

Supporting Fifth Graders in Learning Multiplication of Fraction with Whole Number

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Abstract

The meaning of fractions with integer multiplication is something that is difficult to understand by students. They tend to think that the product it produces a larger number, while the multiplication of fractions with integers, the result can be any number larger or smaller. This study is a research design that aims to develop a local instructional theory to support the students expand their understanding of the meaning of multiplication of fractions with integers. By applying the characteristics of realistic mathematics education (Realistic Mathematics Education), the researchers designed a series of instructional activities related to daily life, such as Indonesia prepares dishes and equitable distribution. Participants of this study were Grade 5 students from an elementary school in Surabaya, along with a mathematics teacher of that class. Some students of the class participated in the first cycle, in order to see how the design of the hypothetical learning trajectory (Hypothetical Learning Trajectory) is running. After going through several revisions, HLT is then implemented in all the other students in grade 5. The results showed that students' prior knowledge affect their learning process. The fractions solve multiplication problems with whole numbers, some students convert the integers to fractions and then use a fraction by a fraction multiplication procedure. The learning process begins with students exploring the contextual situation of fair division, where students extend their understanding that the fraction associated with the division and multiplication. One indicator that the student has broadened his understanding is the more varied representation of the given problem.

Keywords: multiplication of fraction with whole number, RME, daily life situations, extend the understanding, initial knowledge, design research

Abstrak

Makna perkalian pecahan dengan bilangan bulat adalah sesuatu yang sulit dimengerti oleh siswa. Mereka cenderung untuk berpikir bahwa perkalian itu menghasilkan bilangan yang lebih besar, sedangkan dalam perkalian pecahan dengan bilangan bulat, hasilnya dapat berupa bilangan yang lebih besar atau lebih kecil. Penelitian ini adalah suatu design research yang bertujuan untuk mengembangkan suatu local instructional theory untuk mendukung siswa memperluas pemahaman mereka tentang makna perkalian pecahan dengan bilangan bulat. Dengan mengaplikasikan karakteristik dari pendidikan matematika realistik (Realistic Mathematics Education), peneliti merancang serangkaian aktifitas instruksional yang berhubungan dengan

kehidupan sehari-hari, seperti mempersiapkan menu masakan Indonesia dan pembagian adil. Peserta dari penelitian ini adalah siswa kelas 5 dari suatu Sekolah Dasar di Surabaya, beserta seorang guru matematika dari kelas tersebut. Beberapa orang siswa dari suatu kelas ikut serta dalam siklus pertama, dengan tujuan untuk melihat bagaimana rancangan hipotesis dari trayektori pembelajaran (Hypothetical Learning Trajectory) berjalan. Setelah melalui beberapa revisi, HLT tersebut kemudian diimplementasikan pada semua siswa kelas 5 yang lain. Hasil penelitian menunjukkan bahwa pengetahuan awal siswa sangat mempengaruhi proses pembelajaran mereka. Dalam menyelesaikan permasalahan perkalian pecahan dengan bilangan bulat, beberapa siswa mengkonversi bilangan bulat ke bentuk pecahan dan kemudian menggunakan prosedur perkalian pecahan dengan pecahan. Proses pembelajaran siswa dimulai dengan mengeksplorasi situasi kontekstual tentang pembagian adil, dimana siswa memperluas pemahaman mereka bahwa pecahan berkaitan dengan pembagian dan perkalian. Salah satu indikator bahwa siswa telah memperluas pemahamannya adalah dengan semakin bervariasinya representasi dari permasalahan yang diberikan.

Kata Kunci: perkalian pecahan dengan bilangan bulat, pendidikan matematika realistik, situasi dalam kehidupan sehari-hari, memperluas pemahaman, pengetahuan awal, design research

The algorithm for multiplication of two fractions seems easy to be taught and to be learned, since we only have to multiply numerator with numerator to get the numerator of the product, and multiply denominator with denominator to get the denominator of the product (Reys et al, 2007). Multiplication with fraction itself is a difficult idea for students as they tend to associate multiplication with making something bigger (TAL Team, 2008). Meanwhile, in multiplication involving fraction, the result can be smaller. For instance, when we multiply $\frac{1}{2}$ by 3, the result is $\frac{3}{2}$, which is, smaller than 3. In addition, we tend to differentiate the word of multiplication symbol “ \times ” (Streefland, 1991), we use word “*kali*” (times) for the amount greater than one, and for the amount less than one we tend to use the word “*dari*” (of).

According to Armanto (2002), mathematics in Indonesia is taught in a very formal way and teachers merely transfer their knowledge to students in the learning process, they teach with practising mathematical symbols and emphasizing on giving information and application of mathematical algorithm. Students are taught how to use algorithms to multiply fraction with whole number without emphasizing on the meaning behind it.