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Rational number and proportional reasoning: Using intensive quantities to promote achievement in mathematics and science.

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Summary: Student mastery of rational number and proportional reasoning is a recognized challenge, yet supporting mastery is central within mathematics and science. This paper focuses on a 4-lesson teaching programme which was designed to foster mastery in the context of intensive quantities. Intensive quantities such as density, speed and temperature depend upon proportional relations, require rational number for their representation and are relevant to science. Two versions of the teaching programme were developed, one using ratio representation and the other using fractions. Implementation with 535 children aged 9-11 years revealed that both versions promoted mastery of fractions, whilst the ratio version also supported proportional reasoning. It is suggested that the ratio version provides useful foundations for teaching, even with children who, as with the present sample, have no previous experience of ratios themselves.

Classification: C32 F82 F42 C72 C82

Keywords: intensive quantities; mathematics and science education; proportional reasoning; rational number; primary education; comparative studies; empirical investigations; educational research

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