The Effects of Professional Development on Preschool Teacher's Instructional Behaviours During Storybook Reading

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Abstract

Early literacy skill development at the preschool level is critical for later success in learning to read and other reading related activities. Professional development (PD), specifically coaching via performance feedback delivered through email, may provide a viable alternative to other types of trainings (e.g. workshops) that are often ineffective. This study investigated the impact of professional development on the instructional behaviors of teachers of children between the ages of 3 and 5, as well as the subsequent impact on children’s level and complexity of engagement during book reading sessions. A single-case multiple baseline design was applied across 3 teachers and 6 children in two preschool classrooms. Results of the study indicate that PD produced change in teacher behaviors, specifically, their increased implementation of specific evidence-based storybook reading strategies following intervention. Child level behaviors were not significantly changed as a result of the intervention. Implications for the results are provided for implementation of PD in early childhood settings.

Keywords: Professional Development, Preschool, Coaching, Performance Feedback, Early Literacy
Introduction

Literacy skills at kindergarten entry are strongly predictive of later development in reading and writing (Cunningham & Stanovich, 1997; Duncan et al., 2007). Children who lack early reading skills when they enter kindergarten are three to four times more likely not to graduate from high school (U.S. Department of Education, 2002). Furthermore, reading is highlighted as a critical skill predictive of a child’s future success in school and later in life, and thus deserves attention in the earliest years of a child’s schooling. Therefore, considerable attention has been given, both in research and policy, on efforts to improve young children’s early language and literacy skills.

Professional development (PD) of practicing early childhood (EC) educators is considered critical to the quality of experiences afforded to children, particularly with regard to improving early literacy and language outcomes (Powell, Diamond, Burchinal, & Koehler, 2010). However, one-shot workshops remain a common approach to PD in EC education (Guskey, 2003; Winton & McCollum, 2008), despite research questioning the usefulness of this approach for supporting the implementation of new practices (Snyder & Wolfe, 2008; Zaslow & Martinez-Beck, 2006). The ultimate goal of any PD is to improve students’ learning by enhancing teacher use of evidence-based approaches to instruction. With this in mind, an emerging conceptualization of PD is a shift away from a static, knowledge-based focus of training to an emphasis on: (a) sustained opportunities for teachers to learn specific content focused on what they are expected to teach (and children are expected to learn), (b) acknowledgement of the realities of the classroom and school environment, and (c) facilitating active learning (Powell & Diamond, 2011; Wayne, Yoon, Zhu, Cronen, & Garet, 2008).

A number of promising approaches to PD have emerged, including individualized supports or coaching with teachers, to promote implementation of newly learned skills. Coaching approaches that provide ongoing support and feedback about instruction and classroom practices are being acknowledged as potentially effective and perhaps, a more direct path to producing high-quality teaching in preschool (Landry, Swank, Smith, Assel, & Gunnewig, 2006; Pianta, 2005). Further, Pianta recommends that classroom observation also become a central feature of PD as a way to focus directly on how teachers
engage in the process of teaching. Using audio/video technology to record teacher practices is one way to increase repeated observations, and could allow teacher educators to assess teacher performance during and after training activities (Kretlow & Bartholomew, 2012).

This study focuses on one specific coaching strategy called performance feedback. Performance feedback involves providing the teacher with feedback using data from observations of that teacher in the context of his or her classroom (Hemmeter, Snyder, Kinder, & Artman, 2011). As more teachers have gained access to technology, the Internet has become a way to deliver PD (Kinzie et al., 2006; Pianta, Mashburn, Downer, Hamre, & Justice, 2008; Whitaker, Kinzie, Kraft-Sayre, Mashburn, & Pianta, 2007) and a mechanism through which performance feedback might be effectively and efficiently delivered. Computer technology, such as multi-media presentations as well as web-based materials, could serve as effective tools to facilitate teacher learning (Ludlow, 2002; Putnam & Borko, 2000). Researchers further recognize the additional benefits of web-based education such as convenient access and flexible time and pace (Killion, 2000; Matthews, 1999).

Performance feedback can be provided either verbally or in written form, both of which can be cumbersome, time-consuming, and potentially disruptive for both the coach and teacher. Therefore, more efficient methods for providing feedback to teachers should be considered. For example, email has several advantages over more traditional methods. First, email can be sent immediately following an observation without interrupting classroom activities or removing the teacher from the classroom. Second, emails provide an electronic record, allowing the teacher to review the nature and content of the feedback. Finally, email can include questions or opportunities for responses from the teachers, thus promoting dialogue between teacher and coach (Barton & Wolery, 2007).

