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Effects of Web-Mediated Professional Development Resources on Teacher-Child Interactions in Pre-Kindergarten Classrooms

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Abstract

As the workforce in state-funded pre-kindergarten programs continues to grow in the United States, the promise of these and other early education opportunities (e.g., Head Start) depends in large part on in-service professional development and training in key instructional and interaction skills. In this paper, we describe effects of MyTeachingPartner (MTP), a web-based system of professional development resources, that include video exemplars and web-mediated consultation on specific dimensions of interactions with children for 113 teachers in a state-funded pre-k program. Teachers assigned to receive on-line consultation and feedback targeted to their interactions showed significantly greater increases in independent ratings of the quality of interactions than did those only receiving access to a website with video clips. The positive effects of consultation were particularly evident in classrooms with higher proportions of children who experienced economic risks. Implications of these findings for models of professional development and widespread needs for teacher access and support are discussed in relation to the effectiveness of early education.

Keywords

Early childhood education; In-service training; Professional development; Consultation; At-scale implementation

There is currently widespread agreement that the training and professional development of the early education workforce is a key component for ensuring that early childhood education programs make good on the hopes of policymakers, parents, and educators for improving children's success in school (Bogard & Takanishi, 2005; Zaslow & Martinez-Beck, 2005). Enrollment of three- and four-year-olds in early education programs is growing annually (Barnett, Hustedt, Hawkinson, & Robin, 2006; West, Denton, & Germino-Hausken, 2000), with estimates indicating that 200,000 teachers will be needed to staff

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universal enrollment programs by 2020 (Clifford & Maxwell, 2002). Consequently, identifying effective, relevant, and scalable approaches to training the early education workforce is of paramount importance. Furthermore, there is credible evidence that teachers' effective implementation of instruction that emphasizes the quality of their interactions with children is a mechanism through which the putative benefits of access to programs and exposure to curricula are transmitted to children (Hamre & Pianta, 2005; Howes et al., 2008; Mashburn et al., 2007; National Council on Teacher Quality [NCTQ], 2005; NICHD Early Child Care Research Network [ECCRN], 2000). The present paper describes results from the implementation and evaluation of MyTeachingPartner (MTP), an approach to professional development designed to target support for effective teacher-child interactions through a collaborative, web-mediated consultation process and web-based video exemplars of effective practices.

The conceptual basis for the MTP approach is that effective professional development for pre-k teachers (and for those in K-12) requires extensive opportunities for a) *observation* of effective instructional, language, and social interactions between teachers and children, through analysis and viewing of multiple video examples based on *validated* observation tools, and b) repeated *opportunities for individualized feedback and effectiveness-enhancing support* related to a teacher's own interactions with children (e.g., Landry, Swank, Smith, Assel, & Gunnewig, 2006; Pianta et al., 2007; Wasik, Bond, & Hindman, 2006). Central to the MTP approach is that *all* observations of classroom interactions, as well as feedback and support to teachers, are based upon a shared, standardized framework for defining and observing classroom interactions, the Classroom Assessment Scoring System (CLASS; Pianta, La Paro, & Hamre, in press), which has been validated via links to growth in child outcomes within large-scale studies, many of which even isolate classroom effects from family influences (Mashburn et al., 2007; Hamre & Pianta, 2007; Pianta, Belsky, Houts, Morrison, & NICHD ECCRN, 2007). This paper presents results from the first year of a two year experimental study of the effects of MTP support on changing the quality of teacher-child interactions in pre-k classrooms.

The most comprehensive picture of the quality of teacher-child interactions in pre-k classrooms and their effects on child outcomes stems from the extensive observations conducted through the National Center for Early Development and Learning's (NCEDL) Multi-state Study of Pre-kindergarten and the Statewide Early Education Programs study (SWEEP; LoCasale-Crouch et al., 2007; Mashburn et al., 2007; Pianta et al., 2003). Across the more than 700 state-funded pre-k classrooms sampled in 11 states, variation in teachers' use of instructionally and emotionally supportive interactions with children, as assessed by the CLASS (Pianta et al., in press) and Early Childhood Environmental Rating Scale – Revised (Harms, Clifford, & Cryer, 1998), were directly related to growth in children's achievement test scores and social behavior ratings over the pre-k year (Howes et al., 2008; Mashburn et al., 2007) and into kindergarten (Burchinal et al., 2005). Of particular note was the finding that the quality of teachers' *Instructional Support* (e.g., stimulation of conceptual development, provision of feedback) and their language interactions were most consistently and strongly related to growth in literacy, language, and math skills (Howes et al., 2008; Mashburn et al., 2007). However, the average ratings of Instructional Support were on

average notably low (approximately a “2” on a 7-point scale), suggesting that teacher-child interactions were not often of the type that produces children's learning gains (Hamre & Pianta, 2005; Ramey, 2007a; Ramey, 2007b). Collectively, studies of the nature and effects of children's experiences in early education classrooms provide a compelling rationale for making teachers' interactions with students (emotional, instructional, and management-focused) the *target* for professional development and training, particularly because they are both the proximal mechanism responsible for effects and are at best mediocre in terms of level of quality.

Another source of support for a focus on pre-k teacher-child interactions in professional development comes from the literature on early literacy instruction. There is growing evidence that pre-k teachers require focused training to improve their knowledge about high-priority skill targets in language and literacy development (Justice & Ezell, 1999; Landry et al., 2006; Lonigan, 2004) that can be the focus of their classroom interactions with children, either in formal or informal instructional activities (e.g., Landry et al., 2006; Wasik et al., 2006). It is also clear that despite the availability of and training in use of evidence-based curricula, early childhood educators are under-trained in how to *implement* these curricula through early literacy instructional activities and in how to engage in interactions and conversations that promote language skills (Justice, Mashburn, Hamre, & Pianta, 2007; Morrison & Connor, 2002; NICHD ECCRN, 2002b; Wasik et al., 2006).

Given the variation in and fairly low levels of classroom quality reported in observational studies of pre-k, teacher-educators and policy-makers are recognizing that ongoing training and support for high quality implementation of curricula (such as through professional development supports or quality rating systems) can be a critical component of systems that ensure the value of early education experiences, particularly for children at-risk of early school failure (Meisels, 2007; Pianta, 2007). If early education programs, such as state-supported pre-k, are going to achieve high quality standards at scale, then mechanisms need to be developed and tested for delivering effective training to large numbers of teachers focused on their implementation of curricula and interactions with children (Pianta, 2005). At present, college degrees or knowledge, although important components of an early education infrastructure, may not be sufficient to ensure high quality and child growth (Early et al., 2007; Mashburn et al., 2007). Recognizing the need to improve the link between courses and degrees, on the one hand, and the quality of teachers' instruction on the other, efforts are under way to develop higher education courses that effectively produce knowledge and skills in these areas (Pianta et al., 2006).

Professional development for teachers has a history of incoherence and ineffectiveness (Ball & Cohen, 1999); in-service teachers pursue learning opportunities on their own (e.g., weekend workshops), pick up advice within informal settings at school (e.g., in the lunchroom), attend district-mandated workshops, and learn from daily experiences with children in the classroom (Wilson & Berne, 1999) without attention to how these experiences systematically and progressively are linked to classroom performance. Short-term training, often knowledge- or technique-based, is the most common form of in-service training with substantial variation in nature and quality and virtually no evidence of effectiveness (Birman, Desimore, Porter, & Garet, 2000; Garet, Porter, Andrew, &

Desimone, 2001). Workshops fall short in a multitude of ways: teachers are in a passive learner role; content is vague, irrelevant or disconnected from classroom context; and there is limited follow-up (Haymore-Sandholtz, 2002). Yet contemporary estimates of annual spending on professional development range from \$2,000-\$7900 per teacher, which in a city such as Chicago totaled \$193 million in 2002 (Odden, Archibald, Fermanich, & Gallagher, 2002). There is virtually no evidence of positive effects for any of the approaches paid for by these funds.

More specifically, in a survey of 1,000 nationally representative teachers, 79% reported involvement in traditional professional development workshops during the academic year in comparison with only 5-16% who reported opportunities for more active learning (Birman et al., 2000). District-sponsored workshops are ranked as the least preferred form of professional development opportunity, described as neither enjoyable nor useful (Garet et al., 2001). And, although 30% of teachers report involvement in some form of mentoring or coaching efforts, most of those receiving such supports were early career teachers, and there is no evidence that these efforts are effective or standardized in approach, rather they encompass a hodgepodge of approaches and are implemented with incredible variety (Ingersoll & Kralik, 2004; LoCasale-Crouch, 2007).

