Contact (session chair) email: baroody@illinois.edu

Symposium Title: *Issues in assessment and scoring of early numeracy skills*

Conference section: (1) *Early childhood mathematics and science education*; (2) *Research Methods*

Presenting Authors (in order), Affiliations, e-mail:
Arthur J. Baroody, University of Illinois at Urbana-Champaign, baroody@illinois.edu
Erin E. Reid, University of Illinois at Urbana-Champaign, erinreid@illinois.edu
David J. Purpura, University of Illinois at Urbana-Champaign, dpurpura@illinois.edu

Non-presenting Author, Affiliation, e-mail:
Michael D. Eiland, University of Illinois at Urbana-Champaign, meiland@illinois.edu

Paper presentation order:

*Paper 1:* *Scoring Fluency with Basic Addition Combinations in Context*,

*Paper 2:* *Assessing A Linear Representation of the Counting Numbers*
Erin E. Reid, Arthur J. Baroody, and David J. Purpura

*Paper 3:* *Practical Issues in Early Mathematics Assessment*
David J. Purpura, Arthur J. Baroody, and Erin E. Reid

*Discussant:* Herbert P. Ginsburg
Symposium Justification

Symposium Title: Issues in Assessment and Scoring of Early Numeracy Skills

Paper 1: Scoring Fluency with Basic Addition Combinations in Context
Paper 2: Assessing A Linear Representation of the Counting Numbers
Paper 3: Practical Issues in Early Mathematics Assessment

Mathematical proficiency has become an academic and economic gatekeeper and has been linked to success in other academic domains (Baroody et al., 2006; Geary, 1994; Mazzocco & Thompson, 2005; National Mathematics Advisory Panel, 2008). Children begin acquiring mathematical competencies at a very early age (Clements & Sarama, 2008; Duncan et al., 2007; Halberda et al., 2008; Starkey & Cooper, 1980; Starkey et al., 2004; Wood & Spelke, 2005), and these early competencies build upon one another and are necessary for the successful acquisition of later school competencies. However, individual differences emerge early, persist, and become more pronounced as children develop (Aunola et al., 2004; Duncan et al., 2007; Jordan et al., 2006; Locuniak & Jordan, 2008; Mazzocco & Thompson, 2005). For these reasons, interest in early mathematical development and intervention continues to grow among both researchers and educators. However, for research or instruction in this domain to be effective, it is necessary to use valid and reliable assessment tools. Currently, there are numerous research-based and published measures available for both use in research and practice. As a whole, these tests are reliable and valid indicators of young children’s overall mathematical abilities. However, at an item or domain level, there are a numerous practical and psychometric concerns that can lead to erroneous conclusions about children’s mathematical knowledge or development, the effectiveness of intervention, and misidentification of a child’s abilities. Further, many of the administrative procedures for aspects of these tests may be unnecessary, cumbersome for the test administrator, and overly time consuming. The central goal of this symposium is to address how assessment of early mathematical knowledge can be done more accurately or otherwise more effectively.

The first presentation addresses the issue of whether the conventional procedure of scoring mental-addition fluency on a trial-by-trial basis is valid. Scoring the results of a training experiment with at-risk first graders in context (taking into account a child's responses to other trials) revealed response biases that produced false positives. In comparison to scoring in context (in which such false positives are scored as incorrect), the conventional method of scoring all correct and fast responses as fluent overestimated the effects of an experimental intervention. Conventional scoring, then, can lead to inaccurate conclusions about an intervention’s effectiveness.

The second presentation focuses on the whether the commonly used number-line task for assessing a linear representation of number is confusing to young children. An experiment with 5 and 6 year olds indicates that, in comparison to a task that takes into account young children’s understanding of numbers, the conventional task underestimates children’s number knowledge.

The third presentation addresses practical assessment and scoring issues on commonly used tasks of basic numeracy such as structured counting, cardinality, number combinations, and verbal counting. These issues relate to ease of administration, empirically derived scoring techniques, and comparisons of item presentation formats.

Together, the presentations address issues that are critical to efficient and valid assessment of early mathematics skills and provide useful information for anyone interested in mathematics assessment administration or development.
References


