching task developed for this study. This task required children to compose and decompose geometric figures to identify geometric shapes that either matched or did not match the stimulus shape. The stimulus shapes were 2D diagrams of plane and solid-shape geometric figures. The results showed that children overestimated the significance of triangular vertices ("pointiness"); certain kinds of scaling demands gave children trouble in shape classification; children had trouble translating lines found in 2D diagrams into 3D visual boundaries, especially where projected curvature was involved; and that children had difficulty reasoning consistently across the task. Implications for future research as well as teaching recommendations are discussed.

*Classification:* G22 C32

*Keywords:* early geometry; spatial reasoning; dimensionality; mathematical diagrams

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