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Title: Implementation Fidelity and Teachers' Engagement in a Course on Effective Teacher-Child Interactions: Effects on Teacher Beliefs, Knowledge and Practice.

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Background / Context: The National Center for Research on Early Childhood Education's (NCRECE) program of research is a series of experimental studies of specific approaches to training early childhood (EC) educators to be effective in implementation of curriculum and instructional interactions focused on promoting language and literacy skills, two domains that operate as gatekeepers to later achievement. Previous NCRECE work has demonstrated that a 14-week course designed to enhance teachers' use of effective teaching practices was effective in changing teacher beliefs, knowledge, and observed practice (Hamre et al., 2010). This paper examines the extent to which teachers from a variety of backgrounds were engaged in the course and the extent to which their engagement was associated with significant changes in belief, knowledge, and practice. Below, we briefly discuss the context for this work.

By age 5, an unacceptably large number of children in- and near-poverty are lacking in competencies fundamental to their school success (Duncan et al., 2007; Fantuzzo et al, 2007; Raver, 2008). The long-term effects of early gaps in achievement and social functioning are so pronounced that effective and efficient interventions targeting these gaps in the preschool period increasingly are viewed as essential to the developmental success of children as well as the economic and social health of communities (Heckman, 2006; Heckman & Masterov, 2007; Magnusson, Ruhm, & Waldfogel, 2007).

Several factors have contributed to a growing interest in targeting these interventions toward improvements in the quality of teachers' interactions with children. First, there is now compelling empirical evidence that one of the most salient aspects of EC programs' effects on children's development concerns the nature and quality of teachers' interactions with children (Dickinson & Brady, 2006; Howes et al., 2008; Jackson et al., 2006; Mashburn et al., 2008). Research using the Classroom Assessment Scoring System (CLASS: Pianta, LaParo, & Hamre, 2008) documents the ways in which teachers' everyday social and instructional interactions are linked to growth in early literacy, language, math, and social skills (Curby et al., 2009; Mashburn et al., 2008). Second, national data suggest that the average pre-k child is likely to experience teacher-child interactions of mediocre to low quality (LaParo et al., 2009; Phillips, Gormley, & Lowenstein, 2009; Pianta et al., 2005).

A new generation of controlled evaluations, suggests that intensive professional development supports that directly target improvements in teacher-child interaction can be effective (Bierman et al., 2008; Domitrovich et al., in press; Pianta et al., 2008; Ramey & Ramey, 2008; Raver et al., 2008). Most of these interventions provide some combination of curriculum and classroom-based coaching or mentoring to teachers (Bierman et al., 2008; Domitrovich et al., in press; Pianta et al., 2008; Raver et al., 2008). Far fewer studies have systematically tested the effects of coursework on teacher-child interactions or child outcomes (see Dickinson & Caswell, 2007; Howes et al., 1998; Kontos et al., 1996 for exceptions). Coursework has several advantages over coaching or mentoring approaches, particularly related to use at scale. Coursework, which can be delivered for cohorts of students, is likely to be considerably less expensive than mentoring, which is typically delivered as a 1-on-1 intervention. Furthermore, effective courses have the potential of being folded into existing systems of higher education, in contrast to mentoring approaches which will remain as add-ons requiring significant resources from programs.

Previous work demonstrated the efficacy of a course focused on improving the quality of teachers' interactions with children among 440 early childhood teachers (Hamre et al., 2010). Compared to teachers in a control condition, those exposed to the course reported more intentional teaching beliefs and demonstrated greater knowledge of and skills in detecting

effective interactions. Furthermore, teachers who took the course were observed to demonstrate more effective emotional and instructional interactions. The course was equally effective across teachers with less than an associate's degree as well as those with advanced degrees.

To scale this type of intervention, however, it is important to examine the extent to which it can be offered consistently as well as the extent to which a variety of teachers may respond, or not, to the intervention. We were particularly interested in the extent to which fidelity of implementation and teachers' participation in and responsiveness to the course content may help explain variation in response among those who were assigned to the treatment group.

Purpose / Objective / Research Question / Focus of Study: First, we examine the extent to which there was variation in implementation and engagement across the 15 course sections in 9 sites. Second, we examine the extent to which teachers from a variety of backgrounds engaged equally in the course, both in terms of quantity and quality of engagement? Finally, we examine which aspects of participation are most closely associated with changes in teachers' belief, knowledge, and practice?

Setting: The NCRECE course was offered in nine sites across the country: Charlotte, North Carolina; Chicago, Illinois, Columbus, Ohio; Dayton, Ohio; Hartford, Connecticut; Memphis, Tennessee; New York City; Rhode Island; and Stockton, California. Participating teachers worked in a variety of EC programs including Head Start, preschool, and child care.

