Early Childhood Educ J (2009) 37:63–69
DOI 10.1007/s10643-009-0320-5

Professional Development + Coaching = Enhanced Teaching: Increasing Usage of Math Mediated Language in Preschool Classrooms

Loretta C. Rudd · Matthew C. Lambert · Macy Satterwhite · Cinda H. Smith

Published online: 3 June 2009

Abstract In an effort to determine the most efficacious manner to deliver professional development training to early childhood educators, this study investigated the effect of a 2-h workshop followed by side-by-side classroom coaching. Twelve early childhood educators with 4-year degrees teaching in a university child development center participated in the study. The twice weekly classroom observations were analyzed for the use of math mediated language. Results indicate a 56% increase of math mediated language following the professional development; however, the greatest increase (39% increase over professional development condition) occurred during the side-by-side coaching phase of the treatment. These results corroborate previous findings that implementation of teaching strategies presented in professional development trainings can be enhanced by coaching teachers on the use of the strategies.

Keywords Professional development · Coaching · Mathematics education · Early childhood education

Since the passage of the federal *No Child Left Behind* legislation, the call for accountability in our education system has trickled down to our youngest citizens, infants, toddlers and preschoolers in child care programs. A growing, but decidedly limited, body of empirical knowledge exists today about the effects of current child care practices on young children's developmental and educational futures. In the 1990s with welfare reform, our federal government committed to improving the quality of child care by initiating a Quality Improvement project. Federal and state agencies responsible for establishing these quality criteria have focused their attention on staff qualifications and caregiver training. Overwhelmingly the research has shown a correlation between caregiver education and training and outcomes for young children in their care.

L. C. Rudd (✉) · M. C. Lambert · M. Satterwhite · C. H. Smith
Texas Tech University, Lubbock, TX, USA
e-mail: loretta.rudd@ttu.edu

Caregiver Training and Education

In Texas, all child caregivers are required to have at least a high school diploma or its equivalent and 8 h of pre-service training. In addition, these caregivers must receive 15–20 h of training in early childhood education and child development each year. In no other profession is the importance of education and training more important than in the care of our youngest children (e.g., Howes 1983, 1997; Arnett 1989). Less studied is the effectiveness of current methods of caregiver training. This research proposes a study of the effectiveness of a particular method of caregiver training.

Howes (1983, 1997) demonstrated in two large child care studies that children's language, cognitive skills, and play complexity were related to their teacher's level of education. Kruif et al. (2000) found that teachers who had an associate's or bachelor's degree used more elaborative and less directive interactions with toddlers than those teachers with no post high school education. These results corroborate the findings of other studies (Arnett 1989; Howes 1997; Howes et al. 1995; Harms et al. 1990). For example, Arnett (1989) found that training was in fact related to the attitudes and behaviors of the caregiver. The more training the caregivers had, the less authoritarian and the more positive they were with the children in their charge.

Additional studies have shown that caregivers with more formal education, specifically in early childhood, tend to provide higher quality child care. Burchinal et al. (2002)

found that caregivers with formal education in early childhood education were rated as having more sensitive interactions with children in their care. In turn, these children had more advanced language skills. Although relatively few well-controlled empirical studies of in-service training have been conducted, Collins et al. (1987) found that child caregivers' overall communication skills improved with training.

Mathematics in Early Childhood

Several researchers have written extensively about the mathematical abilities of young children. In his seminal work, *Children's Arithmetic: How They Learn It and How You Teach It*, Ginsburg (1989) determined that young children possess mathematical concepts and skills long before they enter formal schooling. In addition, he found that almost all children engage in some form of arithmetic problem solving, if only in an elementary nature (Ginsburg 1989). It has been determined that young children, regardless of their SES or gender, engage in a considerable amount of mathematical activity during their free play (Seo and Ginsberg 2004). Clements (2004a, b) demonstrated that young children have the ability to not only name, describe and sort geometric shapes, but to also discuss complex features of these shapes (Clements 2004a, b). Given the research delineating the seemingly complex mathematical skills young children possess, it is no wonder that Baroody (1987) calls for early childhood educators to "build on children's informal mathematical knowledge" (p. 35). In a more recent work, Baroody (2004) proposes that early childhood educators need to adopt the investigative approach in an effort to facilitate mathematics instruction for young children. Baroody (2004) continues by stating that teachers "need an extensive knowledge base, one that includes a deep understanding of mathematical psychology" (p. 157).

