Research Précis

Edition 04 - 1 Fall 2004

EARLY NUMERACY:

Counting and Conservation

Traditionally (Piaget & Szeminska, 1952) children are thought to "conserve number" when they realize that two sets, shown to be equivalent via one-to-one correspondence or through counting, remain equivalent regardless of whether they are reconfigured. Over-reliance on statements and conclusions taken out of context has led to unnecessary discrepancies among researchers and program developers.

> You line up six napkins and six plates and your preschool child matches one napkin to each plate, then goes on to count each napkin and each plate. He grasps the basic notion that there are the same number of each. He has fully (?) established the concept of equivalence by one-to-one correspondence through both matching (one plate for one napkin) and counting (counting plates and napkins separately).
>
> Satisfied, you stack up the plates, and pile the napkins together, and get ready to finish preparing for dinner. As you do so, you say again (it's not the first time) "So, there are the same number of plates as napkins…"
>
> Your child looks at each, and this time, he says "No, there are more plates."
>
> Oops. Welcome to "conservation of number."

A confluence of findings…

Well and good. Piaget's conclusions that development of this awareness typically does not occur before the age of 6 or 7, as children enter the operational stage, have been confirmed numerous times. Even children's ability to match objects in one set to objects in another in order to determine the relative size of each set, a relatively advanced application of one-to-one correspondence, is a fairly late accomplishment (Brainerd, 1979). However, programs that have made conscious efforts to delay young children's exposure to number concepts until they can fully grasp the principle of conservation and its sidekicks—*integrated* formal understanding of one-to-one correspondence and rational counting—have over-interpreted Piaget's findings and intent. Research has shown, and Piaget's findings do not refute, that even though young children still will rely largely on visual perception, they can and do make use of reasoned counting during the preschool years (Piaget's preoperational stage). Not only have young children exhibited the ability to count in any order (Aubrey, 1993), and correct counting errors such as skipping numbers or double-counting even when the numbers used are beyond their ceiling of known numerals or number words (Gelman & Meck, 1983), but they have done so before exhibiting an operational understanding of quantity. Though there is a difference between *operational understanding* and the *ability to develop fundamental implicit understandings* of such important concepts as one-to-one correspondence (see Early Childhood Numeracy), Piaget would further concur that counting is an excellent exercise for helping children develop pre-formal number concepts that eventually lead to an enhanced ability to apply one-to-one correspondence

and rational counting in an integrated and cogent manner, as well as to conserve number. Evidence supports the notion that children who fail Piagetian conservation tasks still often operate quite successfully when making judgment of equivalence between sets with small numbers of objects through counting (Gelman & Gallistel, 1978), to the extent that some suggest that equality of sets based on numbers counted occurs earlier than when based on one-to-one correspondence (Thompson, 1989). As a final precaution regarding over-analysis, noteworthy given the backdrop: Even the phrase “number concept” itself is misleading because of the existence of a variety of number concepts, and the usefulness of the idea of one-to-one correspondence is no justification for its use as a criterion for judging a young child's grasp of number (Freudenthal, 1973).

Aubrey, C. (1993). An investigation of the mathematical competencies which young children bring into school. *British Educational Research Journal, 19*(1), 27-41.

Brainerd, C. (1979). Concept learning and developmental stage. In H. Klausmeier and Associates (Eds.), *Cognitive learning and development: Piagetian and information processing perspectives*. Cambridge, MA: Ballinger.

Freudenthal, H. (1973). *Mathematics as an education task*. Dordrecht, Netherlands: Reidel.

Fuson, K., Richard, J., & Brials, D. (1982). The acquisition and elaboration of the number word sequence. In C. Brainerd (Ed.), *Children's logical and mathematical cognition: Progress in cognitive development research*. New York: Springer-Verlag.

Gelman, R., & Gallistel, C. (1978). *The child’s understanding of number*. Cambridge, MA: Harvard University Press.

Gelman, R., & Meck, E. (1983). Preschoolers’ counting: Principles before skill. *Cognition, 13*, 343–359.

Jedrysek, E. (2000). Number concept development in young children. In S. Vig, & R. Kaminer (Eds.), *Early Intervention Training Institute Newsletter* (pp. 1-3). Bronx, NY: Rose F. Kennedy Center.

Piaget, J., & Szeminska, A. (1952). *Child’s conception of number*. London: Routledge & Kegan Paul.

Thompson, I. (1989). Early years mathematics: Have we got it right? *Curriculum, 15*(1), 42-48.

Be sure to read the following related articles:

Early Childhood Numeracy

Count With Me!

Add With Me!

Read the following related Research Précis:

Edition 04 - 2 Early Numeracy: Number and Language

Edition 04 - 3 Early Numeracy: Initial Cardinality

Read about other resources for teachers and parents of preschool children.

Go to the **PreKorner™** homepage!

