

THE FEATURES OF EFFECTIVE ONLINE PROFESSIONAL DEVELOPMENT  
FOR EARLY CHILDHOOD EDUCATORS

by

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## DISSERTATION ABSTRACT

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Title: The Features of Effective Online Professional Development for Early Childhood Educators

The purpose of this current study was to examine the effect of a preschool teacher intervention around the use self-monitoring and the online learning modules. The interventions were delivered online using: online learning modules that provided exemplars of the operationally defined instructional language supports. The study included 12 Head Start classrooms, with 21 lead and assistant teachers who were randomly assigned to one of two treatment conditions: (a) graphed feedback based on self-reported data, or (b) written feedback based on performance data from videos. An experimental research design was conducted to evaluate the treatment effects for teachers and children ( $n = 107$ ). The results suggested that regardless of condition, the majority of teachers increased their total frequency of language facilitation strategies. Additionally, the results suggest that teachers' receptive vocabulary skills and their role in the classroom (lead or assistant) may mediate the effect of the professional development intervention.

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## CHAPTER I

### RATIONALE

#### **Current Status of Early Childhood Programs**

As a field we have seen increased investment in early childhood education due to the research documenting its importance and effectiveness. In 2012-2013, state funding for preschool increased by \$116 million dollars and served more than 1.35 million four year olds (Barnett, Carolan, Squires, & Brown, 2015). Forty-three percent of three-year-olds and 69% of four- and five-year-olds attend a preschool or community childcare center before entering kindergarten (U.S. Department of Education, NCES, The Condition of Education, 2007). The learning and relationships that occur in early childhood programs have been connected to later positive experiences with elementary school teachers and long-term academic success for children (Darling-Hammond, 1996; Huffman, Mehlinger, & Kerivan, 2000; Peisner-Feinberg et al., 1999). The effectiveness of early childhood programs comes from high-quality classroom experiences (National Association for Educators of Young Children (NAEYC) Accreditation Standards, 2015). Teachers, who are responsive, engaging, model language, and create positive learning environments, increase the overall skill development for children (e.g., Pianta, Mashburn, Downer, Hamre, & Justice, 2008; Piasta et al., 2012). While all children deserve high-quality preschools, children experiencing poverty may benefit more academically and socially than peers in higher socio-economic groups (Reynolds, Magnuson, & Ou, 2010). For example, early intervention programs, such as Head Start, have been shown to increase the academic performance of children experiencing adversity (e.g., Conti,

Heckman, & Pinto, 2016; Hamre & Pianta, 2005; Pungello et al., 2010; Zhai, Raver, & Jones, 2012).

**Language-Rich Environment.** Children's environments impact their language development and therefore it is important to expose children to language rich environments (Wasik, Bond, & Hindman, 2006). The role that the home environment, in particular primary caregivers, plays on a child's language skills has long been established (Hart & Risley, 1995; Vasilyeva & Waterfall, 2011). In particular, children exposed to poverty are at increased risk for delays in language development (Hart & Risley, 1995; Wasik et al., 2006). We understand that there are syntactical (e.g., complexity, lengthen of utterances) and vocabulary (e.g., number of words, quality of words used, variation in usage of words) differences based on socio-economic status (SES) for both children and adults (Vasilyeva & Waterfall, 2011). Specifically, individuals from lower socio-economic groups often have less syntactically complex language when compared to higher socio-economic peers (Hart & Risley, 1995; Vasilyeva & Waterfall, 2011). Less syntactically complex language has been shown to correlate to lower vocabulary skills and less of an ability to understand more complex oral and written language (Vasilyeva & Waterfall, 2011; Vasilyeva, Waterfall, & Huttenlocher, 2008), which has been shown to influence later academic outcomes such as reading and overall academic achievement (e.g., O'neill, Pearce, & Pick, 2004). Early childhood settings, like Head Start, aim to provide a rich language environment to ameliorate the effects of exposure to high levels of risk factors (e.g., Wasik et al., 2006). Early childhood programs that provide opportunities for children to respond to conversations and expand their vocabulary can increase children's overall expressive language skills (Piasta et al., 2012).

Both the quantity and the quality of teacher-child interactions are important to improve language development (Dickinson & Caswell, 2007; Harms & Clifford, 1980). The quality of exchanges refers to language interactions between children and their caregivers. Children who engage with caregivers, who are responsive to their language bids, read books with great frequency and provide cognitively stimulating environments creates a “nutritious” language diet (Zauche, Thul, Darcy Mahoney, & Stapel-Wax, 2016). Teachers’ increased use of those language enhancement strategies have been connected with increased production and sentence complexity in children (Girolametto & Weitzman, 2002; Vasilyeva & Waterfall, 2011).

Language enhancement strategies used by teachers to foster language skills in children fall into two main categories: (1) language development (e.g., modeling, extension) and (2) language facilitation (e.g., open-ended questions) (Girolametto, Weitzman, & Greenberg, 2006). Language development strategies assist in modeling verbal language for children. While, language facilitation strategies provide opportunities for children to respond or speak more often which is important because the frequency of language opportunities, or opportunities to engage in conversation, has been found to be related to gains in children’s overall language development (NICHD Early Child Care Research Network, 2002). Importantly, early childhood teachers have been found to more consistently use language facilitation rather than language development strategies (Pianta et al., 2012); but further research is needed in this area.