While many studies regarding the training of the caregivers focus on their interaction style, this proposed research focused specifically on the usage of math mediated language. Skilled teachers recognize the importance of language as a tool for teaching mathematics (Whitin and Whitin 2003). They are able to shape and guide conversations using language to help students further their development of mathematical concepts. In addition to recognizing the importance of language as a tool for teaching mathematics, it has been suggested that teachers must plan experiences that connect new mathematical terms or phrases to ideas children already know (Rubenstein and Thompson 2002). When teachers focus on the language of math and present mathematical concepts in fun, engaging ways, children are motivated to learn concepts beyond what is traditionally expected of their age (Kamii and Anderson 2003).

Coaching

A form of training proposed in the present study is coaching of caregivers. It has been shown that the overall quality of the classroom as measured by the Infant Toddler Environmental Rating Scale (ITERS, Harms et al. 1990) was improved when teachers were mentored in addition to receiving direct instruction (Fiene 2002). In addition, effective teaching behaviors were increased and ineffective teaching behaviors decreased as a result of coaching (Miller et al. 1991). A link has been shown between the implementation of coaching and improved social behaviors of children. Hendrickson and colleagues found improvements in children's classroom behaviors and social interactions as a result of coaching the teachers (Hendrickson et al. 1989, 1993).

In a recent study by Rudd et al. (2008), it was found that caregivers of infants and toddlers could be trained through a 4-h professional development experience to engage in more frequent and better types of interactions with toddlers. However, the study found considerable variability in the caregivers' levels of implementation of the process. In a follow-up study, Rudd et al. (2009) found that teachers who received side-by-side coaching demonstrated a higher degree of professional development implementation; however, statistical significance was not reached due to flaws in the research design. Therefore, the current study is necessary to determine the effect of side-by-side coaching as a means of improving implementation of strategies taught in professional development seminars.

The primary research objective of the current study was to discern the critical elements influencing caregivers' implementation of math mediated language when interacting with young children. More specifically, the present study investigated to what degree side-by-side coaching following training improves the level of implementation of the usage of math mediated language in a quality early childhood center.

Methods

Participants

Twelve teachers employed at a university child development center participated in this study. All participants submitted consent to participate, and demographic/academic background forms prior to the commencement of observations. All the participants were female. Table 1 provides the

Table 1 Participant demographic information

	N	Mean	SD
Age	12	35.5	10.81
Childcare experience	12	6.5	6.34
Early childhood hours	11	40.9	18.61
Math hours	10	5.1	2.14

Values for age and childcare experience represent years, while values for early childhood hours and math hours represent college credit hours earned

demographic information submitted by the participants. The mean age of the participants was 35.5, $\sigma = 10.81$. Based on the academic forms submitted by the participants, all twelve participants held a bachelor's degree and many participants (33%) indicated that they had completed some graduate level hours. The mean number of credit hours earned in early childhood education was 40.9, $\sigma = 18.61$. The total number of credit hours earned in math varied, but the average was quite low with a mean of 5.1, $\sigma = 2.14$.

Instruments

The data collected for this study included a demographic survey and an Observational Coding Matrix developed for this study.

Demographic Survey

This form queried the birth date/age, education level, training in early childhood education and mathematics, and years of experience of the participants.

