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Inhibiting natural knowledge in fourth graders: towards a comprehensive test instrument.

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Summary: While understanding rational numbers forms an essential part of mathematical literacy, research has repeatedly shown that they form a stumbling block in education. A big source of difficulty is the inappropriate application of natural number knowledge. The research literature points at three main aspects where natural number knowledge is inappropriately applied: density, operations, and size. While there are numerous test instruments to assess each of these aspects, none of them combines all aspects in an integrated manner. By creating such a comprehensive test instrument and applying it to fourth graders, we found that the strength of the natural number bias was largest in density items, but still clearly present in items about size and operations. We further found that fourth graders' rational number reasoning – more specifically their ability to inhibit the inappropriate use of natural number knowledge – can be described by a one-dimensional construct.

Classification: F43 F33 D73 C43 C33

Keywords: rational numbers; natural number bias; item response theory; conceptual change

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