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Proposing and testing a model to explain traits of algebra preparedness.

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Summary: Early experiences with theoretical thinking and generalization in measurement are hypothesized to develop constructs we name here as logical reasoning and preparedness for algebra. Based on work of *V. V. Davydov* [“The psychological characteristics of the “prenumerical” period of mathematics instruction”, in: L. P. Steffe (ed.), *Children’s capacity for learning mathematics*. Chicago: University of Chicago Press. 109–205 (1975), the Measure Up (MU) elementary grades experimental mathematics curriculum uses quantities of area, length, volume, and mass to contextualize the relationships among the quantities in, for example, $R+C = T$. This quasi-experimental study, conducted with 129 fifth- and sixth-grade students, examines MU effects on students’ preparedness for algebra. Structural equation modeling is used to identify a system of relationships among the variables in our proposed model. Findings show significant direct standardized effects from MU to preparedness ($0.28, p < .05$) and from logical reasoning to preparedness ($0.89, p < .05$). Although positive, the effect of MU mediated by logical reasoning was not statistically significant. This suggests that the development of logical reasoning abilities, attributed to theoretical thinking and generalization, lag preparedness for algebra. It also suggests that MU can potentially contribute to algebra preparedness for students who may not have developed strong logical reasoning abilities. The findings are discussed in terms of their theoretical and practical implications for the successful study of algebra.

Classification: D33 C43 E53 H23

Keywords: Davydov; Vygotsky; measure up project; algebra preparedness; logical reasoning; structural equation modeling

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