Observational Coding Matrix (OCM)

The OCM was developed to collect data on the frequency and duration of math mediated language in the classroom. The categories for the OCM were adapted from *The Young Child and Mathematics* of NAEYC (Copley 2000). The categories included in the OCM are: (a) use of numbers, (b) spatial relations, (c) measurement, (d) geometry, (e) operations, (f) seriation, (g) patterns, and (h) graphical display. Table 2 provides a list of the mathematical categories and an example of the language associated with each category. The categories are listed hierarchically in regards to the complexity of the mathematical concept.

Equipment

The researchers used handheld iPAQ computers to collect the data. The handheld computers were loaded with *Noldus* Observer XT 7.0 software. This software allows the data collector to tap the screen of the handheld computer when the behaviors of interest are observed. The software creates a log file for each observation session, which contains information such as frequencies and rates of behaviors, time stamps, environmental variables, notes made by the observer, as well as any other data collected by the researchers. The log files are then uploaded to a laptop computer equipped with Observer XT software for analyses.

Procedures

Prior to the initiation of the study, two graduate students were trained on data collection techniques by the lead

Table 2 Adapted from learning paths and teaching strategies in early mathematics, NAEYC

Content area	Examples of skills	Examples of "teacher talk"
Number	Counting, labels "how many" objects	Models counting Asks "how many"
Operations	Adds or subtracts using counting-based strategies	Asks "how many are left" or "how many all together?" Demonstrates how to count on or "take away" with objects
Geometry	Recognizes, names or matches 2-D and 3-D shapes Uses shapes separately to create a picture	Introduces and labels a wide variety of shapes Helps children construct shapes in art or other play activities
Spatial	Describes object locations with spatial words	Creates opportunities for children to identify the location of objects by using spatial words (e.g., in, on, under, behind, etc.)
Measurement	Recognizes and labels measurable attributes of objects	Uses comparing words for size, length, weight
Pattern/algebra	Notices and copies simple repeating patterns	Provides opportunities to identify patterns in nature and in the classroom (e.g., color, shape, or size patterns)
Displaying and analyzing data	Sorts objects and counts and compares the groups formed Helps make simple graphs	Provides opportunities for the children to sort, count and then graph their findings
Seriation/ordinal	Ordering of events or objects	Provides opportunities for children to count using 1st, 2nd, 3rd, etc. OR order events by time, objects by size

researcher. The lead researcher provided information on the use of the iPAQ handheld computers, *Noldus* Observer XT 7.0 software, and inter-observer agreement. The research team then independently coded 5 min segments of classroom interactions. The research team was able to assess and obtain significant inter-observer agreement (IOA) with an intraclass Cohen's $k = 0.83$ between all three observers. Due to the number of mathematical categories as well as the homogeneity of several categories (i.e. number and operation), a $k = 0.83$ was considered significant for this research.

The participants for the study were recruited in person by the lead researcher. At the time of recruitment, the nature of the study was described. The participants were informed of the treatment (professional development and coaching), the time commitment, and the risks and benefits of participation. At the conclusion of this explanation all twelve teachers present agreed to participate. Upon agreeing to participate, the teachers completed the consent form and demographic form.

After agreeing to participate, baseline data were gathered on the teachers to determine the current level of math mediated language used in the classroom. The baseline data were collected using the OCM for a 30-min running observation. The observer collected the data from observation rooms equipped with one-way mirrors that are located between each pair of classrooms in the child development center. Each observation room is wired with Hearback® devices enabling a researcher to manipulate multiple microphone feeds, within a single classroom, to best capture teacher vocalizations. All observation sessions conducted for this study were completed from these observation rooms.

Two weeks after consenting to participate, the teachers attended a 2-h training session conducted by the lead researcher. The training was held at the child development center and occurred during the afternoon of a work day typically reserved for staff meetings. Again, all twelve teachers participated in the training which included lecture, live demonstration of concepts, hands-on engagement with materials and planning with co-teachers.

Following the training on using math mediated language in the early childhood classroom, teachers were observed twice weekly for 30 min to determine their level of implementation of the training. The initiation of the coaching phase was staggered across time similarly to a multiple-baseline design in an attempt to discern the effect of professional development from the effect of professional development paired with coaching. Two randomly selected classrooms, four educators, received coaching. One week following the professional development training while the other eight educators did not receive coaching. One week following the implementation of the coaching phase the next two classrooms received coaching and so forth for the remaining educators. Figure 1 provides a visual representation of the experimental design.