### **Teacher Quality in Early Childhood Classrooms**

Current practice in early childhood classrooms often falls short of providing language-rich environments (Justice, Mashburn, Hamre, & Pianta, 2008). One tool that is

commonly used to measure classroom quality in Head Start is the Classroom Assessment Scoring System (CLASS®; Pianta, La Paro, & Hamre, 2008). Federal law mandates that a CLASS® review for each Head Start program is included in all grant reviews. Pianta and colleagues (2008) examined the interactions between teachers and children in early childhood settings using the CLASS®. The CLASS® has ten dimensions related to teaching quality (Pianta et al., 2008). Each CLASS® item is rated on seven point Likert scale (1 lowest to 7 highest). Early childhood classrooms, in particular in Head Start, are consistently scoring in the low range (less than 3 out of 7) for instructional supports (i.e., concept development, quality of feedback, and language modeling). In 2015, Head Start classrooms in the lowest 10% scored 2.22 and in the highest 10% scored 3.53 on the CLASS® in this area (“National CLASS® Scores”, 2016). Low instructional support scores for Head Start programs is particularly concerning given the importance of providing this population of students (i.e., students with potential exposure to higher rates of adverse experiences) with access to language enrichment with the aim to improve growth trajectories and school readiness (e.g., Burchinal, Vandergrift, Pianta, & Mashburn, 2010; LoCasale-Crouch et al., 2007). Some initial research, has shown that increased student academic success is associated with classrooms with higher CLASS® ratings (Justice et al., 2008). Inferring that classrooms with higher levels of teacher-child interactions related to instructional strategies can improve outcomes for students.

Even though it is well documented that access to a language-rich environment fosters the language development of children (Zauche et al., 2016; Lonigan, 2006; Justice et al., 2008), early childhood classrooms by and large have not consistently achieved this goal. More research is needed to more specifically understand the role that various

characteristics related to teachers' conceptual knowledge and instructional practices play on children's language development. Particularly, variations in lead and assistant teacher characteristics (i.e., knowledge and behavior, teacher preparation and educational backgrounds, years of experience) and the in-service professional development offered may influence the quality of instruction.

**Variations in teacher preparation.** Variations in early childhood teacher preparation programs can be explained in the following ways: (a) requirements for pre-service experience, (b) lack of availability of programs, and (c) inconsistency related to content and quality across programs. First, only 23 states require pre-service education for early childhood educators (LeMoine, 2005). Teachers in states with lower educational requirements for early childhood teachers may struggle to meet national standards (LeMoine, 2005), such as the NAEYC or Head Start teacher qualification standards. The educational requirements often differ based on the role of the teacher – lead versus assistant. For example, Head Start teachers should have a minimum of an associate's degree or equivalent and it was recently mandated that at least 75% of teachers in each program should have a minimum of a baccalaureate degree in a field related to early childhood education. All assistant teachers should have a high school diploma or a general education diploma (GED) and 50% should have at least a child development associate credential. There is also a lack of availability of programs. Less than 30% of universities have early childhood education programs (Early & Winton, 2001). Again, the lack of access to programs prevents teachers from receiving the training required to meet the quality indicators (e.g., developmentally appropriate

curricula, knowledge of assessment, classroom management skills) recommended by national organizations.

The range of pre-service educational requirements and experiences for early childhood educators greatly impacts the workforce by creating the potential for disparity in both conceptual knowledge and instructional practices. For example, in Oregon early childhood educators could be employed as childcare workers, Head Start teachers, universal pre-kindergarten teachers or early interventionists. Oregon only requires that early intervention/early childhood special educators be licensed to work with young children ages 3 – 8 years old (Teaching Standards and Practice Commission, 2017). However, Oregon's Office of Child Care states that head teachers, in a childcare program, could hold anything from a bachelor's degree to 20 post-high school credits plus at least one year working at a licensed childcare facility. In Oregon childcare facilities, assistant teachers should have received 20 after high-school credits or 10 credits plus at least six months working at a licensed childcare facility. Additional, research is needed to explore the potential impact of these variations in requirements on the quality of language environments in early childhood classrooms.

**Variations in lead and assistant teacher characteristics.** The traditional early childhood classroom model relies on both a lead teacher and an assistant teacher. Sosinsky and Gilliam (2011) found that in Head Start classrooms, when compared to K-12 settings, lead and assistant teachers shared much of same tasks (e.g., leading small instruction groups, reading books, facilitating play) in the daily classroom routine. However, little to no research exists that examines potential differences, in conceptual knowledge and instructional practices, between lead and assistant early childhood

teachers (Curby, Boyer, Edwards, & Chavez, 2012; Fraser & Meadows, 2008). Early childhood research often disregards the inclusion of assistant teachers when conducting data analysis (Curby et al., 2012). This creates a problem when attempting to understand how potential differences (e.g., educational backgrounds, adult literacy, language modeling, quantity of language interactions) between lead and assistant teachers may affect teacher-child interactions. Approximately, 400,000 people are employed as assistant or associate teachers in early childhood settings (Bureau of Labor Statistics, 2017; Burton et al., 2002) and virtually no research has been conducted on potential differences between assistant and lead teachers. One study that has compared lead and assistant teachers found significant differences between their uses of instructional supports (i.e., language modeling, quality of feedback, concept development) with assistant teachers scoring lower than the lead teachers (Curby et al., 2012). Curby and colleagues (2012) suggested that experience (e.g., years teaching, professional development) might play a larger role in the differences found between the two groups than educational attainment. Further research is needed to examine the possible variation in quality and quantity of language instruction implemented by the lead or assistant teachers.

While we know much less about how the two groups of teachers vary, one possible shared characteristic that could moderate the to ability provide language-rich environments are low adult literacy and oral language abilities. Early childhood educators are reported to have the lowest adult literacy rates when compared to other educator groups (Halle et al., 2009; Zaslow et al., 2010). Considering the emphasis placed on providing children, particularly those experiencing early disadvantages, with a language-

rich environment the possibility of low literacy levels for early childhood teachers is particularly concerning. Pianta, La Paro, and Hamre (2006), demonstrated that classrooms, serving children in low-income areas, scored lower on the CLASS® in the areas of quality of feedback and language modeling. The combination of variability in pre-service educational requirements and the potentially lower teacher language and literacy rates may inhibit early childhood programs from achieving high-quality ratings. Early childhood classrooms aim to provide children with strong school readiness skills, but given the variation and lack of consistent foundational training for teachers and assistants, early childhood programs are highly dependent on professional development opportunities if they are to reach their goal of delivering quality programs to all families and children.

