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Detecting distortion: bridging visual and quantitative reasoning on similarity tasks.

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Summary: This study is focused on identifying and describing the reasoning patterns of middle grade students when examining potentially similar figures. Described here is a framework that includes 11 strategies that students used during clinical interview to differentiate similar and non-similar figures. Two factors were found to influence the strategies students selected: the complexity of the figures being compared and the type of distortion present in nonsimilar pairings. Data from this study support the theory that distortions are identified as a dominant property of figures and that students use the presence and absence of distortion to visually decide if two figures are similar. Furthermore, this study shows that visual reasoning is not as primitive or nonconstructive as represented in earlier literature and supports students who are developing numeric reasoning strategies. This illuminates possible pathways students may take when advancing from using visual and additive reasoning strategies to using multiplicative proportional reasoning on similarity tasks. In particular, distortion detection is a visual activity that enables students to reflect upon and evaluate the validity and accuracy of differentiation and quantify perceived relationships leading to ratio. This study has implications for curriculum developers as well as future research.

Classification: G43 F83 E53

Keywords: proportional reasoning; similarity; visualization; curriculum; middle grades

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