Population / Participants / Subjects: 137 teachers participated in the course. Teachers were diverse in terms of their racial/ethnic and educational backgrounds. Table 1 presents descriptive on the teachers in the sample.

Intervention / Program / Practice: The course, entitled *Support of Language and Literacy Development in Preschool Classrooms through Effective Teacher-Child Interactions and Relationships*, was designed to increase teachers' knowledge about the vital role that teacher-child interactions play in learning and skill acquisition and to build specific skills for observing teacher-student interactions that contribute to language and literacy skills. Because language and early literacy skills are the gatekeepers for later school success, this course also provided teachers with the knowledge they need to implement language and literacy curricula through effective teacher-child interactions. The course was delivered in 14, 3-hour long sessions, through collaborations with local colleges and universities in each site. There were between 5 and 15 teachers in each course section. Instructors (n = 15) were provided with instructor manuals which included PowerPoint presentations, videos, and written assignments for each course section. Instructors attended a week-long training and were provided with ongoing implementation support by NCRECE staff.

Course Instructors were trained to reliability on the CLASS, and on course content and implementation, so that consistent delivery was ensured across course sections with a high degree of fidelity. Instructors participated in training on the guiding principles, research background, and course materials, including the PowerPoint presentations, website, readings, grading and homework procedures. Instructors completed a written assignment related to these materials for each unit of the course. Weekly individual support calls, and periodic group calls were held with instructors, which provided a time to clarify implementation issues, and share success and challenges to teaching the course.

Research Design: The overall study employed a randomized control trial methodology. Teachers within each site were randomly assigned to receive the course or to be in a business as usual control group. The current study is a non-randomized follow up analysis of implementation.

Data Collection and Analysis:

Intervention Implementation Fidelity

Instructor Adherence: Instructors taped themselves teaching 5 of the 14 course units and a course developer expert coded the implementation on a 3-point scale (0=not observed to 2=consistently observed) for 5 aspects of their teaching: overview of presentation, facilitates understanding, content knowledge, discussing video, and instructional climate. Items were summed to provide a total instructor implementation quality score.

Participant Intervention Engagement

Participant Dosage of Intervention: After each course session, instructors entered into the study website who of their registered participants were present in class that day as well as their completion of homework assignments.

Participant Satisfaction with Intervention: Participants were surveyed about their satisfaction with the course following completion. Participants responded to items such as: "What I learned in this course was helpful to my development as a teacher." (alpha = .83)

Participant Quality of Participation with Intervention: Participants across all sites completed the same mid-term and homework. Instructors were trained with how to score the exams and homework, and the participant's scores were entered into a database. Additionally, instructors completed 10 items on all participants indicating their perception of participant effort, such as "this teacher worked hard to meet the demands of this course."

Participant Outcomes:

The remainder of data were collected through teacher report (pre- and post-course) and observations made using videotaped footage of teachers' classrooms. Teachers reported on their beliefs and knowledge regarding effective teacher-child interactions and effective literacy and language instruction. Teachers in both conditions sent in four videotapes of their instructional interactions over the course of the semester. Measures included:

Beliefs. The Beliefs about Intentional Teaching scale is a 13-item, 5-point Likert scale survey that aims to assess the extent to which teachers believe that children's learning is contingent upon intentional interactions in the classrooms. *The Beliefs about Importance of Specific Skills-MTP L/L Objective Beliefs* asks teachers to report how important literacy and language skills (e.g. maintaining 2 turns in a conversation; identifying the first letter in their name) are to children entering kindergarten.

Knowledge. A 15-item scale which tests a teacher's understanding of and knowledge about the types of interactions with children that lead to positive development (*Teachers' Knowledge of Effective Teacher-Child Interactions-Overall Assessment*). A set of multiple choice items provide a brief classroom scenario, and then ask teachers to choose the best answer from a set of four. *Knowledge about language/literacy skills* was assessed through 12 items in which teachers had to categorize skills into one of six language/literacy domains: alphabet knowledge, print concepts, vocabulary and linguistic concepts, pragmatics and social language, narrative skills, and phonological awareness. Scores are computed for percent correct within each domains

Delivery. The quality of teachers' interactions with children during these videotaped activities will be assessed using the CLASS (Pianta, LaParo, & Hamre, 2008). The CLASS measures 11 dimensions of interactions using 7-point scales: (a) positive climate, (b) negative climate, (c) teacher sensitivity, (d) regard for student perspectives, (e) behavior management, (f) productivity, (g) concept development, (h) instructional learning formats, (i) quality of feedback, (j) language modeling, and (k) literacy focus. Interrater agreement (ratings within 1 point on the 1 to 7 rating scale) for these dimensions ranged from .75 to .92.