This study was designed to investigate the impact of a technology delivered PD package paired with performance feedback using email, on the instructional behaviors of teachers of children between the ages of 3 and 5 during book reading sessions. Two research questions were posed to assess the impact of training on teachers: (1) Is there a functional relationship between PD and teacher’s use of strategies? and (2) Is there a functional relationship between PD and teacher’s quality of interactions? A secondary
question was posed to determine the impact of PD on the level and complexity of children’s engagement during book reading sessions.

Methods

Participants

Teachers from identified centers were selected based upon the following criteria: (a) lead teacher in a classroom of children between the ages of 3 and 5, (b) interest in the study, and (c) assessment of book reading practices. The three teachers who were interested in and eligible to participate in the study were interviewed and observed reading a storybook to their children. Information from the interviews as well as analysis of teacher book reading sessions indicated the teachers were not familiar with the intervention content, nor were they consistently implementing the proposed study procedures during book reading. Each teacher was then asked to identify two children from their classroom to serve as targets for observation and participation based upon the following criteria: (a) teacher’s perceived benefit from participation in that the identified children were those who typically struggled with engagement during book reading sessions, (b) regular attendance, and (c) expected enrollment through the summer months.

Tables 1 and 2 provide demographic information on the teachers and children, respectively.

Setting

This study was implemented in two child care centers in a small mid-western town, serving children and families ranging from low to middle socio-economic status. Both centers were selected from a state database of licensed child-care facilities with year round operation and employing teachers of children between the ages of 3-5. The study was conducted in each teacher’s individual classroom as she read to a group of approximately 10-20 children, depending on classroom enrollment and attendance.

Design

This study used a single-case design with multiple baselines across three teachers and six children, to examine the effects of PD on teacher’s implementation of the intervention, and the subsequent impact of the implementation on children’s level and complexity of engagement during book reading sessions. Data were graphed for visual comparison of changes resulting from the intervention
over time, including immediacy of effect and trend. Data were also analyzed to compare the pre and post intervention means for each dependent variable.

An additional calculation for single-case research data, improvement rate difference (IRD), was also completed. IRD is defined as the improvement rate (IR) of the intervention phases(s) minus the improvement rate of the baseline phase(s), and is calculated as the difference between two IRs (Cochrane Collaboration, 2011; Sackett, Richardson, Rosenberg, & Haynes, 1997). The IR for each phase is defined as the number of “improved data points” divided by the total data points in that phase. Improved or unimproved data are defined by data overlap between two phases. In the baseline phase of this study, unimproved data points did not overlap any intervention phase data point. In the intervention phase of this study, unimproved data points equaled or fell below one or more baseline data points. Improved data points were identified visually, and the IRD was calculated as the difference between two independent proportions. A maximum IRD score of 100% (1.0) indicates all intervention phase data points exceed all baseline data points. An IRD of 50% (.5) indicates that half of the scores are overlapping, demonstrating no improvement from baseline to intervention (Parker, Vannest, & Brown, 2009).

Baseline and intervention. Videotaped probes of book reading sessions occurred throughout the duration of the study and were scheduled such that each teacher was videotaped between 2-4 times over the course of 5 days. The first author was the primary video recorder for all sessions. The camera and microphone were positioned behind the children such that the teacher and book were in full view of the camera, and only the targeted children were visible. The coaching aspect of the intervention was delivered primarily via email upon the conclusion of each book reading session. Children targeted for observation during the book reading sessions were included in the same video probes as the teacher, and data was collected on both children in each classroom.

In baseline, teachers’ book reading sessions were videotaped in a “business as usual” format; that is, without any type of intervention or input. It was assumed the target children’s behavior was typical of that displayed on any given day during story time.
Per Institute of Education Sciences (IES) recommendations (Kratochwill et al., 2010) once a stable or descending baseline of at least 3 data points was reached with Abby, she participated in the training procedures as described below. The coaching intervention with Abby began following the training. The baseline measure for the other 2 teachers and their children continued until a response to coaching intervention (i.e. a positive change in both level and trend) was noted with Abby. Then the next teacher, Molly, received training with the same procedures as Abby, followed by coaching intervention with Molly, while Abby continued in intervention. Finally, upon a positive change in Molly’s intervention data, Liz received training and moved into the coaching intervention.