### **Variations in Professional Development**

Professional development refers to the training and support that practicing teachers receive (e.g., Desimone, 2009; Zaslow et al., 2010) after they have completed their teacher preparation programs. The No Child Left Behind Act of 2001 mandated that teachers receive high-quality professional development that is both sustained and content focused. Professional development has been shown to be more effective at increasing teachers' instructional practices than pre-service educational backgrounds for early childhood educators (Honig & Hirallal, 1998). Professional development can directly impact teacher skills (i.e., instructional practices) and conceptual knowledge, thus improving children's outcomes (Garet, Porter, Desimone, Birman, & Yoon, 2001; Odom, 2009; Snyder, Hemmeter, & McLaughlin, 2012).

The review also documented certain features of professional development that are more highly correlated with improved outcomes for children. Professional development should be designed such that teachers are actively engaged with the content and have opportunities to practice the skills; creating a connection between the instructional strategies being presented and the teachers' daily classroom experiences (i.e., practice) (Powell & Diamond, 2013). The current study, drew upon Desimone's (2009) description of five core features of effective professional development: (a) content focus (e.g., language facilitation, instructional practices), (b) active learning (e.g., online discussions, submitting videos for feedback, self-monitoring behavior), (c) coherence (e.g., NAEYC recommendations, Head Start regulations and standards), (d) duration (i.e., frequency and dosage), and (e) collective participation (i.e., engagement with others in learning experiences).

Professional development content (Desimone, 2009), should match the needs of the teachers and their classroom - it should be contextually relevant (Yoon et al., 2007). Teachers must be invested in the process with active learning and collective participation (Desimone, 2009) and it has been found that teachers are more engaged when the professional development matches their programs standards, regulations, and beliefs (Desimone, 2009; Dickinson, Watson, & Farran, 2008). The delivery (e.g., duration, collective participation, active learning) should also be grounded in adult learning theory (Richardson & Placier, 2001). Lastly, professional development experiences that provide teachers with instructional strategies, which are evidence-based, are more likely to change skills and knowledge (Hiebert & Grouws, 2007). Understanding the dynamic relation between the types of professional development delivered (e.g., one time in-

service, coaching, professional learning communities), participants (i.e., lead or assistant teachers), and contextual factors (e.g., educational standards, pre-service training, student needs) is critical for continual improvement of the early childhood workforce (Borko, 2004).

**Current online professional development practices.** Online professional development maps on to the framework proposed by Desimone (2009), because it provides opportunity to address all five core features of effective professional development. First, online professional development addresses concerns related to teachers' access (i.e., active learning and content focused) to resources that can enhance their instructional practices and conceptual knowledge (Treacy, Kleiman, & Peterson, 2002). Current research has shown initial promise and a need for future studies specifically examining how features are related to online trainings in early childhood settings (Odom, 2009; Pianta et al., 2008). The duration, related to length and intensity, of the professional development is critical for change (Desimone, 2009). Some barriers to receiving access to appropriate dosage/duration (i.e., time, distance, external and internal resources, staffing) that occur when implementing traditional forms (face-to-face) of professional development (Dede, Ketelhut, Whitehouse, Breit, & McCloskey, 2009), can be addressed through the use of online professional development. For example, online professional development grants participants access to the learning content anytime and anywhere, which potentially increases the ability for additional teachers to be reached and supported (Ryan & Scott, 2008); relating to the features of active learning and collective participation (Desimone, 2009). When compared to some face-to-face professional development, web-based delivered content could be more easily tailored to

the skills (i.e., instructional practices) and knowledge (i.e., conceptual knowledge) of the learners, addressing the feature of coherence (i.e., maps on to contextual fit), which increases the likelihood of change in adult behavior (National Academy of Sciences, 2007). Online professional development shows great promise for increasing teachers' implementation of instructional practices, thus leading to positive outcomes for students (Powell & Diamond, 2010; Pianta et al., 2008). One concern about online professional development is the lack of research to support best practices (Chen, Chen, & Tsai, 2009). Just as with face-to-face professional development, additional research is needed to better understand the active ingredients of online professional development (e.g., Odom, 2009; Zaslow et al, 2010). One major active ingredient to examine, related to online instruction, is the type of the feedback delivered to the adult learners.

**Feedback.** The provision of feedback is an evidence-based practice (EBP) that shows how teachers can change desired behavior and has effects that are related to intervention skills (Fallon, Collier-Meek, Maggin, Sanetti, & Johnson, 2015; Solomon, Klein, & Politylo, 2012). When providing feedback three considerations are important: (a) content (e.g., corrective, positive, general, specific), (b) timing and frequency (e.g., how often, immediate vs. delayed), and (c) who provides the feedback (Van Houten, 1980). Feedback is more effective at changing behaviors when it is specific; giving the learner more direct instruction on how to correct his/her behavior (Eisner, 1992; Englert & Sugai, 1983). The delayed feedback that is provided by a coach watching videos of the teacher has been shown to be effective in increasing teachers' usage of intervention strategies in early childhood settings (e.g., Barton, Pribble, & Chen, 2013; Hemmeter, Snyder, Kinder, & Artman, 2011; Pellecchia et al., 2011). Reinke, Lewis-Palmer, and

Martin (2007), used a different approach to provide feedback to teachers on their performance, by presenting teachers only with a visual representation of the data they had collected. The proposed study will examine the extent to which type of feedback (graphed self-reported or delayed performance) impacts the teachers' implementation of language facilitation strategies in their classrooms.