Drawing from the literature on adult learning (Abdal-Haqq, 1995; Darling-Hammond & McLaughlin, 1995; Putnam & Borko, 2000; Richardson & Anders, 2005), educators have started to conceptualize and design professional development as a pursuit of knowledge and skill that is active, collaborative, linked to classroom context, and embedded in school culture (Darling-Hammond & McLaughlin, 1995; Lieberman, 1995). The No Child Left Behind legislation (U.S. Dept. of Education, 2002) describes high quality professional development for teachers as intensive, sustained and classroom-focused. Emerging from this re-conceptualization of teacher education is a shift from static, knowledge-based focus of training to the use of coaching, mentoring, and consultation approaches that provide more continuous, practice-focused support and guidance to teachers (Ingersoll & Kralik, 2004; Pianta, 2005). Increasingly it is common for novice teachers to be provided with ongoing mentoring (Fideler & Haselkorn, 1999), often used as a means of reducing teacher turnover and attrition rates (Strong, 2004). A recent review by Ingersoll and Kralik (2004) found that, on average, induction programs had a significant positive effect on beginning teachers, such as promoting job satisfaction and reducing attrition. However, although some early non-experimental studies suggest effects on teacher behavior (Villar & Strong, in press), rigorous research on this form of professional development is nearly non-existent.

In sum, mentoring or coaching approaches that provide ongoing support and feedback about instruction and classroom practices are being acknowledged as potentially effective and perhaps as a more direct path to producing high-quality teaching, both in pre-k (Landry et al., 2006; Pianta, 2005) and in K-12 (Ingersoll & Kralik, 2004). Given that these approaches are identified by teachers both as relevant and as reducing isolation (a particular problem for pre-k teachers), it is not surprising that “coaching” and “mentoring” now dominate the teacher-training landscape. However, we argue that unless professional development models: a) focus on specific teacher-child interactions/implementation as targets, b) anchor interaction targets in standardized, validated measurement systems, and c) use consultation

procedures that are both justifiable and standardized, then in the long run, even this promising approach to training and supporting teachers will join the other discarded and discredited efforts to improve teaching.

Consultation has been used for some time in education settings. Rigorous evaluations of consultation interventions in mental health and school psychology show that to be effective, consultation has to: a) target a specific problem with a validated link to a desired outcome, b) use procedures implemented in a standardized fashion in relation to a protocol, and c) rely on a common understanding of the focus/target on the part of the consultant and client (Caplan & Caplan, 1993; Knotek & Sandoval, 2003; Rosenfield & Gravois, 1996).

The MyTeachingPartner approach to professional development includes two components: a) access to video exemplars of high-quality teacher-child interactions tied to specific dimensions of the CLASS and b) a consultation process that provides regular, multi-modal, ongoing, targeted feedback to pre-k teachers through a standardized protocol that focuses on specific dimensions of teachers' emotional, organizational, and instructional interactions with students, again using the CLASS as the basis for a common, validated understanding of teacher behavior. Although both the video exemplars and the consultation process are designed to be useful and applicable across a spectrum of curricula, all teachers participating in the present study receive access to a language and literacy curriculum, My Teaching Partner- Language & Literacy Curriculum (MTP-LL; Justice, Pullen, Hall, & Pianta, 2003), and the Preschool PATHS-Promoting Alternative Thinking Strategies (Domitrovich, Greenberg, Kusche, & Cortes, 2004) curriculum intended to promote social and emotional development. Every two weeks, teachers videotape their implementation of an activity from one of these curricula and share this footage with consultants. In the consultation condition, web-mediated interactions between a teacher and consultant focus on: a) observing and identifying a teacher's behaviors with students and their effects, both positive and less positive exemplars; b) problem-solving to identify and implement alternative approaches as needed and receiving feedback on such attempts; and, c) establishing a non-judgmental and non-evaluative supportive relationship with a knowledgeable individual (Hadden & Pianta, 2006).

In the present study, results are reported from the first year of a two-year controlled evaluation trial comparing improvement in specific dimensions of teachers' observed classroom interactions across two conditions: one that received only on-demand access to video-clip exemplars of high-quality interactions (Web Only) and another that received the same access to video and was also engaged in a web-mediated MTP consultation process (Consultation). Two central aims are addressed. The first aim is to examine the extent to which participation in the MTP Consultation or Web Only conditions is differentially associated with changes in the observed quality of teachers' interactions with children over the course of a school year. The second aim is to determine whether either of these intervention conditions is more effective in a particular set of classrooms, namely those with a majority of children from high poverty families and with low skill levels, and with teachers who made greater use of the web-based video exemplars. This second aim is based on evidence that the quality of teachers' interactions with children is significantly lower in pre-k classrooms serving a high percentage of poor children or children with low skill levels

(Pianta et al., 2005), two factors that could moderate the effects of consultation supports. Consequently, we hypothesize that teacher consultation will be even more effective in classrooms with high levels of demand on teachers' resources. Finally, as part of this second aim we recognize that not all teachers were exposed to equal doses of the on-demand, web-based video resources. Given the hypothesized importance of observing other teachers' effective interactions with children, we examine whether participating teachers' engagement with these web-based videos moderated the effect of study condition on changes in the observed quality of teachers' interactions with children over the course of a school year, expecting that video usage would be particularly important for teachers without the additional support of a consultant.

Method

Participants

Teachers were recruited into the study in the spring of the year prior to implementation through a process mediated by district-level program coordinators. The recruitment process is described in detail later in this section. At the time of recruitment (spring prior to implementation in the fall), a total of 173 teachers (82 Consultancy and 91 Web Only) agreed to participate for random assignment and were subsequently enrolled in the two treatment groups. The final sample of 113 is smaller than the originally-recruited 173 because of several reasons. First, six teachers dropped between spring recruitment and fall implementation for various reasons (e.g. moving, lack of interest). Second, because we were interested in examining changes in quality of teacher-child interactions over the course of a school year, we also used the following criterion for selecting teachers to participate in the present analysis: teachers must have sent in at least one observation during each of the following time periods—September-November, December-February, and March-June. Fifteen teachers in the Consultancy condition and 34 teachers from the Web Only condition were excluded because they did not meet this criterion. Seven of these 49 teachers (1 Consultancy and 6 Web Only) were excluded from the study due to extended medical or maternity leave during the school year. Given that a function of this study aim was to test effects of *web-mediated consultation*, five teachers in the original Consultancy condition were excluded from the analysis because they participated in the Consultation by phone rather than on the internet. A total of 113 pre-kindergarten teachers participated in this analysis of the first full year of MTP support—61 in the Consultation group and 52 in the Web Only group. We examined the extent to which the teachers who were not included in the present analysis differed from those who were included on a range of demographic (level of education, years of teaching experience) and attitudinal variables (ideas about children, self-efficacy) as well as characteristics of their programs and classrooms (class size and percent poverty), and found no differences.

Teachers participating in this comparison of the Web and Consultation supports represented 24 different school districts statewide. Ninety-five percent of the teachers in these classrooms were women. The majority of teachers reported their race/ethnicity as Caucasian (72%), 24% reported African American, and 4% reported multi-racial. In terms of educational background, 66% had a BA degree and 35% had advanced degrees, while 85%

were specifically certified to teach 4-year-old children. Teachers had an average of 16 years of classroom experience, with a range of 1 to 43 years. Over 98% of the teachers reported using a formal curriculum in their classroom, with High Scope and Creative Curriculum being the most common. Table 1 provides additional information on these 113 teachers and their classrooms.

Procedures

The study was conducted within a state-funded pre-kindergarten program in a single state. The program is targeted to serve an “at risk” population determined by meeting the following risk indicators for early difficulties in school: 1) family income below Federal guidelines for poverty; 2) homelessness; 3) parents or guardians are school dropouts, have less than high school education, or are chronically ill; 4) family stress as evidenced by poverty, episodes of violence, crime, underemployment, unemployment, homelessness, incarceration, or family instability; 5) developmental delays as identified through district-level screening procedures; or 6) limited English proficiency. Each program determines the educational and/or economic risk factors on which eligibility requirements are based. The final enrollment in these classrooms reflected these risk criteria. Based on surveys completed by parents, annual family income was less than \$15,000 for 31% of the families and between \$15-25,000 for another 25% of families. Forty-two percent of mothers reported having a high school degree or less, in comparison with 58% who had some post-high school educational experience—45% with either an Associate's degree, technical training, or some college with no degree, 10% with a BA degree and 3% with advanced college degrees.

