# Can Young Children Divide Using Ideas of Rate?

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Earlier research reported the importance of the rate variable in understanding multiplicative reasoning (e.g., Lamon, 1993). A lack of experience with various semantic structures particularly rate and multiplicative comparison, can cause difficulties for students in upper primary and lower secondary school when faced with situations that require proportional reasoning (e.g., Lamon, 1993; Siemon, 2008).

Allocation/ rate is an alternative conceptualisation of the Equal Groups structure. In this context the multiplier is a rate variable that that defines the relationship between a target object and its multiple counterparts (e.g., four cookies per child). The multiplicand specifies the number of target objects and hence the number of iterations of that relationship (e.g., 3 children, so 3 iterations of the 4 cookies) (Downton & Sullivan, 2017). Previous studies have explored rate problems in the context of multiplication (e.g., Cheeseman et al., 2023; Lu & Richardson, 2018), or both multiplication and division with older children (e.g., Askew, 2018; Downton & Sullivan, 2017; Siemon, 2008).

In this study, the problem was presented to 23 children (5-6 years olds) by their teacher, both as a poster and read aloud: "Fluffy can have four dog biscuits each day. Look into your packet of dog biscuits. How many days can you give Fluffy dog biscuits?" Each child was given a packet of 12 "biscuits" to use to solve the problem and illustrate their solution. To solve this problem children had to interpret the word "each" and consider how many biscuits per day and the number of days; this interpretation can be quite challenging for 5-6 year olds.

Analysis of video recordings, children's drawings and their thinking during the lesson revealed that all 23 children could arrange the "dog biscuits" into groups of four on their whiteboards. Sixteen of these children were able to interpret the rate concept in the context of division, as evidenced by their drawings. These children recorded the number of days the dog would receive biscuits and some also included the days of the week. The remaining seven children struggled to translate the concrete representation of the problem into a recorded solution on paper. In this short communication we will examine the children's representations and thinking in more detail more, inviting discussion on how simple rate problems can be explored with young children, and the implications for teaching and learning in Years 3 and 4.

## References

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