Training Procedure

The training content provided to teachers combined components of dialogic reading (DR), print referencing, and quality of interactions. Specifically those components are: (a) completion prompts, recall prompts, open-ended prompts, wh-prompts (who, when, what, where, and why questions), and distancing prompts by the adult to represent DR strategies, and (b) questions about print, comments about print, and tracking finger along print while reading to represent print referencing strategies. The print referencing strategies cited here are those originally developed by Justice and Ezell (2004) and include all components of the practice. The dialogic reading strategies utilized are taken from Whitehurst and colleagues (1994) and were simplified. In addition, tips and strategies for increasing the quality of interactions between teachers and children, adapted from the Indicator of Parent-Child Interaction (IPCI), an individual growth and development indicator (Baggett, Carta, & Horn, 2006), were provided. Teacher behaviors with respect to teacher facilitators and teacher interruptions were included.

Delivery of training through technology enhanced platform. Content for the platform was drawn from research literature as well as consultation with knowledgeable individuals regarding adequacy of the content. Consultation consisted of 2-3 face to face meetings in which discussions focused on scope and sequence of the information to be included in the platform. Field testing on the usability of the session as well as adequacy of the content was completed prior to the study with 5 testers, including 3 experienced preschool teachers and 2 graduate students in early childhood. Feedback provided by all
testers was then incorporated into the session and content modified to address areas of concern or difficulty.

The training content was delivered via Soft Chalk Lesson Builder (http://softchalk.com/) and included general information regarding the impact of high-quality book reading sessions on young children, as well as more specific information on the strategies and techniques of DR, print referencing, and quality of interactions. Embedded within the training were streamed videos that allowed participants to see the strategies as they were modeled, as well as other interactive media such as hyperlinks, text annotations, and quiz items and activities. Further, a demonstration was provided that included a storybook with strategies applied, followed by teachers independently applying the same strategies to a different storybook. The training took between 45-60 minutes to complete.

**Coaching.** In addition to the technology enhanced platform for delivery of the intervention content, coaching was provided to each of the teachers with the intention of supplementing the information presented in the training session. The coaching consisted of an email that was individualized, providing information specific to the intervention content the teacher had delivered during a particular book reading session. Further, the emails were generated as soon as possible after the completion of a book reading session, so that teachers were able to make immediate adjustments to their teaching practices. Following is an example email that was shared with a teacher during the initial stages of intervention content plus coaching:

“I wanted to touch base with you about today's video. First of all, the book was a great choice in that it was fun, interesting, and presented great opportunities for questioning and discussion. You used 7/8 strategies, which is awesome! The only strategy I didn't see was recall and incorporating that could have simply been asking the kids to remember some aspect about the story. Your use of questioning was really great and I love that you pointed out the words on the signs, prompting someone to ask a question specific to the print on a sign, or I guess the lack of print on a sign. I am also looking at child engagement as a result of your use of strategies and not only was everyone more interactive and very engaged, but “T” (one of my targets) made a really great comment about her experiences at the zoo because you were prompting them with such great questions. All of this is fantastic!

One thing I noticed that would be another way to use the strategies even more frequently then you did is to change the wording of questions a bit. For example, instead of asking "Do you think it would be fun to eat just peanuts?" which probably will get only get a yes or no response, you could ask them an open-ended or distancing prompt by saying..."How do you think it would feel
to eat just peanuts?” or "Has there ever been a time when you had to eat just one thing?” Also rephrasing questions in which you give them choices between 2 answers..."Do you think it would be A or B?” you could change it to a simple ‘wh’ or open-ended question, without giving them choices of answers.”

As the teachers progressed in the intervention phase and their use of strategies as well as quality of interactions positively changed, the emails were used as a way to report data that was collected, as well as provide encouragement and support.

**Dependent Variables**

The first assessment of change in teachers’ behavior conducted was the number of times that teachers implemented the DR and/or print referencing strategies. Table 3 provides the operational definitions and rules that were established for each of these strategies. The observational period began when the teacher gave clear indication that the storybook session was beginning (i.e. children are seated and teacher is introducing the book) and continued until the session was complete. Each time a strategy was implemented the instance was recorded, and then converted into an average across all strategies used per session.