Recruitment of participants proceeded through several steps. First, invitation letters went to selected district-level coordinators of the state-funded pre-kindergarten program; these letters described the study, the interventions, and that the study team was interested in recruiting teachers in each district's program to enroll in the study. Districts were selected for recruitment based on having more than one pre-k classroom; many districts in the state supported only one pre-k classroom and therefore were not recruited. Following the initial mailing, a meeting was held of the subset of interested district coordinators to describe the study in more detail and the procedures for recruitment of teachers. Forty-one district coordinators agreed to facilitate recruitment of teachers; reflecting more than one-third of the districts in which the state-funded program was operating and three of the four largest districts in the state. These coordinators furnished contact information for pre-k program teachers and co-signed the letter of recruitment, indicating the district's permission for teachers to enroll in the study. Teachers received an individual letter inviting them to participate in the study, informing them that they were consenting to participate in the condition to which all the teachers in that district would be randomly assigned.

Random assignment was conducted at the district level for several reasons. First, in initial meetings with district coordinators it was clear that they preferred all teachers in their program to receive the same professional development opportunities. Nearly all of these pre-k program classrooms (and teachers) were organized by district-level program, not by school building, in terms of their training, professional development, curriculum, and program procedures. Thus “district” was a distinct program-relevant feature. Relatedly, there was

concern about contamination of intervention effects across conditions if teachers in the same district (often in the same building) were enrolled in different conditions. For example, teachers participating in the Consultation intervention would, by definition, be exposed to more detailed descriptions of effective practices and receive direct facilitation of their use of the video exemplars on the website. Thus, they could easily “tutor” Web Only teachers in their district in the use of the site’s resources, thereby potentially reducing the key distinction between these conditions. We sought to eliminate this possibility through random assignment at the district level and recognize that causal inferences cannot be made at the classroom level.

The assignment by district was also stratified by district size (in terms of number of classrooms in the pre-k program) before teachers were recruited individually. Based on the distribution of numbers of classrooms per district, districts were classified into large, medium, and small, then assigned randomly by size to condition. Any post-assignment district-related differences at the classroom level are accounted-for in the models described below by using an assortment of covariates.

Although the focus of the present paper is on effects of two professional development conditions on teacher-child interactions, there was a third group included in the study, however this group was only used in comparisons related to child outcomes. Sixty-six teachers from 15 districts were assigned to a control condition in which no data were collected about teacher-child interactions; only child outcome data were collected in these classrooms (using the same procedures followed in the other conditions). Part of our work in the recruitment process involved specifying the benefits of participation to the teachers and districts and a condition of the districts was that teachers would receive some benefit; thus we were not able to design into the study a “business as usual” control that received no treatment. Rather we made available the curricular materials to a group of teachers who received no support (web or consultation) related to implementation. Other studies will examine effects of curriculum and implementation supports on child outcomes using all 3 groups. We focus on the two groups of teachers receiving two different forms of professional development support that vary considerably in structure and intensity.

Once enrolled in the study (in May of the year prior to the intervention), teachers and district coordinators received a series of letters intended to keep them informed about the study and to describe the activities in which they would be engaged during the subsequent academic year. In the fall, prior to the start of the school year, teachers in each district attended a training and introductory workshop held at a convenient location. At the workshop teachers were oriented to the purpose of the study, trained in the intervention to which they were assigned, and informed of a set of data-collection requirements. They also received a laptop computer to ensure equal access to the web-based resources. Over the course of the year all teachers received a generic series of MTP newsletters, reminders, and updates.

Measures

Data were gathered from multiple sources at various time points during the 2004-2005 academic year (August-June), measuring teacher characteristics, classroom characteristics,

teachers' exposure to different components of MTP intervention conditions, and teachers' classroom interactions with children.

Teacher characteristics—Teachers completed a demographic survey upon enrollment into the study, reporting information on *degree status* (advanced degree=1, bachelor's degree=0) and *years of teaching experience*, as well as other variables.

Classroom characteristics—Teachers reported *the number of children in their classroom*. Parents of all the children in the classroom were asked to complete a questionnaire regarding family demographic information. Over 75% of all parents contacted completed these questionnaires (a higher percentage than obtained in the NCEDL-SWEEP studies described earlier), which provided information on household income that was used to calculate *percent poverty in the classroom*, using 150% of the Federal poverty guidelines as the threshold. Analyses comparing overlapping information on demographics obtained from the program and from these questionnaires indicated that the classroom characteristics obtained for the portion of parent returning these measures did not differ from similar information obtained for the entire classroom through district registration procedures.

In addition, language and literacy skills of all the children within each classroom were assessed by their classroom teacher using the Pre-K version of the Phonological Awareness Literacy Screening (PALS; Invernizzi, Sullivan, Meier, & Swank, 2004), a state-wide individually-administered assessment of early literacy. The PALS is a teacher-administered assessment that comprises seven subtests examining children's writing ability, alphabet recognition, print and word awareness, and phonological awareness. Each subtest was converted to a z-score, and a composite score was computed as the mean across all seven subtests. Within each class, scores for consented children (see above) were aggregated to provide a class-level measure of the *mean literacy competence* of children enrolled. The PALS shows high test-retest, internal consistency reliability and correlates with concurrent and future individually administered reading assessments (see Invernizzi et al., 2004). Classroom-level estimates obtained on the basis of consented children did not differ from those for all assessed children.

Intervention conditions and measures of exposure—All teachers received access to web-based versions of MTP lesson plans in language and literacy and a web-version of the PATHS curriculum in social competence (Domitrovich et al., 2004). During the prior-to-school training workshop, all teachers were presented with the same description of these curricular materials. Teachers were asked to use these materials during the week, implementing an MTP-LL activity for at least 10 minutes per day and a PATHS activity once per week. Teachers reported on their frequency of use of these materials, which varied; however variability in teacher reports of frequency of implementation was not related to the assessments made of the quality of their interactions with children (described below).

In addition, teachers received one of two forms of professional development intended to improve specific dimensions of teachers' observed classroom interactions, using the CLASS as the basis for description. These conditions were the focus of the present investigation. One condition offered on-demand access to video-clip exemplars of high-quality

interactions (Web Only). This condition served as a low-intensity support that provided teachers with exemplars of other teachers' interactions in the form of 1-2 minute video clips pertaining to a specific dimension of interaction accompanied by a text description of that teachers' behavior, using language and terms drawn from the CLASS manual and tailored to the clip. These resources were made available through access to the MTP website that teachers used at their own choice.

The other group received MTP Consultation support. Teachers in this condition were each assigned for the entire year to one consultant. Teachers videotaped their implementation of an instructional activity in either language/literacy development or social competence, mailed the tape to their consultant, who then edited the tape into a series of 1-2 minute segments that focused on a specific aspect of interaction. Those edited segments were paired with specific written feedback that explicitly focused on interactive behaviors of the teacher and the children's cues and responses. Included with the written feedback were questions designed to call the teacher's attention to aspects of their behavior, to which teachers responded on the web. These videos, written feedback, and questions were then posted on a private website for the teachers' viewing and response. Teachers and consultants then met on-line in a video-chat to discuss the prompts and feedback, and to problem-solve. This entire cycle was spread over two weeks and was repeated throughout the year.

Teachers were assigned randomly to one of four consultants. Each consultant was experienced in teaching young children and was trained to reliability on the CLASS because of the emphasis on a standardized and common lens for observing and providing feedback on teacher-child interactions. Consultants met weekly with a supervising staff member for problem-solving, case-presentations, and fidelity checks.

Three measures of teachers' exposure to various components of the MTP intervention were recorded (Table 2). The first was the *study condition*, and teachers participated in either the Consultation condition or the Web Only condition. In addition, across conditions teachers' use of the web-based resources was documented from December 2004 through June 2005 using a server that automatically recorded the duration of each teacher's visits to each web page on the MyTeachingPartner website. Two types of web-pages were identified: (1) pages that described MTP language and literacy activities and (2) pages that presented video demonstrations of teaching practices related to high quality teacher-child interactions. The number of visits that teachers made to each type of web-page was used to derive two measures of exposure to the web resources: *number of activity pages* and *number of video pages*. Both indicators were used in the present study to enable a precise measurement of contact with video pages displaying exemplars of effective practices (video pages) as distinct from use of the web to access descriptions of instructional activities that did not contain video-based information or information on effective interactions with students (activity pages). High-frequency web-users could then be distinguished in terms of exposure to the putative intervention. As expected, teachers participating in the MTP Consultancy used the web-resources with greater frequency than teachers in the Web Only group (Table 2). To make the coefficients more interpretable, the number of web pages was divided by 100 to provide estimates of the extent to which each 100-page change in web-use is associated with teachers' interactions with children.

Teachers' interactions with children—Teachers in both the Consultation and Web Only condition were instructed to submit digital videos of their implementation of instructional activities every two weeks and mail these to the project offices throughout the school year (September to June). Teachers were asked to alternate between a PATHS activity and an MTP-Language/Literacy activity in terms of the tapes they submitted (they all received regular email reminders). There was a standard protocol for teachers to follow when taping (where to set up the camera, to record 30 minutes of activity) that was covered during the introductory training workshop. We examined whether there were differences in ratings of the quality of interaction between teachers and children, described below, as a function of activity type (PATHS or Language-Literacy) or tape length and found no such differences.