During the coaching phase of the project, the researcher entered the classroom and observed the teacher interacting with children. The researcher made notes of the setting, the teachers' usage of math mediated language, and any missed opportunities to use math mediated language. After this in-class observation, the researcher met briefly with the teacher to discuss the notes, provide suggestions for using math mediated language, and provide answers to questions or concerns the teacher might have regarding mathematics in the early childhood classroom. A second observation was scheduled to allow the teacher to implement any further suggestions. Each teacher received 2 weeks or four sessions of in-class coaching.

Following coaching, the researchers collected follow-up data to determine the sustainability of the training plus coaching. Again, these observations were conducted for a 30 min running time from the observation booths. Following data collection, data files were transferred from the handheld computers to a computer hard drive and analyzed using *Noldus* Observer XT and SPSS software.

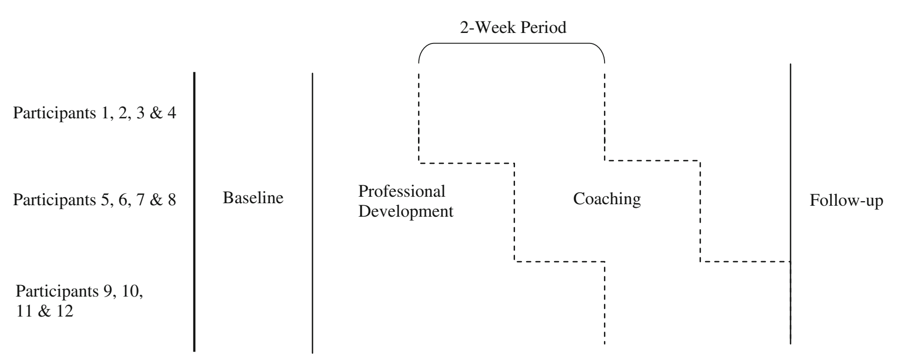

Fig. 1 Visual display of experimental design. Exposure to the experimental intervention during the professional development condition did not vary across participants (i.e. the professional development condition consisted of only one instance of training)

Results

Observations were analyzed both in terms of aggregated (i.e. group) behavior as well as individual level behavior. However, the majority of data analyses discussed in the following section pertain to aggregated data due to the high variability of within-participant data.

All twelve participants increased their usage of math mediated language following only professional development. The group increased an average of 56% over baseline, engaging in an average of 36.95 instances ($\sigma = 14.24$) of MML per observation session compared to an average of 26.6 instances ($\sigma = 13.41$) of MML during the baseline condition. A subsequent increase (39.5%) in MML was observed following the implementation of the coaching condition. Participants averaged 51.55 instances ($\sigma = 26.54$) of MML during the coaching condition. Figure 2 depicts the average rate of MML used during each condition of the study.

Table 3 displays the frequency, mean rate, and the standard deviation of MML across all eight categories following the conclusion of the follow-up condition (i.e. the table contains data from baseline, professional development, coaching, and follow-up conditions).

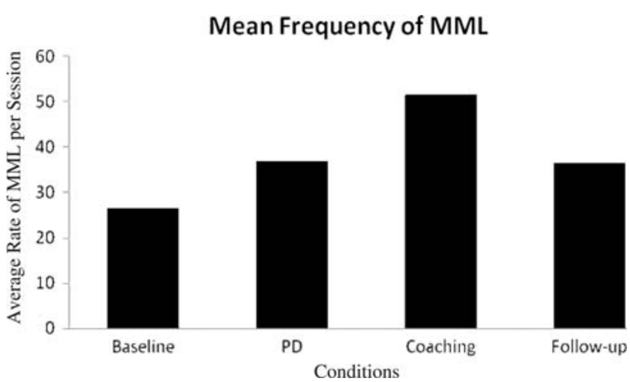

Fig. 2 Average rate of MML per session

Table 3 Descriptive statistics of observed math mediated language

Math category	Frequency	Percent	Mean	SD
Number	598	24	49.83	47.12
Spatial	687	28	57.52	31.21
Geometry	98	4	8.61	2.63
Measurement	761	31	63.41	17.34
Seriation	221	9	18.41	5.44
Operation	51	2	4.25	1.87
Pattern	48	2	4	1.74
Display	3	0.1	0.25	0.32