The second dependent variable related to change in teacher behavior measured in this study is quality of interactions adapted from the Indicator of Parent-Child Interaction (IPCI) (Baggett, Carta, & Horn, 2006). Behaviors with respect to facilitators (i.e. acceptance/warmth, uses descriptive language, follows child’s lead, introduces/extends, and responds to distress) and interruptions (i.e. criticism/harsh voice, restrictions/intrusions, and rejects child’s bid) were rated. These two behavior patterns were chosen to capture whether teachers were attending to children’s needs and utilizing interaction strategies that facilitate active rather than passive engagement by children. As reported by the developers of this instrument ([http://www.igdi.ku.edu/measures/IPCI_Measures/IPCI_technical_soundness.html](http://www.igdi.ku.edu/measures/IPCI_Measures/IPCI_technical_soundness.html)), inter-observer agreement for facilitators is 83.6% and 86% for interruptions. Criterion related validity for low risk dyads is a mean of 99.41 and standard deviation of 2.24 in terms of caregiver facilitators, and a mean of 4.94 and standard deviation of 6.94 in terms of caregiver interruptions. For high risk dyads, criterion
related validity is a mean 68.27 and standard deviation of 22.60 in terms of caregiver facilitators, and a mean of 17.46 and standard deviation of 21.10 in terms of caregiver interruptions.

Behaviors were coded on a likert scale ranging from 0 (i.e. never) to 3 (i.e. often). Scores were added for each dimension of behavior contributing to the teacher facilitators and used to calculate an overall percentage of teacher facilitator behavior during the book reading session. Percentage was calculated by totaling the scores across the 5 facilitators and dividing by the overall score possible, i.e.15. If no opportunity was indicated for “responds to distress” then the overall score was reduced by 3. Items classified as teacher interruptions were similarly totaled.

Child behaviors were assessed in two ways: (a) rating of a child’s level of engagement and, (b) the complexity of that engagement. Definitions for level and complexity of engagement were adapted from McWilliam (2000) Scale for Teacher’s Assessment of Routines Engagement (STARE). A study in which one teacher’s ratings of five children for 10 days using the STARE were compared to child engagement using the E-Qual III (McWilliam & de Kruif, 1998) found that for structured activities there was 100% agreement (within one rank) between the teacher’s rank order and her STARE ratings for each child, and the teacher’s rank order and the E-Qual III data. For unstructured activities, there was 60% agreement (within one rank) between the teacher’s rank order and her STARE ratings for each child and 80% agreement (within one rank) between the teacher’s rank order and the E-Qual III data (see Casey & McWilliam, 2007).

Levels of engagement include the following: almost none of the time, little of the time, half of the time, much of the time, and almost all of the time. At the conclusion of a shared book reading session, one category was chosen that best fit the overall level of engagement during the session. Operational definitions were established for each level, and reliability coders were trained on these definitions to ensure consistency.

Complexity of engagement included the following: (a) non-engaged in which the child is demonstrating inappropriate behavior (aggression, breaking rules, stares blankly, wanders around aimlessly, or cries), (b) unsophisticated in which the child is casually looking around and is not focused
on the teacher, (c) average in which the child is following the routine as expected and is actively interacting with his or her surroundings, (d) advanced in which the child uses understandable context-bound language (language that refers to a person or situation that is present), and (e) sophisticated in which the child talks about someone or something that is not present. Children received a score at the beginning, middle, and end of each session based on the following scale: 1= no comments, 2= 1 comment, 3= 2-3 comments, 4= 3 or more comments. The three scores were then averaged to determine overall complexity.

Data Collection

The researchers video recorded each storybook reading session and later calculated the number of strategies used, quality of interactions, and children’s level and complexity of engagement. Videotaped probes were transferred to a laptop computer using Quick Movie Magic Software and were viewed using Windows Media Player in which a time stamp was displayed for precise coding. As data were collected, analysis was conducted on a continuous basis using visual analysis following each session. Specifically, the graphs were analyzed to determine the level, trend, and variability of the data as well the immediacy of effect produced in the data pattern after a phase change, and the amount of overlap between phase changes (Kennedy, 2005).

Inter-Observer Agreement

Interobserver agreement was established by the first author and two additional recorders who were trained to reach agreement of 85% prior to coding data from the study. Interobserver agreement was calculated on an interval-by-interval basis in which the total number of agreements was divided by the total number of agreements plus disagreements, and then multiplied by 100%. In addition, the researcher and the reliability coders met weekly, or more often as needed to discuss the coding process to avoid drift from the definitions. Interobserver agreement was conducted on 25% of randomly selected videotaped book reading sessions across both baseline and intervention. Interobserver agreement had a mean of 87.2% for strategy use by teachers (range, 80.2-95.6%), 85.9% for the child behaviors (range, 77.5-97.3), and 80.5% for the quality of interactions (range, 74.3-92.1%).
Treatment Fidelity

Treatment fidelity was established in two ways. First, embedded within the technology enhanced platform on Soft Chalk were quiz items that when completed by teachers, a report of results was emailed to the researchers. An additional email generated through Soft Chalk was also sent upon completion of the training. Emails were received for all three teachers, indicating they had completed the training in full. Second, treatment fidelity for the coaching aspect of the intervention was established through recording of email correspondence between teachers and researchers. Teachers were asked to reply to the researchers when they received and read through the content of the emails. All three teachers maintained a 100% response rate for the duration of the study.