**Adult learner characteristics.** A better understanding of the relation between characteristics of the adult learner and professional development is needed, so that we as a field can design the optimal experience for participants (Hammerness et al., 2005). Factors such as age, educational experiences, adult literacy levels, and self-efficacy may influence how a teacher engages with professional development. For example, we know that, on average, the age of the participant does not necessarily play a significant impact on the adult learners' interest or the effectiveness of online learning experiences (Mulenga & Liang, 2008). However, we know little about how adult literacy rates or language skills may impact their engagement with online professional development; it is critical that we explore this gap in research so that we can understand the role it may play in teachers' active learning and appropriately tailor the content to address teacher level variables.

A way to frame interactions (i.e., active learning, duration, collective participation [Desimone, 2009]) during professional development is the Interaction Equivalency Theorem (Anderson, 2003); Anderson's Interaction Equivalency Theorem (2003), posits that the learner must have a high level of engagement with one or more of the following: learner to teacher (e.g., emails, phone conversations, feedback on assignments), learner to learner (e.g., forum discussions, group projects, class discussions), learner to content

(e.g., video examples, analysis and synthesis, presentations); to demonstrate teacher growth and foster participant satisfaction during online education. Ensuring that the learner engages a high rate, with either the teacher, other learners or the content increases the adult learners' motivation and connectedness to the professional development (Borko, 2004); thus addressing active learning and collective participation (Desimone, 2009). We do know that the connection between self-efficacy and participants' interactions with online professional development is important. How an adult learner perceives the relevance of training relates to the learner's motivation (Bandura, 1993). So, in designing professional development how the content is related to the learner should be explicitly incorporated to increase teacher motivation and positively impact engagement. Better understanding the impact of teacher level characteristics (e.g., adult literacy skill, educational level, years of experiences, previous professional development, confidence using a variety of technology) would allow us to create online professional development that better matches the teacher's conceptual knowledge and instructional practices.

Little is known about how teachers' oral language skills might specifically impact their engagement with online professional and the delivery of language-rich environments in the classroom. We need to better understand the role that adults' language skills may play in their engagement with professional development related to language facilitation strategies. We also need to study how an early childhood educators' expressive language skills (e.g., syntax and vocabulary) might shape the classroom language environment and their ability to model language for young children.

**Impact on improving child outcomes.** It is critical that professional development provides a clear link between changes in teachers' skills, knowledge, and

behavior, and child gains (Yoon et al., 2007; Zaslow et al., 2010). Teachers benefit from a clear connection between the professional development content and child outcomes (Brophy, 1999; Timperley & Alton-Lee, 2008). However, it is often difficult to increase teachers' conceptual knowledge that leads to changes in their behavior (i.e., instructional practices) related to language modeling in early childhood classrooms (Zaslow et al., 2010). One thing we can do, is to make clear the connection between professional development and child outcomes for teachers aiming to increase their engagement, which potentially will increase their implementation of instructional practices, thus leading to greater child outcomes. As a field we understand that engagement in professional development involving increased hours (e.g., more sustained contact, increased practice, and on-going feedback) is correlated with higher outcomes for children (Yoon et al., 2007). Professional development, with high rates of sustained engagement, aimed around strengthening teachers' use of language modeling skills has also demonstrated positive outcomes for students (e.g., Hindman & Wasik, 2012; Hsieh, Hemmeter, McCollum, & Ostrosky, 2009; Milburn, Girolametto, Weitzman, & Greenberg, 2014; Powell, Diamond, Burchinal, & Koehler, 2010).

Overall, additional research is needed to examine the features that are most effective at changing teachers' knowledge, skills, and behaviors that lead to improved student outcomes (Snyder, Hemmeter, & McLaughlin, 2012; Wayne, Yoon, Zhu, Cronen, & Garet, 2008; Zaslow et al., 2010). Also, we need to increase our understanding of how and why to make design choices related to features of effective professional development (i.e., active learning, collective participation, duration, content, coherence [Desimone, 2009]) for teachers (Schachter, 2015).

## **Current Study**

The purpose of this study was to examine how varying an aspect related to content and active learning (i.e., the type of feedback) during online professional development may effect the instructional practices of early childhood teachers. All teachers, leads and assistants, received access to online professional development content related to improving the quality of early childhood instruction by focusing on: (a) teachers' self-monitoring and goal setting; and (b) language facilitation strategies (i.e., narration, extension/repetition, open-ended questions). Specifically, what the potential relation between the type of feedback that teachers received and changes in their implementation of language facilitation strategies. Feedback is defined as the amount (i.e., how often) online feedback (i.e., emails, data shared) is provided to teachers (e.g., Daro, Hart, Boller, & Bradley, 2012; Halle et al., 2009; Tout, Halle, Zaslow, & Starr, 2009). Additionally, the current study explored the potential relation between teacher initial receptive vocabulary language skills and their implementation of language facilitation strategies. Based on the following literature review, the current study addressed two main research questions related to the potential effect of the intervention and in addition to gaining greater insight to two exploratory research questions as well.

### **Main Questions:**

RQ 1. To what extent is the type of feedback (graphed self-reported vs. delayed performance) related to teachers' implementation of language facilitation strategies? My hypothesis was that the type of feedback will have no significant effect the teachers' implementation of language facilitation strategies; both are associated with changes in adult behavior however, graphed self-reported data

may require less effort on the part of instructor (e.g., Barton et al., 2013; Hemmeter et al., 2011; Pellecchia et al., 2011).

RQ 2. To what extent is teachers' implementation of language facilitation strategies related to child language outcomes? My hypothesis was that teachers who demonstrate higher rates of increased opportunities to respond (i.e., language facilitation strategies) will lead to more opportunities for children to practice language, thus resulting an increase in positive outcomes in children (e.g., Hindman & Wasik, 2012; Hsieh et al., 2009).

