Use of Newman Error Analysis Guidelines to Identify Pupils' Errors in a Word Problem Involving Fractions

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In Singapore, the model-method is adopted as a problem-solving approach by primary mathematics teachers with the intention to help pupils visualise word problems correctly. It is the use of rectangles and numbers to encapsulate both the quantitative and relational information in a mathematical problem (Kho, Yeo & Lim, 2009). Model drawing provides a form of scaffold in the development of proportional reasoning (Ng & Lee, 2005). However, one of the challenges faced by pupils would be the intricacy of obtaining a diagram that reflects the mathematical intention of the question. For a model to satisfy this condition, it must have sufficient relational accuracy for one to determine the operations required. Furthermore, the model must be drawn such that any relationship between the units and any known parts may be deduced. Meeting these conditions indicate that the word problem is being understood. Successful problem-solving activities using models require: (a) the ability to translate the word problem into models; (b) the ability to use the correct operations from the model; and (c) to put these together. Lower progress pupils tended to have difficulty in identifying the correct operations (Poh, 2007).

The Newman Error Analysis Guidelines (NEAG, 1977a) offers a structured approach in examining how a pupil might think when facing a word problem. It comprises five hierarchical stages, namely reading recognition, general and specific comprehension, transformation, process skills and encoding. In order to examine the difficulties encountered when solving a one-step fraction word problem using the model method, grade 5 low attaining pupils in mathematics were interviewed on their thought processes behind their models drawn and the mathematical equations written using the NEAG.

The findings were similar to earlier research conducted with students of different age groups and nationalities (Prakitipong & Nakamura, 2006) with most of the errors being committed at the comprehension and transformation stages. Therefore, it is important for mathematics teachers to be mindful of how they can better scaffold students' learning at these stages so that pupils would be able to solve these mathematical tasks accurately.

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