Results

Research Question 1: Is there a functional relationship between PD and teacher’s use of strategies?

Results for teacher’s average strategy use per session are presented in Figure 1. Documentation of average strategy use implemented across sessions shows an increase in the use of early literacy strategies following training across all 3 teachers.

During baseline, Abby implemented an average of 1.8 strategies per session with a range from .8 to 3.3. Molly implemented an average of .7 strategies per session with a range from .3 to 1.4. Liz implemented of .9 strategies per session with a range from .1 to 2.8. Each teacher had a relatively stable trend of implementation throughout the baseline phase.

Immediately following phase change to intervention, Abby showed little to no change in implementation of the strategies, with all 4 data points overlapping with baseline. At approximately session 10, an immediate effect was noted, with all but one data point in intervention remaining above baseline. Post intervention, Abby’s implementation of strategies increased to an average of 3.3, with a range from 1.5 to 7.1. There was also an increase in variability in Abby’s data during the intervention phase. Similarly, Molly showed little to no change in implementation of strategies following intervention, until approximately session 16 when a slight increase occurred. Remaining data points after session 16 did not overlap with baseline, although increased variability was present. Molly’s strategy use during
intervention increased to an average of 3.6 with a range from .8 to 7.8. There was a lower level of change between phases with Liz than was observed with Abby and Molly. However, there was an overall increase in strategy use following intervention, with an average strategy use of 2.8 and a range from 1.4 to 4.3. The last 3 data points in intervention remained above baseline for Liz. Between teacher analyses showed a marked increase in the level of strategy use following the intervention package.

Table 4 documents the average number of times each of the eight strategies was used during baseline and intervention for all three teachers combined. Increases were observed for each strategy from baseline to intervention. During baseline, teachers implemented the following strategies most frequently: (a) open-ended questions (2.3), and (b) wh-questions (4.1). Teachers implemented completion (.3), distancing (.1), and all print referencing strategies (0, .2, and .5 respectively) least frequently. Following intervention, teachers implemented the following strategies most frequently: (a) wh-questions (7.5), and (b) tracking finger along print (6.6). The remaining 6 strategies were used with the same relative frequency, ranging from 1.1 to 2.9. The greatest changes were observed in the same strategies: (a) wh-questions (4.1 – 7.5), and (b) tracking finger along print (.5 – 6.6). Also noted were increases in completion, distancing, and questions and comments about print, all of which went from an average of almost no use, to an average of at least one use from baseline to intervention.

**Improvement rate difference (IRD):** The calculations for each of the three teachers were determined based upon the minimum number of data points to be removed to eliminate all overlap between the contrasted phases (i.e. baseline vs. intervention) (Parker, Vannest, & Brown, 2009). For Abby, the baseline improvement rate was 1/4 = 25%, and the intervention phase was 7/10 = 70%. The IRD is calculated to be 45%. For Molly, the baseline improvement rate was zero, and the intervention phase was 6/9 = 67%. The IRD is calculated to be 67%. For Liz, the baseline improvement rate was 1/17 = .05%, and the improvement rate was 6/7 = 85%. The IRD is calculated to be 80%. An IRD for the entire design can be obtained by averaging the individual IRD values, providing an omnibus IRD. The omnibus IRD for this study was calculated to be 64%. While benchmarks for small, medium, and large effects have yet to be established, Parker and colleagues have provided tentative estimates as follows: very small and
questionable effects score about .50 or below, moderate-size effects score around .50 to .70, and effects rated as large generally receive IRD scores of .70 or .75 and higher (2009). Based upon these estimates, the IRD score for this study can be considered a moderate effect.