**Exploratory Questions:**

RQ 3. Do the level of teachers' receptive vocabulary skills predict their usage of language facilitation strategies? My hypothesis was that teachers with higher vocabulary levels (pre-intervention) would implement the language facilitation strategies at a greater frequency than teachers with lower vocabulary levels (Hart & Risley, 1995).

RQ 4. Does the frequency of implementation of language facilitation strategies vary between lead and assistant teachers? My hypothesis was that post-intervention lead teachers would implement the language facilitation strategies at a greater frequency than assistant teachers (Curby et al., 2012).

## CHAPTER II

### LITERATURE REVIEW

#### **Importance of Language Facilitation in Early Childhood**

The quality and quantity of adult-child language interactions shapes the language abilities of children (Hart & Risely, 1995). Increasingly children are spending more time out of the home and in early childhood programs (National Association of Child Care Resource and Referral Agencies, 2012), therefore it is critical that teachers provide a language-rich environment for children (Wasik et al., 2006). Children, particularly those from lower socio-economic backgrounds, may have less exposure to complex and varied language models when compared to their peers growing up in families with higher socio-economic status (Vasilyeva & Waterfall, 2010). The use of language facilitation strategies encourages children to vocalize, which builds upon their language skills (e.g., Copple & Bredekamp, 2009; Hart & Risley, 2003; Girolametto et al., 2006). Language development strategies (e.g., expansion, mapping, narration) lead to increased production and sentence complexity in children (Early et al., 2006; Girolametto & Weitzman, 2002). Also, the increased frequency of conversations between adults and children is positively correlated with an increase in children's overall language development (NICHD Early Child Care Research Network, 2002). Early childhood educators use two main types of strategies to encourage language: (1) language development (e.g., modeling, extension) and (2) language facilitation (e.g., open-ended questions) (Girolametto & Weitzman, 2006). Caregivers who respond to children's utterances increase further language development (Snow, Midkiff-Borunda, Small, & Proctor, 1984). In the current study, the term "language facilitation" refers to both kinds of strategies.

The content of the online professional development in this study includes five language facilitation strategies: (a) extension, (b) open-ended questions, (c) narration, (d) self-talk, and (e) repetition. See Table 1 for examples of the five language facilitation strategies. Teachers' use of extensions leads to increases in the mean length of utterances for children (Early et al., 2005). Teachers' use of open-ended questions creates opportunities for children to respond. When children have increased opportunities to respond and exchange information they further develop their knowledge and skills (NICHD Early Child Care Research Network, 2002). While the opposite has also been found, caregivers who use more close-ended questions and directive speech can lead to decreases in children's language production (e.g., Lieven, 1984). Self-talk, or event casting, and narration describe the actions and activities in the child's environment, which model language and provide context for children to practice speaking.

We know that it is not just the quality, but also the quantity of verbal interactions that fosters a language-rich environment in early childhood programs (e.g., NICHD Early Child Care Research Network, 2002; Pianta, La Paro, Payne, Cox, & Bradley, 2002; Vasilyeva & Waterfall, 2010). The higher frequency of verbal interactions between teachers and children has been found to predict both positive vocabulary and oral language outcomes (Girolametto & Weitzman, 2002). However, often in childcare settings, children experience more directive and less conversational speech (Girolametto, Weitzman, & van Lieshout, 2000); teachers' use of directive speech limits the exchanges and complexity of language children are exposed to thus failing to provide them with a language-rich environment (Girolametto et al., 2006). As previously mentioned, one way to change teaches' skills, knowledge, and behavior is through in-service. Specially,

professional development has shown promise in addressing concerns (i.e., adult language skills, frequency of interactions, too directive) related to language environments for children in early childhood settings (e.g., Ota & Autsin, 2013, Powell et al., 2010; Wasik et al., 2006).

### **Professional Development in Early Childhood**

**Current status of the field.** Professional development seeks to improve teachers' conceptual knowledge and instructional practices (Desimone, 2009; Joyce & Showers, 2002). A growing body of literature describes professional development interventions and the effects on early childhood educators (e.g., Odom, 2009; Snyder et al., 2011; Zaslow et al., 2010). The last 14 years has brought about increased empirically based professional development practices for early childhood education. These practices draw from (a) elementary and secondary in-services, (b) adult learning theory, and (c) behavior analytic principles (Snyder et al., 2011). A major increase in research around professional development for early childhood education arose around 2000. No longer should professional development for educators be a one-time event; often these one-time events fail to take into account the interplay between content and context (Mockler, 2005). One-day trainings are less effective than ongoing long-term professional development and do not adequately meet the needs of adult learners (Joyce & Showers, 2002). Many in the field recommend that professional development should be collaborative in nature, practice-based (in classrooms) and provide teachers with feedback regarding their implementation of instructional practices (Miller & Stayton, 2005; Odom, 2009; Snyder et al., 2011). The current study's online professional development intervention is grounded in the following approaches: (a) Desimone's (2009) five features of effective

professional development (i.e., content focus, active learning, coherence, duration, and collective participation), (b) Odom's (2009) call for "enlightened PD" (e.g., online PD), and (c) Anderson's (2003) Theory of Interactivity

In 2009, Odom wrote that all practices in professional development could be categorized as either "expired", "tired", or "wired". Specifically, the one-time in-service approach to professional development should be considered "expired" because it does not lead to long-term sustainable change in early childhood settings (Joyce & Showers, 2002; Odom, 2009). Future research should instead be focused on the "wired" or "enlightened professional development"; shifting towards online sustained instruction focused around increased implementation of evidence-based practices for early childhood educators (Odom, 2009). The next section describes in greater detail how the five features of effective professional development, combined with Odom's push for online professional development, have been considered and incorporated in the current intervention.