The quality of these interactions on each video was rated using the 10 dimensions of interaction described by the CLASS (Pianta et al., in press). The CLASS is an observational assessment of dimensions of teacher-child interactions in classroom settings. Factor analysis of the CLASS yields three factors, which, in this study, comprised the following items (Pianta et al., in press; Hamre, Pianta, Mashburn, & Downer, 2007): *Emotional Support*, which includes the dimensions of Positive Climate, Negative Climate (reversed), and Teacher Sensitivity; *Classroom Organization*, which includes the dimensions of Effective Behavior Management, Instructional Learning Formats, and Productivity; and *Instructional Climate*, with dimensions including Language Modeling, Concept Development and Quality of Feedback. A short description of each dimension is provided in Table 3. In prior work, higher scores on these dimensions of teacher-child interactions predicted growth in pre-k children's achievement (Howes et al., 2008; Mashburn et al., 2007); first-graders' achievement gains (Hamre & Pianta, 2005); social adjustment in early childhood and elementary school (NICHD, 2006) and concurrent levels of student engagement (Downer, Rimm-Kaufman, & Pianta, in press; La Paro, Pianta, & Stuhlman, 2004). Each dimension is described in a 7-point rating scale with behavioral indicators and anchor-point descriptions provided for low, medium, and high levels of that dimension. Observers' ratings of teacher-child interactions on these specific dimensions, from a minimum of 4 occasions across the school year, were the outcome measure(s) of focus in the present study. The outcomes were level and slope of ratings on these specific dimensions; the 3 factors were not used as outcomes because the actual interventions (video exemplars and consultation) were focused at the level of CLASS dimensions (and behaviors) not at the factor-level.

Tapes were coded by a team of observers trained to reliability and blind to study condition. Training consisted of exposure to short video clips illustrating each CLASS dimension, followed by practice coding at least five master-coded videos of preschool classrooms. Discussions of these practice videos were led by a certified CLASS trainer. Following training, each observer had to pass a reliability test in which they needed to score within one point of the master code on 80% of scores, across five additional video segments. If observers did not pass this test, additional training segments were provided and a second reliability test was administered. These training procedures and reliability criterion are similar to those used in other studies using classroom observation methodology (e.g., NICHD ECCRN, 2002b; Pianta et al., 2005).

After passing the reliability test, observers were assigned randomly to tapes, and the coding team met on a weekly basis to conduct joint drift tests and discuss any coding-related concerns. Inter-rater reliability for each of the seven CLASS dimensions was computed by comparing the ratings made by two independent observers of 33 randomly-selected tapes. Ratings that were within 1 point of each other along the 1 to 7 rating scale were considered to reflect an acceptable degree of accuracy. The percentage of ratings that were within 1 point of each other for each of the seven CLASS dimensions is: Positive Climate (85%), Teacher Sensitivity (82%), Instructional Learning Formats (79%), Behavior Management (94%), Productivity (97%), Concept Development (85%), and Language Modeling (85%). This level of agreement is comparable to the inter-rater reliability data reported for the other scales of the CLASS that have been used in large scale observational studies of preschool through third grade classrooms that used live observation procedures (La Paro et al., 2004; NICHD, 2002b, 2005; Pianta et al., 2007).

The comparability of video and live coding of tapes was examined prior to use of video-based ratings in substantive analysis. Ratings derived from video-coded cases were examined for distributional properties in relation to the large, national samples of state-funded pre-k classrooms obtained in the NCEDL/SWEEP studies. There were no differences in terms of mean ratings, variance, and skew. Furthermore, these ratings were subjected to confirmatory factor analyses to examine fit with the 3-factor model of classroom interaction, with no significant differences in fit between this sample and that of four other large samples of classrooms rated using live observation and multiple observation cycles (Hamre et al., 2007). There was not a direct comparison of video and live observation on the same set of classroom interactions; however, the analyses presented above indicate support for the comparability of video and live observation.

Implementation—On average, teachers submitted approximately 14 videotapes throughout the academic year; 56% of tapes included a language/literacy activity and 44% involved an activity designed to promote social development. Tapes lasted, on average, 24 minutes in length. As noted above, in addition to the outcome assessments of CLASS codes, a number of characteristics of each observation were measured as reflecting variation in actual implementation of the protocol, and were used in the analyses as covariates. These included the *number of tapes* submitted by each teacher, *the percentage of time an instructional activity occurred* on the tape, *the length of the tape* in seconds, and the *type of activity*, which in this case referred to whether the taped activity was a language/ literacy-focused activity or an activity to promote social-emotional development. As noted above, none of these metrics differed as a function of type of activity (PATHS or MTP-LL) or study condition.

Analysis Plan

Hierarchical Linear Modeling (HLM; Raudenbush & Bryk, 2002) using SAS Proc Mixed (Singer, 1998) for two-level models (observations within teachers) estimated teachers' growth trajectories for each of the nine dimensions of teacher-child interactions over the course of the school year. We first conducted preliminary analyses in which district was modeled in two ways. First, we estimated three level models in which observations were

nested within teachers and teachers were nested within districts. For each measure of teachers' interactions with children, estimates of the between-district variance in intercepts and slopes were either not able to be estimated or the estimates were not different than zero. We then conducted two-level models in which observations were nested within teachers, and we fixed the effects of districts to account for between-district differences by including district dummy variables for both estimates of the intercepts and slopes. F-tests were computed for between-district differences in intercepts and slopes, and for each outcome, these values were not different than zero. Because of the low degree of between district variance, we conducted the following two-level hierarchical models, in which study condition was included at the level of analysis in which the intervention was implemented (teacher-level) rather than at the level in which randomization occurred (district-level). Baseline, unconditional growth models were first analyzed for each dimension of teacher interactions, which specified a linear growth function such that quality changed at equal increments across each unit of time. Time was centered at zero on September 1, 2004 and increased one unit every thirty days; thus, the resulting growth trajectories from the baseline models provide an estimate of the mean level of teacher-child interactions at the beginning of the school year (intercept) and the mean rate of change in teacher-child interactions for each month (slope). The baseline growth models also estimated the variability across teachers for the estimated intercepts and the estimated slopes. There was significant variability in intercepts across teachers for each dimension, indicating that there was a wide amount of variation in interactions at the beginning of the school year. For two of the dimensions—Negative Climate and Quality of Feedback—the variability in slopes was not able to be estimated, which indicated that there was no systematic variability across teachers in their rates of change in these dimensions during the year. As a result, these two dimensions were excluded from subsequent analyses intended to explain variability in initial status and predict rates of change in teacher-child interactions as a function of teachers' exposure to the MTP Consultation and Web Only conditions.

Conditional models were analyzed, which included a number of time-varying and time-invariant covariates in the model to account for their influences on the estimated intercept and slope of the growth trajectories for each dimension of teacher child interactions. Time-varying covariates were: the length of time the video observation occurred, the percentage of the video observation in which a structured activity occurred, and whether the structured activity included a language or literacy activity. In addition, because 13 observers coded the digital video footage, 12 dummy variables were included to account for the influence of the observer on the ratings of teacher-child interactions. The following characteristics of observations, teachers, and students in each classroom were included as time-invariant covariates in the conditional model: the number of coded video observations of teacher-child interactions included for each teacher (entered to control for the potential lower reliability of estimated slope and intercepts associated with fewer observations), teachers' level of education and number of years of teaching experience, number of students enrolled in the class, the percentage of students in the class who were poor, and the mean language/literacy ability levels of students in the class.

The focus of the present study was to examine differences in observed teacher-child interactions associated with teachers' exposure to and use of the various components

available to them under the two conditions of MTP professional development support. Indicators of putative intervention resources included: the study condition to which teachers were assigned (Consultation or Web Only); the number of visits to activity web pages (conceptualized as a potential confound related to ease of use of the web); and the number of visits to video web pages. These measures were included to estimate their associations with teacher interactions at the beginning of the school year, and the rates that these interactions changed over the course of the school year.

Thus the final model, predicting intercept and slope for the dimensions of teacher-child interaction assessed repeatedly through the year, entered predictors hierarchically according to the following order from distal to proximal effects: covariates for properties of the observational procedures (e.g., length of tape, activity type), teacher and classroom covariates (e.g., teacher education, classroom poverty level, classroom reading level); and exposure to intervention resources (e.g., condition, time viewing video pages).