**Research Question 2: Is there a functional relationship between PD and teacher’s quality of interactions?**

Results for teacher’s quality of interactions are presented in Figure 2. Data on Abby’s quality of interactions during baseline displayed some variability for teacher facilitators (M = 65%; range, 50-75%), and was stable for teacher interruptions (M = 33%; range = 0%). During the intervention condition (M = 76.6%; range, 53-83%), data on facilitators was moderately stable with a steady upward trend, with the exception of sessions 7 and 14 that overlapped with baseline data and displayed significantly lower mean percentages. With respect to teacher interruptions during the intervention condition (M = 18.33%; range, 0-44%), data displayed a stable downward trend with the exception of sessions 7 and 14 that overlapped with baseline data and displayed higher mean percentages.

Data on Molly’s quality of interactions during the baseline condition was highly variable across teacher facilitators (M = 40.8%; range 16-66%) and interruptions (M = 18%; range, 0-33%). Upon entering intervention, facilitators and interruptions remained stable until session 15 when facilitators displayed a positive upward trend (M = 79.2%; range, 50-100%), and interruptions became relatively stable and low (M = 6.1%; range, 0-11%). While there were several overlapping data points with baseline data for both facilitators and interruptions, there was a stable positive increase and a low stable trend that was maintained through the end of the intervention phase for facilitators and interruptions respectively.

With respect to quality of interactions, Liz’s facilitators during the baseline condition (M = 80.4%; range, 67-100%) were variable at a high level. Interruptions (M = 7.7%; range, 0-22%), were initially stable at a low rate, with a slight increases occurring at sessions 10, 13, and 17. During the intervention condition (M = 98.8%; range, 93-100%), Liz’s facilitators were maintaining at a stable, very high rate. Interruptions (M = 1.83%; range, 0-11%) were maintaining at a low, stable rate.
Secondary Research Question: Is there a functional relationship between PD and children’s level and complexity of engagement?

Results for children’s level and complexity of engagement are presented in Figure 3. Because of relatively moderate to high percentages of both level and complexity of engagement across all three classes of children during baseline, as well as the variability in data between baseline and intervention, a marked, sustained difference is not observable. While some notable differences did occur and are discussed below, children’s level and complexity of engagement was not noticeably changed as a result of the intervention.

Discussion

This study investigated the impact of a technology delivered PD package paired with a specific type of coaching, performance feedback, on the instructional behaviors of teachers of children between the ages of 3 and 5 during book reading sessions. Results of the study indicate that PD produced change in teacher behaviors, specifically, their increased implementation of specific evidence-based storybook reading strategies following intervention. On average, each of the three teachers utilized more strategies per session after receiving the training and performance feedback. As a whole, the teachers also increased in their use of each of the eight individual strategies over the baseline condition, with the greatest changes observed in “wh-questions” and “tracking finger along print.” Further, calculation of an omnibus IRD indicated a moderate effect size in terms of change in average strategy use for the three teachers. With regard to quality of interactions, teachers increased their use of positive interactions (i.e. facilitators) and decreased their use of negative interactions (i.e. interruptions) from the baseline condition.

These findings contribute to the existing literature in a number of ways. First, in-service teachers typically receive instruction during PD activities such as workshops, seminars, and conferences; however, these training approaches generally do not lead to sustainable changes in instruction (Fixsen, Naoom, Blase, Friedman, & Wallace, 2005). The PD intervention used in this study combined a web-based training package with the use of performance feedback delivered via electronic mail. Further, this study extends the emerging literature (e.g. Barton & Wolery, 2007; Hemmeter, Snyder, Kinder, & Artman,
2011; Pianta et al., 2008) related to the use of technology in PD by demonstrating that performance feedback delivered electronically can be effective in changing teacher practices.

With regard to child behaviors of level and complexity of engagement, the results demonstrate the intervention was not successful in creating significant change. It should also be stated that the two children per class may not represent the class as a whole, particularly since the children were not randomly selected. Abby’s children showed little to no change in either level or complexity of engagement from baseline to intervention, with a fair amount of variability across both phases. Molly’s children were also variable across baseline and intervention for both level and complexity of engagement. While complexity of engagement did not meaningfully change between phases for Molly’s children, level of engagement demonstrated an immediate effect post intervention, and was able to stay at 100% for the remaining data points. Liz’s children were highly variable in terms of level of engagement across baseline and intervention; however, except for one data point in intervention, their levels remained high and consistent. Complexity of engagement was somewhat variable between phase changes for Liz’s children, but overall, marked, consistent change was not observed.