*Active learning.* It is the interactivity, particularly in online professional development, which drives change in teacher conceptual knowledge and instructional practices (Anderson, 2003). Interactivity refers to the three main interactions that occur in educational experiences – learner to learner, learner to instructor, and learner to content (Anderson, 2003; Borko, 2004). At least one of the three types of interactions should occur at a high level in order for the instruction to be effective (Borko, 2004). For example, weekly feedback from the instructor or coach could provide the level of interaction needed to increase teachers' implementation of instructional practices.

Often face-to-face in-services involve more passive learning, which is inconsistent with adult learning theory (Knowles, 1990). Active learning, which is

critical for adult learners, refers to opportunities for teachers to engage with the material and that could include leading group discussions or being observed in combination with the provision of feedback (e.g., Banilower & Shimkus, 2004; Borko, 2004). Increased opportunities for learning engagement occurs when feedback, based on teachers' demonstration of skills, practice or knowledge is provided (Joyce & Showers, 2002). Professional development should be built on adult learning theory with a focus on social interaction and experiential learning (Dewey, 1933; Recchia, Beck, Esposito, & Tarrant, 2009); social interaction can occur in a variety of ways: (a) communities of practice, (b) including all classroom teachers, or (c) receiving feedback from a coach. In recent reviews, researchers have called for a reframing of professional development that is centered on scaffolding experiences, which are practiced in real world settings (Webster-Wright, 2009; Zaslow et al., 2010). The opportunity for teachers to practice new skills in their classrooms increases the likelihood of sustained change in teacher behavior (Zaslow et al., 2010). The educational experiences in effective professional development should be active, collaborative, and centered around the practices within the classroom (Darling-Hammond & McLaughlin, 1995; Putnam & Borko, 2000).

*Coherence.* Teachers are more likely to modify their behaviors and take risks when the material presented aligns with their belief system (e.g., Guskey, 2002; Wlodkowski, 2011); that coherence between what teachers experience in the classroom and the content presented is critical. Coherence refers to the connection between the content of the professional development and its relation to the teachers' current knowledge and belief system (Desimone, 2009). Additional aspects of coherence should be considered when thinking about online professional development. Learner

characteristics, such as experience with technology and their conceptual knowledge and instructional practice, can impact how teachers relate to the online instruction (Johnson, 2004). Teachers' comfort and knowledge related to the technology used in online professional development can moderate the effects of the intervention (Kao & Tsai, 2009). When designing online professional development we should consider variation in teachers' characteristics and how that may influence the effectiveness of the intervention.

*Duration.* Duration describes both the amount of time teachers are exposed to the content and the number of hours engaged with the content (e.g., Desimone, 2009; Supovitz & Turner, 2000). Professional development, like one-time in-services or conferences, lack the intensity or duration needed to change adult behavior (Birman, Desimone, Porter, & Garet, 2000; Desimone, 2009). On average the recommended duration for professional development that correlates with higher rates of change in teacher behavior is 20 hours over several months (Desimone, 2009). It should be noted that optimal duration to effect change in teacher practice that correlates to positive child outcomes has not yet been established (Desimone, 2009; Zaslow et al., 2010). There are a number of obstacles (e.g., time, staffing, financial, access to experts) to implementing intense, long-term professional development for teachers. Video-conferencing and online learning show promise as a way to decrease barriers and increase teachers' exposure to professional development (Kinzie et al., 2006; Whitaker, Kinzie, Kraft-Sayre, Mashburn, & Pianta, 2007; Zhao, Lei, Yan, Lai, & Tan, 2005). The ability to provide professional development online may reduce some of obstacles for early childhood programs. The demand for more access to supports has led to an increase in online professional

development (Dede et al., 2009) and has created more opportunities for programs to access consultation and feedback (Joyce & Showers, 2002; Odom, 2009).

*Collective Participation.* A great strength of the early childhood field, as noted by Odom (2009), is the utilization of the social nature that naturally exists within a team of educators; it is through this collective participation that we have seen change in classrooms (Desimone, 2009). Collective participation refers to engaging teachers from the same classroom or school to increase opportunities for interaction related to the content (e.g., Borko, 2004; Desimone, 2009). Recruiting teachers from the same classroom to participate in professional development opportunities may increase the likelihood that teachers will change their implementation of intervention strategies and thus be more likely to influence their conceptual knowledge and instructional practice. Collective participation is utilized in a variety of professional development settings: (a) mentoring or coaching fellow teachers (e.g., Ottley, Coogle, Rahn, & Spear 2016), (b) communities of practice (e.g., Sheridan, Edwards, Marvin, & Knoche, 2009; Wesley & Buysse, 2001), (c) web-based instruction/online learning (Odom, 2009; Pianta et al., 2008), and (d) coaching and consultation in the field of early childhood education (Sheridan et al., 2009). The concept of collective participation maps on to active learning; drawing from adult learning theory which tells us that professional development with high rates of interaction with others in a natural setting leads to the greatest impact on changing adult behavior (Anderson, 2003; Desimone, 2009). Also, research has shown that targeting teaching teams in professional development results in higher rates of implementation and maintenance (Dickinson & Brady, 2006; Dickinson & Caswell, 2007; Zaslow et al., 2010). The relationship between teaching teams requires further

research to better understand how that may impact individual's engagement with professional development and the subsequent change in classroom practices.

*Content Focus.* Content focus refers to the information being presented in the professional development that is linked to changing teacher knowledge and practice to improve outcomes for students (Desimone, 2009). Online instruction lends itself to being tailored to meet learners' individual needs (National Academy of Science, 2007). The feedback can be delivered face-to-face or through web-based platforms. Technology, such as web-based video or interactive learning systems, has also proven to be an effective way to delivery professional development content (Ingvarson, Meiers, & Beavis, 2005; Odom, 2009; Pianta et al., 2008). The instruction content refers to how the online instruction is designed for learners to engage with it (Chen, Klein, & Minor, 2009). The online professional development should consider the pacing of instruction (self or instructor), video modules, check-ins/quizzes, or narrated text. In summary, there are many features to consider when developing and evaluating the potential effectiveness of online professional development.