In addition to the potential main effects of teachers' exposure to and implementation of the various components of MTP, moderating effects were also examined. In particular we were interested in whether individual differences in teachers' use of the resources in the condition to which they were exposed would account for any effects (or lack thereof) of the intervention condition per se. Thus we examined whether associations between study condition and teachers' changes in interactions depended upon teachers' use of the web-based resources. In addition, we also noted the extent to which classroom demands, operationalized by the percent of students living in poverty, class size, and average literacy competence level of students, influenced quality of teacher-child interactions (Pianta et al., 2005); thus, we examined whether associations between study condition and teachers' changes in interactions depended upon characteristics of children enrolled in class, hypothesizing that the effects of the support provided by the Consultation condition may have a stronger influence on the quality of interactions in more demanding classrooms.

Results

Effects of Exposure to MTP Components

Table 4 presents results of conditional models in which characteristics of observations (the length of each observed video, the proportion of the observation in which a structured activity was implemented, the type of activity that was implemented, the coder who rated the observation, and the number of observations per teacher) characteristics of teachers (years of experience, advanced degree), and characteristics of classrooms (percentage of children who were poor, number of children in the class, children's abilities assessed at the beginning of the school year) were included to account for their associations with each rating of the teacher-child interactions. Level of exposure to three components of the intervention (Consultation or Web Only, number of activities web pages visited divided by 100, number of video web pages visited divided by 100) were also entered to estimate their unique associations with initial status and rates of change for each of the seven dimensions of teacher-child interactions. The results reported below for each predictor included in the model reflect unstandardized parameter estimates (B's) adjusted for all other predictors in the model.

Characteristics of the observations were significantly related to a number of dimensions of quality of teacher-child interactions. Tapes that were longer had, on average, higher quality instructional interactions (Concept Development, Quality of Feedback, and Language Modeling), higher ratings on Instructional Learning Formats, and lower scores for Productivity and Behavior Management. Observations comprising higher proportions of structured activities had interactions scored as higher quality on Concept Development and Language Modeling. In addition, observations that included a language-literacy activity were characterized by greater Productivity, better use of Instructional Learning Formats, and higher Concept Development. None of the teacher and classroom characteristics produced significant main effects on the intercept or slope.

These conditional models also included the three measures of teachers' exposure to the intervention. Results indicated that the number of web pages with videos and activity descriptions that teachers visited were not associated with initial levels or changes for six of the seven dimensions of teacher-child interactions. However, contrary to hypotheses, more visits to web pages with activity descriptions was associated with higher observed behavior management at the beginning of the school year and lower rates of increase in behavior management over the course of the school year.

In terms of the main effects of intervention condition on *improvement* in the quality of teacher-child interactions over the academic year, associations were in the expected direction. Teachers participating in the Consultation condition had more positive growth compared to teachers in the Web Only condition for each of the seven dimensions of teacher-child interactions. For three dimensions of interaction quality—Teacher Sensitivity, Instructional Learning Formats, and Language Modeling—the rates of change were significantly different between teachers who participated in the Consultation condition and teachers who participated in the Web Only condition. Figure 1 presents the differential rates of growth for teacher sensitivity for teachers in the two study conditions. The figure was created from the parameter estimates resulting from the models. Nearly identical effects were observed for Instructional learning Formats and Language Modeling. Teachers exposed to Consultation supports, in contrast to those who received support only via on-demand access to video-resources on the web, showed greater improvements in aspects of interaction that involved reading and responding to students' cues, using a variety of formats to actively engage children in instruction, and intentionally stimulating language development.

Moderating Effects of Child Characteristics and Exposure to MTP Web Resources

Table 5 presents results from analyses that examined whether the effects of study condition on the changes in teacher-child interactions were moderated by characteristics of children enrolled in classrooms and teachers' use of the MTP web-based resources. Results indicated that the association between the study condition and changes in Teacher Sensitivity and Instructional Learning Formats depended upon the level of poverty of children the classroom (Figures 2 and 3). Specifically, the figures are based on parameter estimates from the models and provide estimated growth trajectories for Consultancy and Web Only teachers in classrooms with students from high poverty (100% of students classified as poor)

and moderate poverty (50% of students classified as poor) backgrounds. Results indicate that when classrooms had only 50% of children classified as poor, there were no differences in rates of change between teachers in the Consultation and Web Only conditions. However, in high poverty classrooms, teachers who received the consultation supports had greater increases in the quality of teacher-child interactions than teachers did not receive these supports. Thus, within the highest poverty classrooms, participating in the Consultation condition was associated with positive changes in Teacher Sensitivity and Instructional Learning Formats while teachers participating in the Web Only condition actually declined over the year in the quality of their interactions on these dimensions.

Differences in patterns of observed changes in Teacher Sensitivity, Behavior Management and Productivity across the Consultation and Web Only conditions were also conditioned upon teachers' use of the on-line MTP video resources. Figure 4 illustrates this effect and provides estimated growth trajectories in sensitivity based on model estimates for Consultancy and Web Only teachers who did not use the web resources and who used it the average amount. Importantly, if teachers *only* had on-demand access to the web-based video resources (i.e., the Web Only condition), then the frequency of their exposure to the video pages on the MTP web site had a positive influence on changes in sensitivity and the other two dimensions of teacher interactions. For teachers who received the Consultation component of MTP, the amount that teachers accessed videos on the MTP web site was not associated with changes in teacher-child interactions during the school year.

Discussion

The results of this investigation indicate the quality of pre-k teachers' social and instructional interactions with students can improve as a function of selected professional development supports that are focused on such interactions. Teachers in pre-k programs serving at-risk students who were engaged in a regular cycle of observation and feedback related to their interactions with students in their own classrooms showed greater gains in aspects of these interactions than did teachers receiving only access to video exemplars of "best practices" via the web. However, for teachers receiving only on-demand access to video exemplars, use of these exemplars was associated with greater rates of improvement in aspects of their interactions with students. A key finding is that for teachers in the highest poverty classrooms, consultation support was associated with positive changes in their interactions while access only to the less-intensive non-individualized web-only resources did not produce positive increments in quality. These findings, while qualified by small effect sizes and some features of the design, tentatively confirm the hypothesis that individualized feedback and consultation focused on teachers' practices using a standard approach to feedback and classroom observation would lead to improvements in the quality of teachers' practices when such resources were actually accessed by teachers. The results also suggest that the use and availability of more intensive professional development supports such as consultation may be needed to offset the demands of teaching in high-need classrooms. These results have implications for the conceptualization and design of professional development in early childhood education and for the use of the web as a mechanism for delivery of effective and individualized supports.

Results demonstrating a significant, albeit modest, benefit for the quality of teachers' interactions with students as a function of engagement in individualized, focused consultation and feedback may have consequences for leveraging the value of public investments in early childhood education (Zaslow & Martinez-Beck, 2005). To date, research and development efforts focused on identifying effective and replicable approaches to teacher training that produce positive, and even accelerated, gains in children's academic performance have come up short, particularly for empirically-supported approaches that address the needs of a large number of teachers (Brandon & Martinez-Beck, 2005; Ramey & Ramey, 2005). Like nearly every other form of teacher training, including in K-12, there is virtually no evidence linking *specific* in-service training experiences to observed classroom quality (NICHD ECCRN, 2002b, 2005; NCTQ, 2005; Pianta, La Paro, Payne, Cox, & Bradley, 2002); this is one of the first evaluations of professional development in pre-k programs to show positive effects; however we also emphasize the preliminary nature of these findings and the need for replication and independent evaluation in more highly-controlled trials.

The MyTeachingPartner approach is based in large part on the need for professional development and training of teachers in instructional/interaction skills (Zaslow & Martinez-Beck, 2005), particularly as they apply to supporting children's early literacy and language competence (Dickinson & Brady, 2005). This approach targets the improvement of interactions through consultation and video-based exemplars that are tied to a standardized and validated observational measure of interactions, because there is little evidence that accumulating course credits, advancing in terms of degree status (e.g., from AA to BA), or attending workshops produce improved teaching (e.g., Early et al., 2007; NCTQ, 2005). In fact, we argue that the professional development needs of teachers, particularly early childhood educators, should be conceptualized not in terms of credentials or degrees, but rather actual demonstrated skill in the classroom. If early education programs are going to achieve high quality at scale (Pew Charitable Trusts, 2005) then new mechanisms of training teachers must be developed and tested both in preservice teacher training and in alternate certification and re-training routes used by large school districts or alternative suppliers (Birman et al., 2000; Borko, 2004; Clifford & Maxwell, 2002; Cochran-Smith & Zeichner, 2005; Pianta, 2005). The present study suggests promise in approaches that are heavily video-based, individualized (yet tied to common conceptual and assessment frameworks), and skill-focused, in which the target is teachers' delivery of instruction and provision of social and emotional supports.