In post intervention interviews, each of the teachers commented that while the flexibility and pacing of reviewing the content was appropriate, they were overwhelmed with the amount of information being provided. While still utilizing the web-based format, future training packages could be broken into smaller sections and presented individually to the teachers to not only alleviate the time spent getting through the content, but also assist the teachers in learning, retaining, and implementing the content. Further, results demonstrated that a handful of strategies, such as “wh-questions” and “tracking finger along print” were more easily learned and utilized than other strategies such as “distancing,” “completion,” and “questions and comments about print.” Additional research on those strategies that seem to be more difficult to consistently implement could inform development of future training packages related to evidence-based literacy instruction, and add to the research base.

Results from several randomized controlled trial studies of professional development interventions that included face to face coaching have revealed small but significant effects on children’s
learning, with somewhat larger effects on teacher instruction (Bierman et al., 2008; Landry et al., 2009; Powell, Diamond, Burchinal, & Koehler, 2010; Wasik, Bond, Hindman, 2006). While email as a coaching and performance feedback tool is practical in that it enables an efficient, immediate written record of feedback that can be retained and reviewed indefinitely, future research is needed to tease out the idiosyncrasies of email feedback as it relates to effective teacher training. For example, which components of email feedback produce the most substantial change in teacher behavior, as well as examining the dosage of feedback provided. Other potential directions include examining the effectiveness and efficiency of electronic feedback versus feedback delivered in person, as well as the extent to which different delivery formats impact different types of teacher outcomes. Specifically those elements of face to face coaching versus long distance coaching that may make one approach more or less feasible and efficient in terms of producing change in specific teacher behaviors.

Overall, the teachers responded positively to the intervention. The teachers reported that coaching via email was helpful to them as they moved through the process of incorporating the specific strategies. Molly commented that she actually copied and reread the emails so that she could see the possible implementation process she could take during future storybook readings. While Liz was provided with some oral feedback immediately following the readings, she appreciated having the suggestions written down and sent to her via email as well because then she had something to “refer back to.” She also thought the very specific feedback and suggestions were helpful.

Limitations

Follow-up to determine maintenance of both teacher and child behaviors as well as additional data points in intervention (particularly for Liz), was not possible. Future research is needed to determine if in fact the behaviors of teachers and children can be maintained several weeks after the end of the intervention condition.

The relatively moderate to high rates of children’s level and complexity of engagement during baseline may have limited our ability to interpret the results and assess the effectiveness of teacher’s increased use of strategies, as well as change in quality of interactions on children’s behavior. While both
Molly and Liz’s children were able to reach and maintain a very high level of engagement post intervention, the change was not significant enough to demonstrate a functional relationship. Further, complexity of engagement across all three classrooms did not change substantially or with any consistency. The measure used for child behavior may not have captured the discrete child behaviors. Future research should examine other approaches to monitoring child change such as mean length of utterance or the match between teacher prompt and child response. The teachers in this study were already using practices that engaged the children in storybook reading, prior to the intervention. In such situations, the variables measuring child behaviors might focus more on behaviors related to emergent literacy skills such as correct response to content questions or print awareness. Hemmeter and colleagues reported similar difficulties in drawing associations between child engagement and teacher’s use of descriptive praise, possibly due to the way child engagement was measured in their study (2011). More refined definitions of child engagement may be needed in future studies to more accurately measure this specific behavior.

Conclusion

This study documents the effectiveness of using a web-based PD package paired with electronically delivered performance feedback on teacher’s implementation of evidence-based early learning strategies, and their quality of interactions during storybook reading sessions. As EC programs continue to strive for increased early literacy skills prior to kindergarten entry for young children, effective models for training and supporting teachers in evidence-based literacy instruction are critical. Given the relative ease and efficiency of coaching via electronically delivered feedback, this approach to PD may be a viable alternative to workshop trainings.

Positive and constructive feedback shared by a coach via email provides a written record of performance that can be reviewed as often as needed by the teacher, and promotes dialogue between teacher and coach. This approach could provide teachers the opportunity to ask questions and seek guidance on how to implement evidence-based literacy instruction. More experienced teachers could also use this approach as a way to mentor newer or less experienced teachers, while also potentially creating a
community of learners. Finally, email feedback allows time for teachers to reflect on their practice in a way that may not otherwise be possible with traditional face to face interactions.
References


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Table 1  
*Teacher Demographics*

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Years Teaching</th>
<th>Educational Background</th>
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<tr>
<td>Molly</td>
<td>40</td>
<td>17</td>
<td>High School Diploma</td>
</tr>
<tr>
<td>Liz</td>
<td>24</td>
<td>2</td>
<td>Bachelor’s in Elementary Education</td>
</tr>
</tbody>
</table>