Analyses presented below include descriptive analysis of implementation and engagement measures as well as hierarchical linear models with teachers nested in course sections. The first set of HLM analyses use teacher level demographic factors and beliefs to predict course participation. The second set of HLM analyses use teacher-level participation to predict changes in teachers' beliefs and knowledge from pre- to post-course. This second analysis was only possible in the first cohort of teachers as pre-test measures were dropped in the second cohort due to constraints on teachers' time. Future analyses will add course section-level predictors to each of these models (e.g. number of participants, instructor quality, etc). Finally, CLASS data is currently being coded for both cohorts and these data will be analyzed using growth models for the final presentation.

Findings / Results:

Coding of videos of the course section revealed that instructors delivered the course with high levels of fidelity (mean=1.99, SD-.02, range 1.95-2). Teacher engagement was also high. As displayed in Table 2, on average teachers attended 12.34 of the 14 sessions and completed the vast majority of their homework assignments. These attendance and homework variables were highly correlated and were composited for further analyses (alpha = .89). Instructors also reported high levels of engagement across teachers and teachers overwhelmingly reported that the course was useful to their practice. There was more variability in the quality of engagement, as measured by scores on homework assignments and the midterm exam.

There was, however, some evidence of systematic variation in teacher engagement across course sections. Interclass correlations (Table 3) suggest that between 0 and 48% of the variance in teacher engagement variables was explained at the course section level. There was no course section-level variance in teacher-reported usefulness and a very high level of course section-level variance in midterms. This latter finding suggests that instructors may have varied quite substantially in how they graded midterms. More moderate, but still significant levels of course section variance were observed in teachers' engagement, as observed and as reported by instructors, as well as in the quality of their video homework assignments.

Table 3 presents results of the prediction of engagement from teacher factors. The strongest finding was that teachers who reported more authoritarian, teacher-centered, beliefs prior to the start of the course were less engaged – they attended fewer session and completed fewer assignments, instructors reported them to be less engaged, they reported the course to be less useful, and the quality of their work was lower. A second consistent finding was that teachers with more experience teaching pre-k were less engaged – they reported to course to be less useful and the quality of their engagement was lower. There were not significant differences in teacher engagement based on education levels or whether or not they taught in a public school building. Head Start teachers did perform significantly more poorly on the midterm than did other teachers, but they had equal levels of participation as other teachers, reported the course to be as useful, and did equally well as other teachers on homework assignments. Future analyses will add course-section level predictors to these models.

The final analyses examined the extent to which these engagement variables predicted changes in teachers' beliefs and knowledge from pre-course to post-course. Future analyses will similarly examine changes in observations of teachers' interaction with children in the classroom. Initial results suggest that teacher attendance and homework completion were an important factor in changing beliefs and knowledge. Teachers who had higher level of attendance and homework completion displayed greater increases in their knowledge about language and literacy skills and effective interactions and also reported increased beliefs

regarding the importance of teachers taking an active role in children's learning. There was not systematic evidence for associations between any of the other engagement variables and changes in teacher belief and knowledge.

Conclusions: Despite a clear need for improvement in the quality of EC teachers interactions with children, programs and teachers remain uncertain about how to make systematic changes in the nature and quality of these classroom interactions. The professional development system built to address this problem has a history of incoherence and ineffectiveness (Ball & Cohen, 1999). Recent work suggests that coursework focused specifically on improving teachers' knowledge and skills regarding interacting with young children can be effective (Hamre et al., 2010). The findings reported here provide further evidence to support the effectiveness of this course, but also provide some interesting insights into groups of teachers for whom this course may be of greatest interest.

The course was implemented with high levels of fidelity across 9 sites and 15 different instructors. Observations of the course sections revealed that most instructors were using materials as intended, completing all components of the course, and actively facilitating conversations with teachers. This provides evidence that coursework can be delivered consistently at scale. There were, however, variations in teachers' engagement across course sections. Future analyses will examine the extent to which course section-level factors, such as class size or the composition of students, may contribute to this finding.

Results suggest several teacher-level factors that predict engagement. Teachers with less authoritarian beliefs and teachers with less pre-k teaching experience were more likely to be engaged in course material. It may be that the course content, which focused on the importance of teacher-child interactions and also highlighted the importance of fostering children's autonomy, was in conflict with some teachers beliefs in ways that led them to become more disengaged with course material. Teachers with more teaching experience reported the course was somewhat less useful, although they still gave generally high ratings. Interestingly, the quality of experienced teachers' engagement was somewhat lower – they performed more poorly on homework and midterm assignments. This is somewhat counterintuitive as we might expect these teachers to know the most about classroom interactions. However, it may be that teachers who have been in the classroom for a long time have more set ideas about what effective interactions look like, and thus have a harder time performing on tasks that ask them to shift to thinking about new ways to interact in the classroom.