One finding from this investigation is that effects of the consultation intervention were detected across all three domains of teacher-child interaction assessed by the CLASS. Given that effective teaching in early childhood education requires skillful combinations of explicit instruction, sensitive and warm interactions, responsive feedback, and verbal engagement/stimulation (Burchinal et al., 2000; Hyson & Biggar, 2005), it appears the intervention has across-the-board benefits. Because these aspects of instruction and interaction uniquely predict gains in young children's literacy and language development, effectively contributing to closing gaps in performance (e.g., Burchinal et al., 2000; Howes et al., 2008; Hamre & Pianta, 2005; NICHD ECCRN 2002a;), the MTP Consultation intervention may hold

promise as a mechanism that not only improves classroom quality but also impacts child outcomes, a hypothesis to be tested in subsequent investigations of the MTP approach.

As noted earlier, the effects sizes observed for the intervention conditions, even when significant, were small. In understanding and interpreting effect sizes of this magnitude, there are a few considerations that are useful to highlight. First, these effect sizes translate into gains, during the academic year, of roughly one-half point on CLASS scales, on average for the entire Consultancy group, and close to one scale point for certain subgroups (e.g., high poverty). When interpreting the meaning of effects of this magnitude, it is important to point out that increments of one scale point on CLASS indicators in the instructional domain (e.g., Language Modeling) or emotional domain (e.g., Sensitivity) have been shown in other work to be associated with gains in child outcomes of between .3 and .5 standard deviation units on standardized tests of achievement in first grade (Hamre & Pianta, 2005) and in state-funded pre-k (Vandergrift, Burchinal, & Pianta, 2008). In the present study, preliminary analyses indicate significant gains for child outcomes in literacy and language for children in classrooms receiving consultation (Downer, Pianta, Fan, Hamre, & Mashburn, 2008). A second consideration that can be useful in framing the magnitude of effects observed in this study involves the actual conditions being evaluated. Of note is that the present study is testing two forms of interaction-focused professional development support against one another and not a no-treatment control; thus, it is likely that the benefits of consultation or web-access are underestimated. Furthermore, teachers in both conditions were also implementing curricula in social development and language/literacy that included well-crafted suggestions for implementation, instruction, and interaction with children. Testing effects of consultation (or web-access support) by itself, with a no-support control group in classrooms in which there was less curricular support for high-quality interactions, could also result in detection of larger effects.

The results of this study also indicate that if teachers are exposed to multiple field-based examples of objectively-defined high quality practice and receive regular feedback about the extent to which their classroom interactions and instruction promote learning in key skill domains, then specific dimensions of instructional quality improve. A next step in our work will be to test more directly the link between the specific dimensions of interaction that are the focus of consultation and web use, and the dimensions of observed interaction in the classroom that change as a result.

Given the current focus in early education policy on program quality improvement through a variety of mechanisms, one of which could be a Quality Rating System using classroom ratings, then a promising element of these findings is the potential for scalability in regards to the web-based video resources and the very close tie between the quality metric (i.e., the CLASS) and the professional development supports (i.e., MTP). In relation to scale, when teachers were provided only with on-demand access to videotaped teaching exemplars, their consistent engagement with these resources was related to as much as a half point improvement in behavior management, teacher sensitivity, and productivity on a 7-point rating scale. Providing teachers with the opportunity to watch how other teachers interact with children and then to read accompanying text about how these interactions are effective in exposing children to rich learning opportunities appears to be a potentially valuable and

scalable tool for improving their own interactions with children. Of course a limitation to scalability of this approach is teachers' access to and skillful use of internet-based resources either at home or in their preschool programs. Our results showed considerable variability in teachers' stand-alone use of the web-only resources, an aspect of implementation that appears to be predicted by attitudes, and prior experience, among other factors (Whitaker, Kinzie, Kraft-Sayre, Mashburn, & Pianta, 2007).

As part of this videotape-viewing process, we argue that teachers can become better observers of teacher-child interactions, thus gaining the capacity to critically evaluate their own classroom practices and generate ideas for how to make changes in their everyday interactions with children. An important next step in "scaling up" these web-based video resources is to discern what distinguishes a teacher who *does* make use of the videos from a teacher who is given access but *does not* login and watch the video exemplars. There may be technological barriers in certain settings to accessing web-based videos, or there may be characteristics of teachers (e.g., comfort with technology, age) that either facilitate or deter the use of resources on the internet.

This combination of findings provides some support for the conceptual premise that teachers are likely to benefit from in-service professional development that includes dual opportunities to watch other teachers interact in effective ways with children *and* observe and receive feedback about their own interactions with the children in their classroom. Both opportunities lead to improvements in effective teaching practices, yet there is more to be learned about how the two operate in a paired fashion. For example, would the process of self-evaluation and consultant feedback be more effective if teachers first became skilled observers of other teachers' interactions with children using a validated framework like the CLASS? This hypothesis is being addressed in a series of studies conducted by the National Center for Research on Early Childhood Education that focus on course-based training of observation and interaction skills.

Finally, we make note of the findings demonstrating that in very high poverty classrooms, more intensive, focused, and individualized intervention was actually associated with *improvements* in teacher-child interaction while in classrooms offered less-intense supports there was a pattern of *declining quality*. These findings should be considered in light of results showing a) higher rates of child poverty in pre-k classrooms are among the strongest predictors of low quality interactions and classroom settings (Locasale-Crouch et al., 2007; NICHD ECCRN, 2002a; Pianta et al., 2005), b) child poverty is clearly among the single more powerful contributors of skills gaps at the start of school (Brooks-Gunn & Duncan, 1997), and c) pre-k programs tend to serve poor children and are designed to address achievement gaps. Thus we see some suggestion in these data that in order for pre-k programs to deliver levels of quality consistent with improvements in child competence (Hamre & Pianta, 2005; Howes et al., 2008), teachers may require rather intensive, individualized supports, including resources that target their practice and resources present in a supportive relationship with another adult. These types of supports may be necessary to offset the demands of teaching in the types of classrooms such programs tend to or are designed to sponsor. A legitimate concern raised in relation to scalability pertains to the

availability of computer and internet resources in high-poverty areas, although it is the case that at least most Head Start classrooms are so equipped.

We readily acknowledge a number of limitations in the present study. Foremost among these is the fact that randomization occurred at the district level while we are drawing inferences related to effects at the teacher/classroom level. Although our reasons for this approach to randomization were noted before, it nonetheless limits the causal nature of these findings even when we used an assortment of statistical techniques to equate the teachers. Notably, when results are examined controlling for district, we find no appreciable differences with the findings presented in this study. A second limitation is the fairly large number of predictors entered into each model and the repeated analyses on separate dimensions of teacher-child interaction, which resulted in somewhat diminished power and a slight increase in the possibility that the reported results were obtained by chance, although significant effects were found for 3 of the 10 CLASS dimensions. Another limitation of this work is the extent to which the reliability of the classroom interactions ratings attenuates the magnitude of the effects of intervention, thus these results may in fact underestimate the benefits of these approaches to professional development. We also recognize that there was considerable variation in teachers' use of and exposure to the professional development resources offered to them. Clearly dosage was not uniform across teachers within each condition, thus limiting our capacity to identify a clear level or amount of a specific treatment as effective or not. Another limitation concerns the possible selection bias of children whose parents provided consent to allow their children to participate in this study. The overall rate of consent was 75%; however, there is not data available to explore the potential selection biases by comparing these children with the 25% of children whose parents did not provide consent. Not only may this potential bias affect the generalizability of the findings, it also may affect the reliability of the classroom-level measures (e.g., percent poverty) that are based on the data available for consented children in each class. Finally, the CLASS, although a valid instrument for measuring the quality of interactions, may not be as sensitive to change as alternative instruments and we also recognize that alternative assessments of teacher effectiveness in the classroom may indeed prove a better focus for professional development, if validated against child outcomes.

In sum, despite certain methodological limitations, this study provides preliminary support for an approach to professional development for teachers in pre-kindergarten that is focused on their interactions in classrooms and provides teachers with individualized feedback and support using the internet as the medium for communication. That these resources can offset the demands of teaching in very high poverty classrooms and that more frequent access to such resources appears to be an important feature of their benefit, are suggestive of further lines of research that need to be conducted to provide additional information on feasibility, utility, and effects when these forms of professional development are better-integrated into state or district support and incentive programs. Overall, the results may have implications for the nature and type of support that can be helpful to teachers and the ways in which that support can be delivered.