### **Professional Development Using Different Types of Performance Feedback**

Performance feedback has been described as “information provided to individuals about the quantity or quality of their past performance” (Prue & Fairbank, 1981). Feedback has been shown to be successful when provided through either direct observation or through videos. Feedback can be delivered in several ways electronically or face-to-face. While we know that more immediate feedback is better, it is not always possible and we should consider alternative methods of feedback delivery.

Three types of commonly used feedback are graphical, verbal, or written (Zoder-Martell et al., 2013). Graphical feedback refers to the data collected and then shared with the participants with the intention of changing their practice based on the graphed data (Zoder-Martell et al., 2013). For example, Casey and McWilliams (2008) sent teachers a weekly email that contained data related to the teachers' implementation of incidental teaching practices. Verbal feedback is feedback that is provided directly to the teacher and is often based on an observation and the teachers' performance during that observation. Ruble, McGrew, Toland, Dalrymple and Jung (2013) provided verbal feedback to the teachers on their implementation of the Collaborative Model for Promoting Competence and Success (COMPASS) every five weeks. Written feedback, delivered either face-to-face or electronically, is shared with teachers to describe the behaviors of interest. Artman-Meeker and Hemmeter (2013) emailed teachers weekly with feedback on their implementation of preventive practices based on the videos collected in the teachers' classrooms. Feedback often focuses on the process – the teacher implementation and child outcomes with teachers (Fallon et al., 2015). Feedback can result in increased treatment fidelity, which is related to positive outcomes for children (Biggs, Vernberg, Twemlow, Fonagy, & Dill, 2008).

The current study compared written graphical feedback (based on self-reported data) to written performance-based feedback. It should be noted that there are currently no examples of graphical feedback being provided based solely on self-reported data. Please see Table 2 for articles related to both self-reported graphical feedback and performance-based written feedback. For each type of feedback the following is discussed: (a) content of the feedback, (b) frequency (i.e., how often feedback was

given), (c) the delivery method (i.e., electronic or face-to-face), and (e) the impact of feedback or reported results.

**Graphical feedback.** Eight studies have used just graphical feedback in professional development to support change in teachers' conceptual knowledge and instructional practice. Seven of the eight studies used a single-subject research design; the average number of teacher participants was four. Noell and colleagues (2005) conducted an experimental group design with 45 participants and used graphical feedback focused on treatment integrity. The study reported a positive effect ( $\eta^2 = .81$ ), increasing the teachers' treatment integrity related to their use of intervention plans for students in their classroom. Graphical feedback has most often included the delivery of feedback related to participants' implementation or instructional fidelity (e.g., Noell, Witt, Slider, & Connell, 2005; Witt, Noell, LaFleur, & Mortenson, 1997; Zoder-Martell et al., 2013). Graphical feedback has been shown to increase treatment integrity (e.g., Casey & McWilliams, 2008; Leach & Conto, 1999; Zoder-Martell et al., 2013). Graphical feedback has also been used to share teachers' skill usage or change in their practices (Reinke, Lewis-Palmer, & Martin, 2007). The frequency with which teachers received feedback ranged from daily (e.g., Witt et al., 1997) to weekly (e.g., Casey & McWilliams, 2008). Only one of the studies reviewed provided graphical feedback electronically (Casey & McWilliams, 2008); the rest of the studies delivered in-person feedback. Casey and McWilliams (2008) emailed the teachers weekly graphs of their implementation of incidental teaching strategies. The teachers' trend and level increased in relation to the delivery of the feedback. Graphical feedback shows promise as a way to share specific feedback to teachers in order to change their behavior. Leach and Conto

(1999) used graphical feedback to provide teachers with data related to child engagement in the classroom. When provided with graphical feedback the teachers increased both the trend and level of their use of strategies, when the feedback with was withdrawn the trend lines decreased, demonstrating a functional relation between the intervention and the engagement of students.

**Electronic written performance-based feedback.** Seven studies were reviewed related to written performance-based feedback delivered electronically in early childhood settings. Four of the studies conducted a single subject research design. For example, Artman-Meeker and Hemmeter (2013) conducted a single-subject research design and provided weekly feedback to teachers related to their use of preventive strategies. They demonstrated a functional relation between the electronically delivered performance feedback and the increase in teacher use of transition preparation and social emotional strategies. They also demonstrated, that changes in teachers' implementation of instructional strategies led to a decrease in children's challenging behavior. The other four studies carried out either quasi-experimental (Marturana & Woods, 2012) or experimental designs (Pianta et al., 2008; Powell et al., 2010; Ruble, McGrew, Toland, Dalrymple, & Jung, 2013). The content included in the reviewed studies ranged from preventive practices (e.g., Artman-Meeker & Hemmeter, 2013) to language and literacy instruction (e.g., Powell et al., 2010; Dennis & Horn, 2013). The frequency with which teachers received feedback teachers ranged from weekly (e.g., Barton & Wolery 2007; Hemmeter et al., 2011) to every five months (e.g., Ruble et al., 2013). Two studies compared electronic to face-to-face feedback delivery (Powell et al., 2010); Ruble et al.,

2013) and both studies reported no difference in effectiveness related to delivery condition.

### **Professional Development Related to Language Facilitation**

Hindman and Wasik (2011) found variability in teachers' use of language facilitation in early childhood settings. In particular, early childhood programs often are low quality language environments (e.g., Girolametto & Weitzman, 2002; Pianta et al., 2008). Early childhood professional development research has focused heavily on supporting teachers' language facilitation skills and improving outcomes related to children's language development. Please see Table 3 for a sample ( $N = 20$ ) of the current body of research in early childhood professional development with an emphasis on language facilitation. The following sections will summarize the: (a) content (i.e., expressive language strategies) (b) research design, (c) components (e.g., coaching, in-service training), (d) delivery method (i.e., online or face-to-face), (e) teacher outcomes, and (f) child outcomes.