Teachers from a wide variety of educational backgrounds reported that the course was useful and displayed equal level of engagement. It is unusual for a course to target such a broad range of teachers but this finding suggests that the course material, focused on teacher-child interactions, was relevant to teachers across the educational spectrum. This may reflect the fact that few teachers, even those who have taken many early childhood courses, have had opportunities to learn about effective teacher-child interactions in a college course setting.

Adding to efficacy evidence from the intent-to-treat analysis, this study suggests that teachers who attended more course sections and completed more of the homework assignments displayed greater changes from pre- to post-test on three of the four measures of beliefs and knowledge. Thus, dosage appears to matter. There was not evidence to support the idea that teachers' own views of usefulness, instructor-reported engagement, or the quality of teachers engagement (i.e. homework and midterm scores) were systematically associated with changes in belief and knowledge. Future analyses may examine the individual components of participation and quality of engagement in more detail to try to unpack the "active ingredients" of this course.

Appendices

Not included in page count.

Appendix A. References

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Appendix B. Tables and Figures

Table 1. Teacher Demographics (n=137)

	%
Female	97%
Ethnicity	
African American	44%
Asian	2%
Caucasian	10%
Latino	33%
Other	10%
Highest Education	
AA or less	42%
BA	44%
More than BA	14%
Head Start Teacher	59%
In Public School Building	31%

Table 2. Descriptive Statistics on Implementation Variables (n=137)

	Mean	SD	Range
Number of Course Sessions Attended	12.34	1.98	2-14
Number of Homework Assignments Completed			
Video	16.44	3.65	0-18
Guided Reading	5.43	1.4	0-6
Papers	1.80	.50	0-2
Instructor Reported Engagement	4.22	.83	0-5
Teacher Reported Usefulness	4.63	.51	1.8-5.0
Quality of Video Homework (% correct)	82.94	14.29	33-100
Midterm Exam Scores	47.86	8.31	23-60

Table 3. Prediction of Engagement Variables from Teacher Background and Beliefs (N = 137)

	Observed Participation	Instructor Reported Engagement	Teacher-reported Usefulness	Quality of Video Homework	Midterm
ICC	.12	.08	.00	.16	.48
	B (SE)	B (SE)	B (SE)	B (SE)	B (SE)
Intercept	.39 (.37)	5.43 (.29)	5.08 (.17)	104.92 (5.56)	62.60 (3.0)
AA or less	-.04 (.28)	-.06 (.21)	.12 (.12)	-.71 (4.06)	-2.14 (2.0)
BA	.10 (.24)	.08 (.19)	.07 (.12)	1.98 (3.55)	-0.15 (1.7)
Pre-K Experience	.02 (.01)	.01 (.01)	-.01 (.005)*	-.32 (.16)*	-0.16 (.08)*
Head Start Teacher	-.16 (.18)	-.04 (.14)	.06 (.08)	2.59 (2.73)	-2.93 (1.37)*
In Public School	.30 (.19)	.08 (.14)	-.14 (.08)	4.59 (2.83	0.89 (1.47)
Authoritarian Beliefs	-.26 (.13)*	-.49 (.10)***	-.15 (.06)*	-8.64 (1.95)***	-4.39 (1.47)***

*p < .05; **p < .01; ***p < .001

Table 4. Prediction of Gains in Teacher Knowledge and Beliefs from Engagement Variables (n=69)

	Beliefs about Importance of Literacy & Language Skills	Knowledge of Literacy & Language Skills	Beliefs about Intentional Teaching	Knowledge of Effective Interactions
ICC	.00	.11	.00	.12
	B (SE)	B (SE)	B (SE)	B (SE)
Intercept	2.56 (.54)	53.56	.84 (.75)	49.89
Pre-Course Score	.30(.09)**	.09 (.09)	.54 (.10)***	.14 (.14)
Observed Participation	.00 (.10)	8.09 (3.64)*	.34 (.12) **	8.15 (3.75)*
Instructor Reported Engagement	-.06 (.10)	-2.63 (3.17)	.00 (.13)	1.89 (3.61)
Teacher Reported Usefulness	-.01 (.09)	-.49 (3.51)	.01 (.12)	-4.51 (3.55)
Quality of Video Homework	.00 (.00)	.09 (.16)	.01 (.01)	0.05 (.16)
Midterm	.02 (.01)*	.45 (.28)	.00 (.01)	0.52 (.28)

*p < .05; **p < .01; ***p < .001