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Inappropriately applying natural number properties in rational number tasks: characterizing the development of the natural number bias through primary and secondary education.

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Summary: The natural number bias is known to explain many difficulties learners have with understanding rational numbers. The research field distinguishes three aspects where natural number properties are sometimes inappropriately applied in rational number tasks: density, size, and operations. The overall goal of this study was to characterize the development of the natural number bias across the span between 4th and 12th grade. To achieve this goal, a comprehensive test was constructed to test 4th to 12th graders' natural number bias. This test was administered to 1343 elementary and secondary school students. Results showed that an overall natural number bias could be found. This bias appeared to be equally strong in tasks with decimal numbers and tasks with fractions. Moreover, the natural number bias was weakest in size tasks, somewhat stronger in operations tasks, and by far the strongest in density tasks. An overall decrease of the strength of the natural number bias – but no disappearance except for size tasks – could be found with grade.

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