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Representational flexibility and problem-solving ability in fraction and decimal number addition: a structural model.

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Summary: The aim of this study was to propose and validate a structural model in fraction and decimal number addition, which is founded primarily on a synthesis of major theoretical approaches in the field of representations in Mathematics and also on previous research on the learning of fractions and decimals. The study was conducted among 1701 primary and secondary school students. Eight components, which all involve representational transformations, were encompassed under the construct of representational flexibility in fraction and decimal number addition. This structure reveals that, for both concepts, the representational transformation competences of recognition and conversion, and therefore representational flexibility as well, were affected by the complexity of the concepts involved and the direction of the conversion, respectively. Results also showed that two first-order factors were needed to explain the problem-solving ability in fraction and decimal number addition, indicating the differential effect of the modes of representation that is diagrammatic and verbal form on problem-solving ability irrespective of the concepts involved, as in the case of the conversions. Representational flexibility and problem-solving ability were found to be major components of students' representational thinking of fraction and decimal number addition. The proposed framework was invariant across the primary and secondary school students. Theoretical and practical implications are discussed.

Classification: F40 D50
Keywords: decimal number addition; fraction addition; problem-solving ability; representational flexibility; representational transformations; structural equation model
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