Table 2  
*Child Demographics*

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Gender</th>
<th>SES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tommy</td>
<td>5</td>
<td>Male</td>
<td>Low</td>
</tr>
<tr>
<td>Cooper</td>
<td>5</td>
<td>Male</td>
<td>Low</td>
</tr>
<tr>
<td>Jordan</td>
<td>5</td>
<td>Male</td>
<td>Middle</td>
</tr>
<tr>
<td>Leslie</td>
<td>5</td>
<td>Female</td>
<td>Middle</td>
</tr>
<tr>
<td>Annie</td>
<td>4</td>
<td>Female</td>
<td>Middle</td>
</tr>
<tr>
<td>Denise</td>
<td>4</td>
<td>Female</td>
<td>Middle</td>
</tr>
<tr>
<td><strong>Strategy</strong></td>
<td><strong>Rules</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completion</td>
<td>Teacher must pause to allow the children to fill in the appropriate word/phrase to count as completion. If teacher is saying the word/phrases with the children, it does not count.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recall</td>
<td>Asking children to remember aspects of the story. Can happen while the book is being read, at the end of the story, or before a re-read of the same book.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Examples:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>“What happened?”</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>“What do you remember?”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open-ended</td>
<td>Questions that will lead to a yes/no response do not count, unless the child elaborates after the yes/no response. Questions restricted to either/or answers also do not count. Question would count if it leads to child providing a descriptive response relevant to the book.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Examples:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>“What was your favorite part of the story?”</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>“How do you know?”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wh-prompt</td>
<td>Questions that are specific to context of the book, for example when asking for definitions of words or when pointing to or referencing a specific page in a book.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Examples:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>“What does it mean to….?”</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Why do you think….?”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distancing</td>
<td>Questions that ask children to bring in their own background knowledge.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Examples:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Have you ever…?”</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Tell me about a time when…?”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Questions about print</td>
<td>Questions that are asked when specifically referring to print in the book. For example when pointing at signs, letters, or specific words that are different than the other print on the page.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comments about print</td>
<td>Comments that are referring specifically to print in the book. Examples include:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Look right here on this sign it says….,”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tracking finger along print</td>
<td>Each instance of a word or words being pointed at counts</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 1

Teacher’s Average Strategy Use Per Session

- **Baseline**
- **Intervention**

*Graphs for Abby, Molly, and Liz showing changes in average strategy use over sessions.*

**Legend:**
- **Avg Strategy Use**
- **Sessions:** 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28

**Notes:**
- The graphs illustrate the change in average strategy use over sessions for different teachers:
  - **Abby**
  - **Molly**
  - **Liz**

**Data:**
- **Sessions:** 1 to 28
- **Average Strategy Use:**
  - Abby: Baseline 4.0, Intervention 8.0
  - Molly: Baseline 5.0, Intervention 7.0
  - Liz: Baseline 6.0, Intervention 5.0

**Analysis:**
- The intervention phase shows a significant increase in average strategy use for all teachers.
- The graphs suggest an improvement in strategy use over the intervention period.
Figure 2
Teacher’s Quality of Interactions

- Facilitators
- Interruptors

Abby

Molly

Liz
Table 4
*Teacher’s Average Use Per Strategy*

<table>
<thead>
<tr>
<th>Skill</th>
<th>Baseline</th>
<th>Intervention</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dialogic Reading</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Completion (C)</td>
<td>.3</td>
<td>1.8</td>
<td>1.5</td>
</tr>
<tr>
<td>• Recall (R)</td>
<td>1.6</td>
<td>2.7</td>
<td>1.1</td>
</tr>
<tr>
<td>• Open-ended (O)</td>
<td>2.3</td>
<td>2.9</td>
<td>.6</td>
</tr>
<tr>
<td>• Wh-questions (W)</td>
<td>4.1</td>
<td>7.5</td>
<td>3.4</td>
</tr>
<tr>
<td>• Distancing (D)</td>
<td>.1</td>
<td>2.1</td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Print Referencing</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Questions about print (Q/P)</td>
<td>0</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>• Comments about print (C/P)</td>
<td>.2</td>
<td>1.1</td>
<td>.9</td>
</tr>
<tr>
<td>• Tracking finger along print (T/F)</td>
<td>.5</td>
<td>6.6</td>
<td>6.1</td>
</tr>
</tbody>
</table>
Figure 3
Children’s Level & Complexity of Engagement

Abby’s Children

Molly’s Children

Liz’s Children

Sessions