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Global Evidence of Wide Variability in Mathematics Achievement Within Classrooms

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Abstract

Understanding academic achievement in the context of homogeneous or heterogeneous classrooms is critical for effective teaching and learning. Nevertheless, achievement variability within classrooms has been largely overlooked by international assessments.

The purpose of this study is to raise awareness of the wide mathematics achievement variability that exists within the 4th grade classrooms of schools worldwide. Nationally representative mathematics achievement data from intact grade 4 classrooms from 63 countries and education systems that participated in the Trends in International Mathematics and Science Study (TIMSS) 2023 were considered. Analysis of variance (ANOVA) served to decompose the mathematics score variance that lies within classrooms and between classrooms and schools, while descriptive statistics were used to further quantify the variability of mathematics scores existing within the classrooms.

Results show that most of the student achievement variability lies within the classrooms. On average, across all participating countries and education systems, 70% of the mathematics score variance was within classrooms, considerably more than the 30% found between classrooms and schools. The spread of achievement in an average classroom covered three full standard deviations of the national achievement distributions. This was equivalent to almost five years of primary school. An average 4th grade classroom included students from every single achievement level described by TIMSS: 10% were from the Advanced level, 24% High, 29% Intermediate, 21% Low, and 16% from the Below Low level. This study argues for training and curriculum that better support teachers to target instruction to the learning needs of the students in their classrooms.

Keywords: Classroom Heterogeneity; Differentiated Instruction; Learning Variability; Mathematics Achievement; TIMSS