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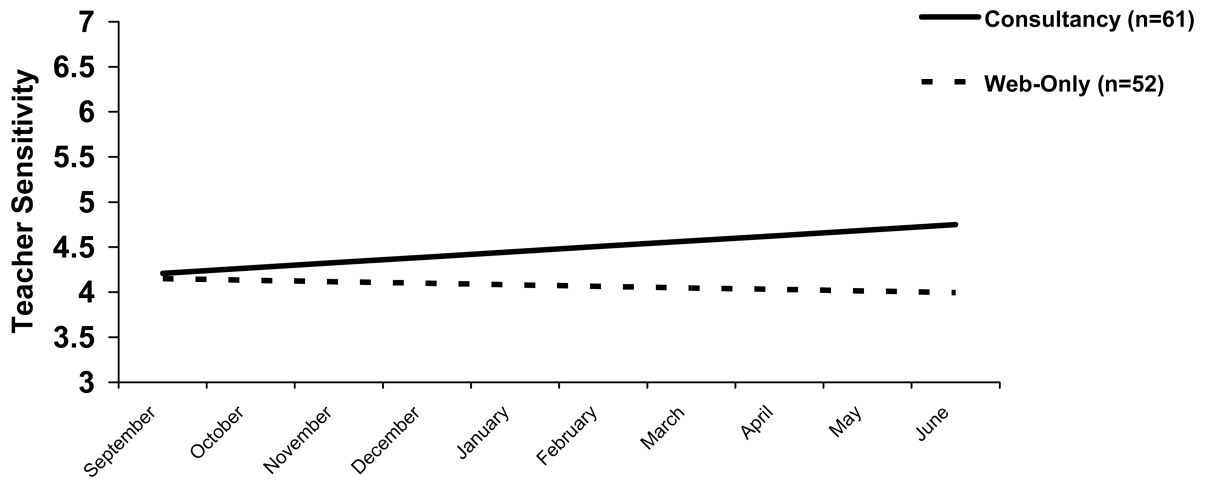


Figure 1. Changes in teacher sensitivity for teachers participating in the MTP consultation and web only study conditions

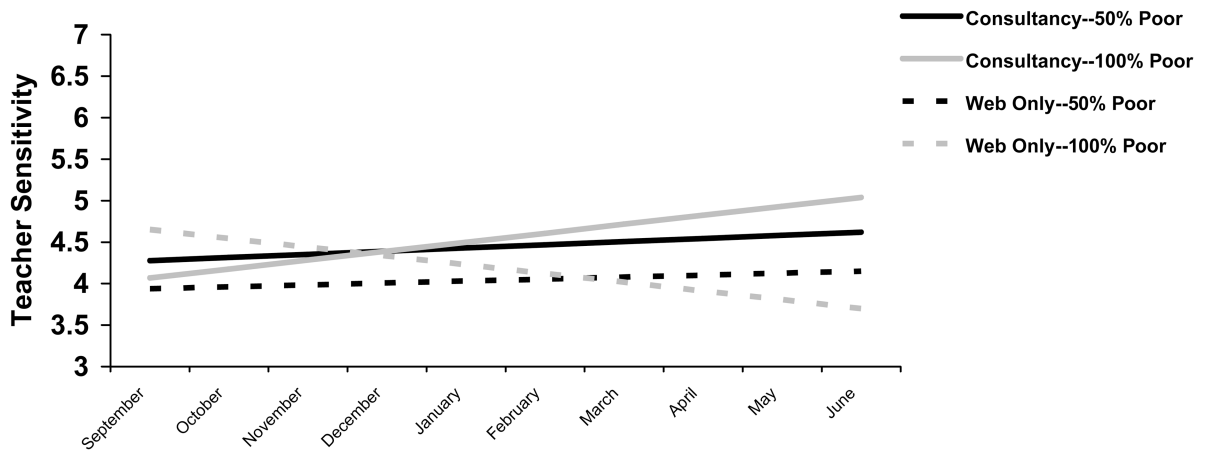


Figure 2. Moderating effects of study condition on the association between classroom poverty and changes in teacher sensitivity

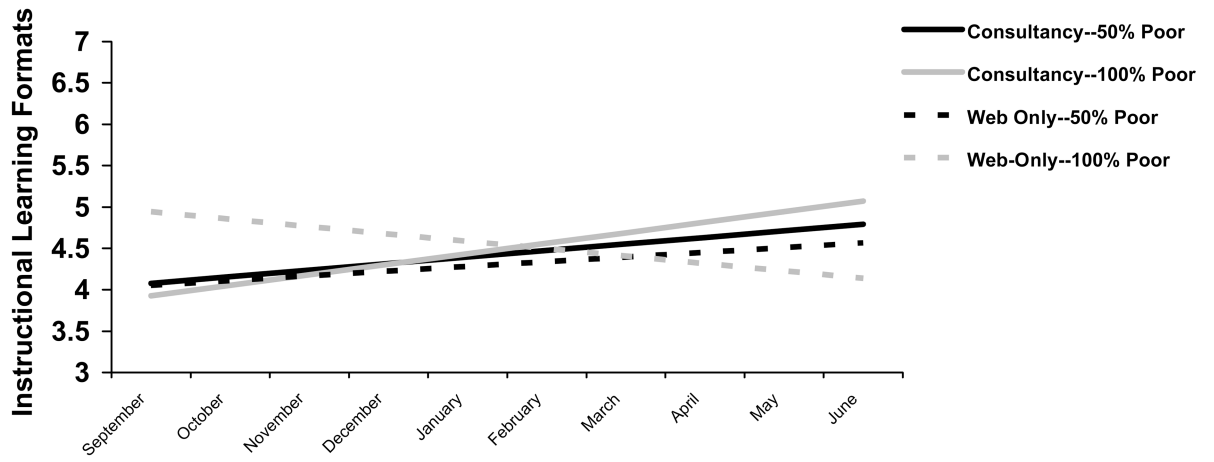


Figure 3. Moderating effects of study condition on the association between classroom poverty and changes in instructional learning formats

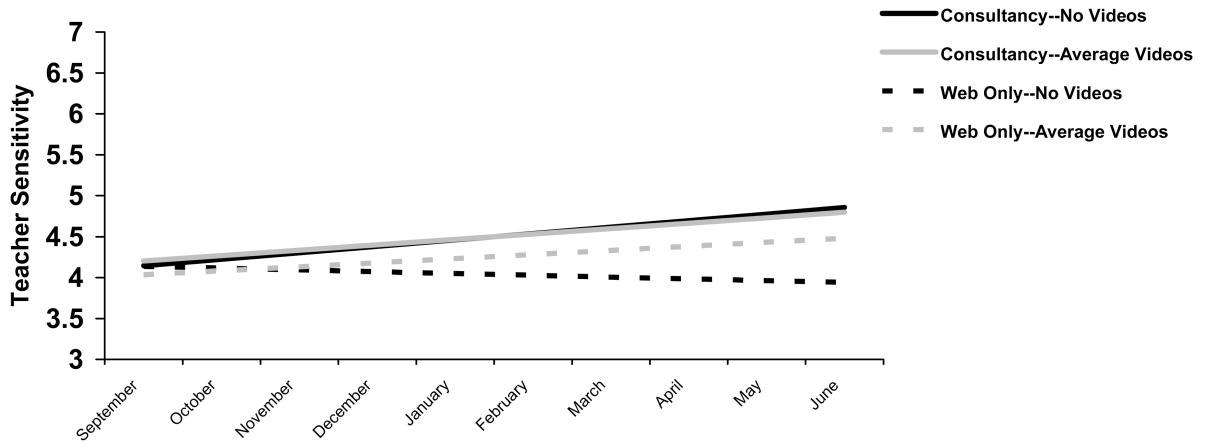


Figure 4. Moderating effects of study condition on the association between visiting video pages and changes in teacher sensitivity

Table 1
Descriptive Statistics for Observations, Teachers, and Classrooms by Study Condition

	Consultancy (n=61)				Web Only (n=52)					
	n	%	M	Sd	Range	n	%	M	Sd	Range
Teachers										
Years teaching experience	61		14.9	9.22	1-36	51		17.0	10.4	2-43
Missing	0					1				
Advanced degree										
Yes	19	31				20	39			
No	42	69				32	62			
Classrooms										
Number of students	61		13.9	2.81	7-18	51		14.9	1.93	6-17
Missing	0					1				
Percentage of students who are poor	61		69	25	11-100	52		67	20	13-100
Mean language/literacy skills at pretest (z-score)	61		0.04	1.03	2.6-2.3	52		0.20	0.91	-2.1-2.3
Observations										
Length of observation (minutes)	501		24.2	6.57	3-47	401		24.5	6.52	7-43
Missing						1				
Percentage of time activity implemented	490		62.5	24.6	7-100	397		61.3	27.5	8-100
Missing	13					5				
Activity type										
Language/Literacy	264	54				230	58			
Social-emotional	222	46				168	42			
Missing	17					4				
Number of observations/teacher	61		14.4	2.95	8-19	52		12.9	3.67	5-19