Professional Development

Following professional development all twelve participants increased their use of MML in the classrooms. Overall, professional development attributed to a positive effect on educator behavior; the participants increased an average of 56% over baseline levels for the same behaviors. However, participants across age levels implemented the training differently. For instance, preschool educators tended to use more measurement and seriation language (i.e. high-level) while toddler and infant educators used more number and spatial language (i.e. low-level).

Low-Level Categories

Low-level categories included spatial, number, and geometry. The participants were using language defined as low-level MML at an average rate of 22.4 instances per session during the baseline condition. Following the professional development the use of low-level MML actually decreased, for the entire sample, to a rate of 19.8 instances ($\sigma = 12.31$) per session. However, toddler and infant educators increased low-level MML over that of baseline. Toddler and infant educators used an average of 20.2 instances ($\sigma = 12.43$) of low-level MML per session during the baseline condition and an average of 27.8 instances ($\sigma = 14.2$) of low-level MML during the professional development condition. Conversely, preschool educators decreased their use of low-level MML during the professional development condition from 24.8 instances ($\sigma = 17.22$) during baseline to 18.2 instances ($\sigma = 13.61$) during professional development. Infant and preschool educators increased their use of low-level MML at a greater rate than preschool educators following the receipt of professional development.

High-Level Categories

High-level MML included operations, seriation, measurement, patterns, and display. These categories were observed quite rarely during the baseline condition and therefore became a focus of the professional development training session. Increases in high-level MML were not consistent across age levels. Preschool educators increased their use of high-level MML at a greater rate than toddler and infant educators. Preschool teachers engaged in an average of 7.8 instances ($\sigma = 4.21$) of high-level MML during baseline compared to 3.42 instances ($\sigma = 1.86$) engaged in by toddler and infant educators during baseline. Following the receipt of professional development, preschool educators increased their use of high-level MML to an average of 12.3 instances ($\sigma = 6.1$) per session while toddler and infant educators increased high-level MML to an average of 8.21 instances ($\sigma = 5.22$) per session.

Coaching

Following the professional development condition of the study, participants were exposed to side-by-side coaching in the classroom for 2 weeks. During the coaching condition, participants averaged 51.55 instances ($\sigma = 28.2$) of MML, a 39.5% increase over the professional development condition. MML usage during the coaching condition increased 118% over the rate of MML observed during baseline. A significant increase in MML was observed for eleven of the twelve participants across the professional development and coaching conditions. The one participant who did not significantly increase her usage of MML across conditions already engaged in what were considered to be high levels of MML during both the baseline and the professional development conditions.

Low-Level Categories

Similar patterns of differential engagement of MML were observed during the coaching condition as were observed during the professional development. Infant and toddler educators used more spatial and number language than preschool teachers during the coaching phase. However, preschool educators did increase their use of low-level MML across professional development ($m = 18.2, \sigma = 13.61$) and coaching conditions ($m = 24.31$, $\sigma = 14.16$).

High-Level Categories

Preschool educators increased their use of high-level MML at a greater rate than toddler and infant educators during the coaching condition. Preschool educators engaged in an average of 18.2 instances ($\sigma = 11.34$) of high-level MML during the coaching condition compared to 8.52 instances ($\sigma = 6.72$) engaged in by toddler and infant educators.

