

1) Title: Playing Linear Numerical Board Games Promotes Low-income Children's Numerical Development

Source: Siegler, R.S. & Ramani, G.B. (2008). Playing linear numerical board games promotes low-income children's numerical development. *Developmental Science*, 11, 655-661.

Summary:

Children's mathematics achievement in the early years is a strong predictor of their later success in this subject area. There is a clear discrepancy in the mathematics performance between high and low-income children. The authors hypothesize that low-income children are not performing as well as their economically advantaged peers because they use linear representations for numerical magnitudes less frequently. They also predict that playing numerical board games will lead these children to use more appropriate representations and thus improve their overall math competence. In two separate experiments, the authors first demonstrated that low-income children indeed have significantly poorer knowledge about numerical magnitudes compared to their high to mid-income peers. Nevertheless, they also revealed that giving these children opportunities to play numerical board games for 15-minute sessions, twice a week, for two weeks closed the low-income and high to mid-income gap. That is, low-income children's numerical knowledge improved so drastically that they were performing at par with their more economically advantaged peers.

2) Title: Teaching Number Sense

Source: Griffin, S. (2004). Teaching number sense. *Educational Leadership*, 61, 39-42.

Summary:

From a conventional perspective, number sense has been narrowly defined as the manipulation of numbers through rules and algorithms. In actuality, it should be perceived as "a set of conceptual relationships between quantities and numerical symbols" (Griffin, 2004 p. 39). The author explains that mathematics is comprised of three worlds (actual quantities, spoken counting numbers, and formal written symbols). In order to have a strong number sense foundation, students must understand the intricate relationships between these three worlds. In the article, the author outlines the development of number sense from infancy into early childhood. She also emphasizes the need for research-based

mathematics programs such as the one she co-developed called Number Worlds. The purpose of these research-based programs is to ensure students are introduced to concepts in a developmentally appropriate sequence, making rich connections, and have the opportunity to explore and discuss the concepts.

3) Title: Promoting Broad and Stable Improvements in Low-income Children's Numerical Knowledge through Playing Number Board Games

Source: Ramani, G.B. & Siegler, R.S. (2008). Promoting broad and stable improvements in low-income children's numerical knowledge through playing number board games. *Child Development, 79*, 375-394.

Summary:

This article is similar to the one above by Siegler and Ramani (2008). That is, playing a linear number board game significantly improved low-income children's scores on different numerical measures such as numerical magnitude comparison and number line estimations. These results remained even after nine weeks. The researchers also revealed that playing number board games in the home environment is positively correlated with children's number sense.

4) Title: The Empty Number Line: A Useful Tool or Just Another Procedure?

Source: Bobis, J. (2007). The empty number line: A useful too or just another procedure? *Teaching Children Mathematics, 410-413*.

Summary:

The empty number line is a linear visual representation with no numbers or other marks. Children can use it to show their thinking when completing addition and subtraction computation questions. In fact the author claims that the empty number line can be considered a very useful thinking tool since it reflects children's intuitive mental strategies and can help them develop more sophisticated ones. Before children can start using the empty number line successfully to add or subtract more complex numbers, they must first be familiarized with the number line. They would also need to learn how to count by and jump across tens on the number line. The author provides examples of these strategies in the article.