

# WHY IS IT SO? – ELICITING PRECURSORS OF MATHEMATICAL REASONING IN KINDERGARTEN

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Mathematical reasoning is a standard of school mathematics (e.g. NCTM, 2000) and, hence, a goal of mathematics education. Besides a narrow understanding of mathematical reasoning as mathematical proof, a broader understanding includes precursory skills, e.g. making connections, investigating conjectures, or comprehending arguments. Whereas mathematical instruction – encompassing mathematical reasoning – starts with preK-level (at the age of 5) in some traditions, in others (including Germany), mathematical instruction is not common before the start of elementary mathematics education at first grade. Hence, it is an open question if and to what extent children at the transition to first grade have the disposition to use these mathematical reasoning abilities. However, even if early mathematical instruction is common, the development of these abilities is not yet understood in detail (for an overview, see Ginsburg et al., 2008). Accordingly, this study aims at modeling and measuring precursors of mathematical argumentation abilities of children in their last year of kindergarten (age 5-6) with the foci: What precursors of mathematical argumentation can be identified across mathematical content areas? Can these precursors be distinguished from mathematical knowledge, general cognitive skills, and effects of maturing?

Interview-based tests were developed for mathematical reasoning and mathematical knowledge and administered to  $N = 120$  children (age  $M = 5.2$  yrs,  $SD = 0.5$ ). The results based on  $N = 75$  complete data sets show that mathematical reasoning is interrelated with mathematical knowledge ( $r = .58^{**}$ ) as well as working memory capacity as an indicator of general cognitive skills ( $r = .29^*$ ), but not with the age ( $r = .04$  n.s.). Regression analyses show that mathematical knowledge is the only significant predictor explaining 34% of the variance. Hence, mathematical reasoning abilities were found to be distinct from related abilities. In the following studies, the development of these abilities during the last year of kindergarten will be investigated in order to evaluate its variability during the transition to first grade.

The poster will focus on the framework for precursors of mathematical reasoning and present sample items in detail. Quantitative information will be presented in more detail as a basis for the discussion of the general importance of these findings.

## References

Ginsburg, H. P., Lee, J. S., & Boyd, J. S. (2008). Mathematics education for young children: What it is and how to promote it. *Social Policy Report of the Society for Research in Child Development*, 22(1), 3–11.

NCTM (2000). Principles and standards for school mathematics. Reston, VA: NCTM.