Science in the Classroom: Finding a Balance between Autonomous Exploration and Teacher-led Instruction in Preschool Settings

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There is growing recognition of the importance of including science learning experiences in prekindergarten.[1] Nevertheless, little science instruction occurs in the typical classroom. Designated science areas, if present, are often neglected by teachers and students.[2] We ask whether an intervention targeting children's understanding of one particular science tool - the balance scale- will:

• "market" the science area and draw children to play there.

•increase understanding of this common measurement tool.

Method

• Observations of 6 classrooms in urban New Brunswick, NJ

• Interviews with 16 intervention participants (mean=58 mos., 12 girls) and 19 controls (mean=56 mos., 12 girls)

References

[1, 2] Brenneman, K. Stevenson-Boyd, J. & Frede, E. (in press). Early mathematics and science: Preschool policy and practice. *Preschool Policy Matters*. New Brunswick, NJ: National Institute for Early Education Research.

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[2] Tu, T. (2006). Preschool science environment: What is available in a preschool classroom? *Early Childhood Education Journal, 33(4), 245-251.*

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Phase 1 - Pre-intervention

• Science area observations

  • 120 minutes each, over 4-5 days, during free play

  • time sampling method (every minute) to record presence of children and teachers and their activities

• Interviews

  • after observations were completed

  • included 3 questions about the balance scale

    • What is this called?

    • Which side is heavier (after putting objects in the buckets)?

    • Can you make the two sides even/equal? Show me.

Phase 2 - Intervention

• Two circle time lessons about the balance scale in intervention classes

  • introduced children to a tool found in their science area

  • provided experience using and interpreting the balance scale

• Two circle time science lessons unrelated to the balance scale in control classes

  • probed children's ideas about the insides and outsides of unusual animate and inanimate objects

Phase 3 - Post-intervention

•Science area observations

  • immediately after lessons

  • balance scale returned to science area

  • all activity recorded for 60-80 minutes after each lesson

• Interviews

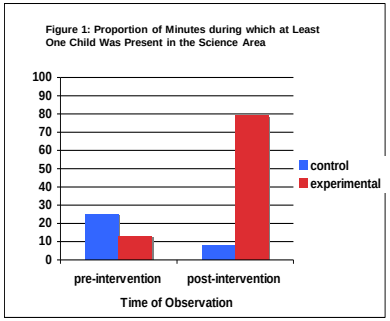
  • 20-25 days after intervention

  • same questions as pre-test except Questions 2 and 3 were asked twice and scores averaged for comparison to pre-test scores

Results

1. Did the intervention increase children's interest in the science area?

Yes. The number of minutes children spent in the science area increased in experimental classrooms after the intervention, $\chi^2(1), 167.89, p<.01$. Figure 1 illustrates this effect.

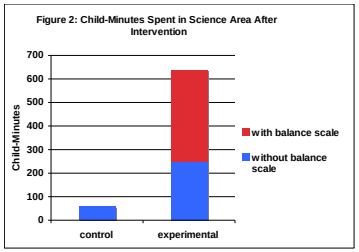


We also calculated "child-minutes" by summing the number of children present in the science area during each minute that the area was occupied. Child-minutes increased from 76 to 635 in the experimental condition, and decreased from 118 to 57 in the control condition, $\chi^2(1) = 264.36, p<.01$.

2. What did children do in the science area?

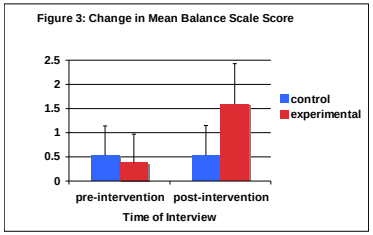
As shown in Figure 2, interaction with the balance scale increased from 0 to 387 child-minutes in the experimental classrooms and remained at 0 in the control classrooms.

The balance scale intervention also increased attention to other science materials. When we subtracted child-minutes spent with the balance scale from total child-minutes, the increase in child-minutes in the science area remained reliable, $\chi^2(1) = 92.45, p<.01$.



3. Did children's knowledge about the balance scale increase as a result of the intervention?

Yes. Each child earned a "balance scale score" based on responses to the three questions about the scale. Figure 3 shows the interaction between time of interview and experimental condition, $F(1,33) = 19.37, p<.01$.



Results for individuals mirrored group means. In the experimental condition, 13 (out of 16) participants' scores increased, 1 decreased, and 2 stayed the same. This increase was reliable, $p<.001$, sign test. In the control condition, these figures were 4, 6, and 9 (out of 19) respectively.

Conclusion

Baseline data confirm that preschoolers do not spend much time in the classroom science area nor do they know much about a tool that is often found there - the balance scale. A 2-day circle time intervention was successful in marketing the science area and led to increased knowledge about the function of the scale. Results suggest that a little bit of teaching can have a large effect on where children choose to play and what they choose to play with.