Follow-Up

A follow-up probe was conducted 2 weeks before the conclusion of the school year which was two to 4 weeks following the termination of the coaching condition dependent on participant. This condition consisted of one 30-min observation session. Participants averaged 36.66 instances ($\sigma = 15.71$) of MML per session which was an approximately 56% increase over baseline and identical to levels observed during the professional development condition, but represents a 39.5% decrease from the coaching condition.

Discussion

Overall, professional development had quite a positive effect on the frequency of MML. However, the greatest increase in MML was observed during the coaching condition. This pattern of MML (i.e. increase from baseline to PD and subsequently an increase from PD to coaching) was observed on a single-subject basis for nine of the twelve participants. The increases of MML were consistent with the manipulation of experimental conditions despite the staggered implementation during the coaching condition.

Please note that single-subject data are not presented due to the high degree of variability in the observed data. In many cases, descriptive statistics provided a more parsimonious analysis of treatment effect. A large proportion of variability appeared to derive from the nature of the teaching environment in this particular learning center; each classroom has two educators. As observations progressed, researchers discovered an interesting dynamic occurring between the two educators in many of the classrooms. Educators in the same classroom would engage in differential levels of MML on any given day. For instance, as one educator increased her use of MML the other educator would decrease her use of MML during the same school day. This dynamic appeared to extend to all adult-child interactions. One educator would focus more on child interaction and instruction while the other educator focused more on custodial duties and activity preparation. This pattern of inversely related MML behavior, with respect to the pairs of educators, was observed across four of the six pairs of teachers. The most salient patterns were observed in the preschool classrooms. This relationship between educators led to sizable fluctuations in data thusly decreasing the visual proficiency that single-subject graphs possess.

Although the primary research objective concerned increasing MML by providing training and coaching, secondary research objective was to delineate the effects of training and the effects of training paired with coaching. To demonstrate the relationship between training and educator use of MML, researchers collected baseline data and then implemented a training session for all participants. To investigate the effect of side-by-side coaching, researchers used a design staggered across time in an attempt to mitigate internal threats to validity such as a carry-over effect from the training condition. This component is rather similar to a multiple-baseline design used in single-subject research. Researchers observed significant increases in MML for ten of the twelve participants following the coaching condition. This increase in MML coincided with the introduction of the coaching condition for all ten participants regardless of when the coaching condition was initiated. This systematic change in MML yields confidence that the coaching condition had a functional relationship with MML and was indeed the more significant component of the intervention package.

This research suggests that the professional development training in addition to side-by-side coaching was an effective intervention package for increasing MML for this sample of early childhood educators. However, the analysis of data is a limitation to this study. The use of descriptive statistics yields results quite favorable to suggest an increase in MML. In contrast to descriptive statistics, visual analyses of single-subject data are quite convoluted. The data, on an individual level, displays far too much variability to conclude, with a high degree of confidence, that functional relationships exist between MML and professional development or side-by-side coaching. High levels of variability in the data do not suggest that a functional relationship is absent, but the variability does make visual analysis of the data difficult. Aggregated data makes the analysis simpler and quantitative, but disregards the individual differences of implementation within the sample.

References

Arnett, J. (1989). Caregivers in day-care centers: Does training matter? *Journal of Applied Developmental Psychology, 10*, 541–552. doi:10.1016/0193-3973(89)90026-9.

Baroody, A. J. (1987). *Children's mathematical thinking: A developmental framework for preschool, primary, and special education teachers*. New York: Teachers College, Columbia University.

Baroody, A. J. (2004). The role of psychological research in the development of early childhood mathematics standards. In D. H. Clements & J. Sarama (Eds.), *Engaging young children in mathematics: Standards for early childhood mathematics instruction* (pp. 149–172). Mahwah, NJ: Lawrence Erlbaum Associates.

Burchinal, M. R., Cryer, D., Clifford, R. M., & Howes, C. (2002). Caregiver training and classroom quality in child care centers. *Applied Developmental Science, 6*(1), 2–11. doi:10.1207/S1532480XADS0601_01.