Table 2
Descriptive Statistics for Overall Web Usage by Study Condition

	Overall			Consultancy n=61			Web Only n=52		
	Mean	Sd	Range	Mean	Sd	Range	Mean	Sd	Range
Activity pages	73.5	126.7	0-510	118.4	155.4	0-510	20.9	39.8	0-214
Video pages	14.2	21.6	0-143	23.7	25.1	0-143	3.2	7.3	0-37

Table 3
Description of CLASS Dimensions by Area

Dimension	Description
<u>Emotional Support</u>	
Positive Climate	Reflects the overall emotional tone of the classroom and the connection between teachers and students
Negative Climate	Reflects overall level of expressed negativity in the classroom between teachers and students (e.g., anger, aggression, irritability).
Teacher Sensitivity	Encompasses teachers' responsiveness to students' needs and awareness of students' level of academic and emotional functioning.
<u>Classroom Management</u>	
Behavior Management	Encompasses teachers' ability to use effective methods to prevent and redirect misbehavior, by presenting clear behavioral expectations and minimizing time spent on behavioral issues
Productivity	Considers how well teachers manage instructional time and routines so that students have the maximum number of opportunity to learn.
Instructional Learning Formats	The degree to which teachers maximize students' engagement and ability to learn by providing interesting activities, instruction, centers, and materials
<u>Instructional Support</u>	
Concept Development	The degree to which instructional discussions and activities promote students' higher order thinking skills versus focus on rote and fact-based learning.
Quality of Feedback	Considers teachers' provision of feedback focused on expanding learning and understanding (formative evaluation), not correctness or the end product (summative evaluation).
Language Modeling	The quality and amount of teachers' use of language-stimulation and language-facilitation techniques during individual, small-group, and large-group interactions with children.

Table 4
Growth Models Examining Effect of Characteristics of Observations, Teachers, Classrooms, and Intervention Implementation on Quality of Classroom Interactions

	PC	TS	ILF	BM	PR	CD	LM
Intercept	5.32	4.15	4.32	4.85	5.48	2.99	4.25
Slope	-0.05	0.01	0.01	0.03	0.03	-0.01	-0.04
Observations							
Length of Tape	0.01 (0.01)	0.01 (0.01)	0.02*** (0.01)	-0.02* (0.01)	-0.02*** (0.01)	0.03*** (0.01)	0.03*** (0.01)
% activities on tape	-0.09 (0.15)	0.06 (0.16)	-0.10 (0.15)	-0.27 (0.16)	0.20 (0.14)	0.40* (0.15)	0.36* (0.16)
LL activity	-0.10 (0.07)	0.02 (0.07)	0.14* (0.07)	-0.03 (0.07)	0.17*** (0.06)	0.01* (0.07)	-0.03 (0.07)
Number of observations	-0.02 (0.03)	0.00 (0.03)	0.00 (0.03)	-0.04 (0.03)	-0.03 (0.02)	0.04 (0.03)	0.01 (0.02)
Number of observations*time	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.01)	-0.00 (0.00)	0.00 (0.00)	-0.01*** (0.00)	-0.01 (0.00)
Teacher and Classroom							
Advanced degree	-0.11 (0.18)	0.11 (0.19)	0.03 (0.18)	-0.09 (0.18)	0.00 (0.00)	-0.06 (0.16)	-0.05 (0.16)
Years experience	-0.00 (0.01)	-0.01 (0.01)	0.00 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.00 (0.01)
Number of students	-0.07 (0.04)	-0.05 (0.04)	-0.06 (0.04)	-0.07 (0.04)	-0.03 (0.03)	0.01 (0.03)	-0.02 (0.03)
% Poor	0.34 (0.41)	0.35 (0.42)	0.56 (0.40)	0.28 (0.42)	0.53 (0.36)	0.48 (0.37)	0.36 (0.36)
Mean ability	0.14 (0.09)	0.06 (0.09)	0.15 (0.09)	0.14 (0.10)	0.14 (0.08)	-0.09 (0.08)	-0.07 (0.08)
Advanced degree*time	-0.01 (0.03)	-0.03 (0.03)	-0.00 (0.03)	-0.00 (0.03)	-0.00 (0.00)	-0.01 (0.03)	-0.02 (0.03)
Years experience*time	0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)
Number of students*time	-0.00 (0.01)	-0.00 (0.01)	0.00 (0.01)	-0.00 (0.01)	-0.00 (0.00)	-0.00 (0.01)	-0.00 (0.01)
% Poor*time	-0.02 (0.07)	-0.02 (0.06)	-0.06 (0.07)	-0.11 (0.06)	-0.09 (0.05)	-0.05 (0.06)	-0.01 (0.06)
Mean ability*time	-0.01 (0.01)	0.01 (0.01)	-0.01 (0.02)	-0.01 (0.01)	-0.01 (0.01)	0.02 (0.01)	0.02 (0.01)
Intervention Exposure							
Consultation(I)/Web(0)	0.11 (0.21)	0.05 (0.21)	-0.30 (0.20)	-0.28 (0.21)	-0.12 (0.18)	0.09 (0.18)	-0.14 (0.18)
Number of activity pages	0.09 (0.08)	0.11 (0.08)	0.05 (0.07)	0.22*** (0.08)	0.11 (0.07)	0.13 (0.07)	0.12 (0.07)
Number of video pages	0.64 (0.47)	0.31 (0.48)	0.30 (0.45)	0.30 (0.49)	0.11 (0.41)	-0.07 (0.42)	0.02 (0.42)
Consultation(I)/Web(0)*time	0.05 (0.03)	0.07* (0.03)	0.07* (0.04)	0.03 (0.03)	0.02 (0.03)	0.01 (0.03)	0.09*** (0.03)
Number of activity pages*time	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.02* (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)
Number of video pages*time	-0.05 (0.08)	-0.04 (0.08)	-0.05 (0.08)	-0.09 (0.07)	-0.03 (0.06)	-0.01 (0.07)	-0.02 (0.07)

* p .05.
** p .01.
*** p .001.

PC=Positive Climate; TS=Teacher Sensitivity; ILF=Instructional Learning Formats; BM=Behavior Management; PR=Productivity; CD=Concept Development; LM=Language Modeling.

Table 5
Moderating Effects of Participation in MyTeachingPartner Consultation and Changes in Teaching Quality in Pre-K Classrooms¹

	PC	TS	ILF	BM	PR	CD	LM
Consultation*classroom							
Consultation*# students	-0.04 (0.08)	-0.08 (0.08)	0.03 (0.08)	-0.03 (0.08)	-0.02 (0.07)	-0.00 (0.07)	0.01 (0.07)
Consultation*# students*time	0.01 (0.01)	0.01 (0.01)	0.00 (0.01)	0.01 (0.00)	0.01 (0.01)	0.01 (0.01)	-0.01 (0.01)
Consultation*% poor	-1.26 (0.78)	-1.85* (0.78)	-2.08** (0.73)	-1.35 (0.81)	-0.68 (0.69)	-0.71 (0.70)	-0.37 (0.69)
Consultation*% poor*time	0.14 (0.13)	0.36** (0.12)	0.35** (0.13)	0.12 (0.12)	0.03 (0.10)	0.13 (0.12)	0.11 (0.12)
Consultation*mean ability	-0.03 (0.19)	0.26 (0.19)	0.35* (0.18)	0.31 (0.19)	0.37* (0.16)	0.09 (0.17)	0.03 (0.17)
Consultation*mean ability*time	-0.01 (0.03)	-0.05 (0.03)	-0.05 (0.03)	-0.05 (0.03)	-0.04 (0.02)	-0.02 (0.03)	-0.03 (0.03)
Consultation*web use							
Consultation*activity pages	0.11 (0.33)	-0.10 (0.33)	-0.53 (0.31)	0.27 (0.33)	0.12 (0.28)	0.05 (0.29)	-0.30 (0.28)
Consultation*activity pages*time	0.03 (0.05)	0.04 (0.05)	0.09 (0.06)	-0.00 (0.05)	-0.00 (0.04)	0.02 (0.05)	0.06 (0.05)
Consultation*video pages	0.51 (1.81)	1.12 (1.84)	-0.25 (1.74)	3.01 (1.83)	2.75 (1.58)	2.04 (1.61)	-0.28 (1.59)
Consultation*video pages*time	-0.47 (0.30)	-0.63* (0.30)	-0.13 (0.32)	-0.58* (0.29)	-0.55* (0.24)	-0.32 (0.29)	-0.29 (0.30)

Note: These analyses included characteristics of observations, teacher and classroom characteristics, and intervention exposure.

* p .05.

** p .01.

*** p .001.

PC=Positive Climate; TS=Teacher Sensitivity; ILF=Instructional Learning Formats; BM=Behavior Management; PR=Productivity; CD=Concept Development; LM=Language Modeling.

¹ Results obtained for separate entry of interaction terms adjusting for base prediction model in Table 4.