

The Mathematical World > Describing Change

Research on Student Learning

Early adolescents and also many adults have difficulty with proportional reasoning. ^[1] Difficulty is influenced by the problem format, the particular numbers in the problem, the types of ratios used, and the problem situation. ^[2] Middle-school students can solve problems in proportions that involve simple numbers and simple wordings. ^[3] Middle-school students have trouble with more difficult numerical values or problem contexts. Problems using 2:1 ratios are easier than problems using n:1 ratios, and can be solved by elementary-school children. ^[4] Problems using n:1 ratios are easier than problems using other integer ratios (e.g., 6/2) which in turn are easier than problems using non-integer ratios (e.g., 6/4). ^[5] Different ratio types (e.g., speed, exchange, mixture) appear to give more or less difficulty. For example, speed problems appear to be more difficult than exchange problems. ^[6] And these difficulties compound one another. Unfamiliarity with the problem situation causes even more difficulty when it occurs with a difficult ratio type. ^[7]

References

[1] Behr, M.J. (1987). Ratio and proportion: A synthesis of eight conference papers. In Bergson, U. (Ed.), *Psychology and mathematics education*, 2, .

Hart, K. (1988). Ratio and proportion. In Hiebert, J. (Ed.), *Number concepts and operations in the middle grades* (pp. 198-219).

[2] Heller, P., Ahlgren, A., Post, T., Behr, M., Lesh, R. (1989). Proportional reasoning: The effect of two context variables, rate type, and problem setting. *Journal of Research in Science Teaching*, 26, 205-220.

Karplus, R., Pulos, S., Stage, E. (1983). Proportional reasoning of early adolescents. In Lesh, R. (Ed.), *Acquisition of mathematics concepts and processes*.

Tournaire, F., Pulos, S. (1985). Proportional reasoning: A review of the literature. *Educational Studies in Mathematics*, 16, 181-204.

Vergnaud, G. (1988). Multiplicative structures. *Number concepts and operations in the middle grades*, 141-161.

[3] Vergnaud, G. (1988). Multiplicative structures. In Hiebert, J. (Ed.), *Number concepts and operations in the middle grades* (pp. 141-161).

[4] Shayer, M., Adey, P. (1981). *Towards a science of science teaching*.

[5] Tournaire, F., Pulos, S. (1985). Proportional reasoning: A review of the literature. *Educational Studies in Mathematics*, 16, 181-204.

[6] Heller, P., Ahlgren, A., Post, T., Behr, M., Lesh, R. (1989). Proportional reasoning: The effect of two context variables, rate type, and problem setting. *Journal of Research in Science Teaching*, 26, 205-220.

Vergnaud, G. (1988). Multiplicative structures. In Hiebert, J. (Ed.), *Number concepts and operations in the middle grades* (pp. 141-161).

[7] Heller, P., Ahlgren, A., Post, T., Behr, M., Lesh, R. (1989). Proportional reasoning: The effect of two context variables, rate type, and problem setting. *Journal of Research in Science Teaching*, 26, 205-220.