Clements, D. H. (2004a). Major themes and recommendations. In D. H. Clements & J. Sarama (Eds.), *Engaging young children in mathematics: Standards for Early childhood mathematics instruction* (pp. 7–72). Mahwah, NJ: Lawrence Erlbaum Associates.

Clements, D. H. (2004b). Geometric and spatial thinking in early childhood education. In D. H. Clements & J. Sarama (Eds.), *Engaging young children in mathematics: Standards for Early childhood mathematics instruction* (pp. 267–298). Mahwah, NJ: Lawrence Erlbaum Associates.

Collins, D., Gabor, P., & Ing, C. (1987). Communication skill training in child care: The effects of preservice and inservice training. *Child Youth Care Quarterly, 16*(2), 106–115. doi:10.1007/BF01083975.

Copley, J. V. (2000). *The young child and mathematics*. Washington, DC: National Association for the Education of Young Children.

Fiene, R. (2002). Improving child care quality through an infant caregiver mentoring project. *Child and Youth Care Forum, 31*(2), 79–87. doi:10.1023/A:1015318501688.

Ginsburg, H. P. (1989). *Children's arithmetic: How they learn it and how you teach it*. Austin, TX: Pro-Ed.

Harms, T., Cryer, D., & Clifford, R. (1990). *Infant-toddler environmental rating scale*. New York: Teachers College Press.

Hendrickson, J. M., Gardner, N., Kaiser, A., & Riley, A. (1993). Evaluation of a social interaction coaching program in an integrated day-care setting. *Journal of Applied Behavior Analysis, 26*, 213–225. doi:10.1901/jaba.1993.26-213.

Hendrickson J. M., Stroka K., & Gable R. (1989). Peer coaching: A specific approach for improving teacher performance and trainee competency (ERIC Document Reproduction Service No. ED 321:207).

Howes, C. (1983). Caregiver behavior in center and family day care. *Journal of Applied Developmental Psychology, 4*, 99–107. doi:10.1016/0193-3973(83)90061-8.

Howes, C. (1997). Children's experiences in center-based child care as a function of teacher background and adult: child ratio. *Merrill-Palmer Quarterly, 43*, 404–425.

Howes, C., Smith, E., & Galinsky, E. (1995). *The Florida child quality improvement study: Interim report*. New York: Families and Work Institute.

Kamii, C., & Anderson, C. (2003). Multiplication games: How we made and used them. *Teaching Children Mathematics, 10*(3), 135–141.

Kruif, R. E. L., McWilliams, R. A., Ridley, S. M., & Wakely, M. B. (2000). Classification of teachers' interaction behaviors in early childhood classrooms. *Early Childhood Research Quarterly, 15*(2), 247–268. doi:10.1016/S0885-2006(00)00051-X.

Miller, S. P., Harris, C., & Watanabe, A. (1991). Professional coaching: A method for increasing effective and decreasing ineffective teacher behaviors. *Teacher Education and Special Education, 14*, 183–191.

Rubenstein, R. N., & Thompson, D. R. (2002). Understanding and supporting children's mathematical vocabulary development. *Teaching Children Mathematics, 9*(2), 107–112.

Rudd L. C., Cain D. W., & Saxon T. F. (2008). Does improving joint attention in low quality child care enhance language development? *Early Child Development and Care*, *178*(3), 315–338.

Rudd L. C., Cain D. W., Wilder P. H., Saxon T. F., Myers A. E., & Menninger S. E. (2009). Coaching early childhood educators in high quality centers through the use of Focus-Follow-Talk procedures *Early Child Development and Care* (under review).

Seo, K. H., & Ginsberg, H. P. (2004). What is developmentally appropriate in early childhood mathematics education? Lessons from new research. In D. H. Clements & J. Sarama (Eds.), *Engaging young children in mathematics: Standards for Early childhood mathematics instruction* (pp. 91–104). Mahwah, NJ: Lawrence Erlbaum Associates.

Whitin, D. J., & Whitin, P. (2003). Talk counts. *Teaching Children Mathematics, 10*, 142–149.