

Title: Preschoolers' opportunities to learn numeracy and patterning at school

Ashli-Ann Douglas, Jennifer Tang, Erica Zippert, Bethany Rittle-Johnson

Little is known about how often preschool teachers provide instruction about specific numeracy and patterning concepts despite research indicating that some numeracy and patterning concepts are unique predictors of preschoolers' later math achievement (Fyfe et al., 2019). Thus, 44 pre-K teachers from 5 public and 7 private schools were asked to report on their numeracy and patterning instruction via a 17-item (see Table 1 for frequency of items).

Teachers provided numeracy instruction more often ($M = 13.40$ days per month, $SD = 3.66$) than patterning instruction ($M = 9.93$, $SD = 2.60$), $t(43) = 4.57$, $p < .001$. The numeracy and patterning concepts they taught most often were object counting and identifying patterns, while the least frequent were arithmetic and abstracting patterns. Further, teachers taught foundational numeracy concepts (e.g. rote counting and identifying written numerals) more often than advanced numeracy concepts (e.g. arithmetic and magnitude comparison), $t(43) = 5.99$, $p < .001$. Similarly, they taught foundational patterning concepts (e.g. figuring out what comes next in patterns) more often than advanced patterning concepts (e.g. identifying pattern units), $t(44) = 4.69$, $p < .001$.

Results indicate that patterning is a focus of math instruction in preschool, although less than numeracy. Additionally, preschool teachers primarily focus on foundational than advanced math concepts suggesting that they may benefit from guidance on children's math learning trajectories (Clements & Sarama, 2008). Future research should examine the frequency of preschool teachers' instruction about other math concepts such as geometry.

References

- Clements, D., & Sarama, J. (2008). Experimental Evaluation of the Effects of a Research-Based Preschool Mathematics Curriculum. *American Educational Research Journal*, *45*(2), 443–494. <https://doi.org/10.3102/0002831207312908>
- Fyfe, E. R., Rittle-Johnson, B., & Farran, D. C. (2019). Predicting success on high-stakes math tests from preschool math measures among children from low-income homes. *Journal of Educational Psychology*, *111*(3), 402–413. <https://doi.org/10.1037/edu0000298>

Table 1

Frequency of Numeracy and Patterning Instruction

Math Concept	<i>M</i>(<i>SD</i>)
<u>Numeracy</u>	
Advanced	10.80(5.34)
Compare quantities	12.93(6.34)
Add simple sums or talk about number facts without objects	8.21(8.44)
Simple adding & subtracting with objects	11.97(6.99)
Count backward	10.07(7.82)
Foundational	15.38(3.51)
Count items	19.39(1.90)
Count out loud above 10	17.16(5.39)
Match number names to appropriate set of objects	13.70(7.12)
Talk about what number comes before or after another	13.42(7.42)
Name written numerals	12.74(7.72)
<u>Patterning</u>	
Advanced	8.20(6.37)
Describe patterns in word	9.36(7.34)
Copy a pattern with different materials	6.79(7.54)
Identify the part that repeats in patterns	8.46(7.58)
Foundational	10.41(7.01)
Figure out what comes next in pattern	10.02(7.11)
Make or copy pattern with objects or sounds	10.80(7.63)

Notes. Two of the 17 items were not numeracy or patterning concepts and so were not included in analyses. One patterning item (“Discuss patterns in days of week, months in year, or seasons”; $M = 15.18$, $SD = 7.38$) could not be classified as advanced versus foundational.