**Content.** Twenty articles that focused on increasing teacher knowledge, skill or practice related to language facilitation in early childhood settings were reviewed. Three studies focused on increasing teachers' fidelity of implementation related to literacy and language curriculum (e.g., Assel, Landry, Swank, & Gunnewig, 2007; Domitrovich et al., 2009). Other studies sought to impact the overall language environment of the classroom (e.g., Ota & Austin, 2013). Nine studies provided content that related to the specific use of language facilitation strategies aimed at providing a more language-rich environment (e.g., Milburn, Girolametto, Weitzman, & Greenberg, 2014; Wasik et al., 2006). In

summary, the 20 reviewed studies focused on overall classroom language environment and the implementation of specific language facilitation strategies.

**Research design.** Of the 20 reviewed studies three used a single-subject research design, 12 used an experimental design, four used a quasi-experimental design, and one was descriptive (Justice et al., 2008). All three single-subject research designs met or met with reservations the What Works Clearinghouse (WWC) quality standards (U.S. Department of Education, Institute of Education Sciences, What Works Clearinghouse, 2013) related to: (a) manipulation of the independent variable (IV), (b) dependent variable (DV) repeated measured, (c) IOA reported for at least 20% of sessions across conditions and behaviors, (d) IOA reported to be greater than 80%, (e) at least three attempts to demonstrate a treatment effect, (f) at least three data points per phase, (g) strength of evidence, and (h) meets WWC standards. The group design studies ( $n = 16$ ) were analyzed for the following WWC standards: (a) random assignment, (b) inclusion of a comparable group, (c) IV and comparison group were described, (d) use of multiple outcome measures, (e) reliability of outcomes reported, (f) validity of outcome measures reported, (g) fidelity of IV reported, and (h) attrition was  $<30\%$ . Three of the studies did not include a control group and two other studies did not randomly assign participants to conditions. Sixty percent of studies did not report the fidelity of the IV. Overall, approximately 80% of the group design studies did not meet the WWC standards for methodological rigor. In summary, only five out of the 20 reviewed studies met WWC standards for methodological rigor.

**Components and delivery method.** Nineteen of the 20 studies utilized an in-service as a core component of their professional development model. Gianoumis,

Seiverling, and Sturmev (2012), used only coaching as part of the intervention with three preschool teachers to aimed at increasing the implementation of a naturalistic teaching paradigm with children diagnosed with autism. The other 19 studies used a combination of in-service with coaching, consultation, mentoring, or peer mentoring. The teachers, on average across all 20 studies, completed two hours of in-service per study. Of the 19 studies that included coaching or consultation as a component of their professional development intervention, the teachers received feedback from the coach at least bi-weekly. One study used peer mentoring, Ottley, Coogle, Rahn, and Spear (2016), asking teaching teams to deliver feedback via bug-in ear technology to their teaching partners. Four of the 20 studies delivered the interventions either completely online or with a hybrid model (e.g., in-service face-to-face and coaching electronically). For example, Justice and colleagues (2008) used self-paced web-based learning modules to provide content to teachers related to the quality of instruction and children's language development.

**Teacher outcomes.** The teacher outcomes for the 20 reviewed professional development studies reported a range from no effect (e.g., Justice, Pence, & Wiggins, 2008) to an effect size of 2.05 (e.g., Pence, Justice, & Wiggins, 2008). One reason that Justice, Pence, and Wiggins (2008) may have not found an effect is that their intervention only provided an in-service and current research has shown that in-service alone is not enough to change the conceptual knowledge and instructional practices of teachers (Joyce & Showers, 2002). Another reason that the range of effect sizes is so large could be due to the difference in dependent measures. Four studies measured the effect of intervention on teachers' conceptual knowledge with direct assessments of pre-post changes and that

could influence the effect size. Higher effect sizes could also be related to the measures such that studies who created measures specifically for the intervention would be more fine grain and thus more likely to detect change in participants' behaviors. A recent review stated that an average effect size, for teacher outcomes, reported for language focused professional development in early childhood is  $d = .45$  (Zaslow et al., 2010). The studies reviewed here are consistent with Zaslow and colleagues (2010) findings.

**Child outcomes.** The reporting of child outcomes for language focused professional development however was less consistent in the 20 reviewed studies. Eight studies did not report child outcomes connected to the teachers' professional development (e.g., Dickinson & Caswell, 2007; Domitrovich et al., 2009; Justice et al., 2008). Twelve studies reported effect sizes ranging from no change in oral language (Powell et al., 2010) to an effect of  $d = .68$  in children's expressive vocabulary (Assel et al., 2007) after their teachers received professional development (e.g., Assel et al., 2007; Gianoumis et al, 2012; Wasik & Bond, 2001). It should be noted that of the 12 studies reporting on child outcomes, four of those studies included measures of both oral language and literacy skills for child participants. Those four studies reported more information on the pre-literacy skills of children than on the expressive or receptive language skills targeted in the professional development intervention (e.g., Landry, Anthony, Swank, & Monseque-Bailey, 2009). Overall, the children who participated in studies, that reported effect sizes, were typically from public preschools or Head Start programs and were monolingual English speakers.

### **Future Research**

Future professional development research should seek to address gaps in the current early childhood literature: (a) content related to increasing knowledge and skills, (b) measuring children's outcomes, (c) use of online instruction, (d) examining the role that outcome measures as well as other factors may play in variation in effect sizes, and (e) collecting and analyzing potential mediating or moderating teacher level characteristics. Professional development should explicitly instruct teachers on how to implement evidence-based language facilitation strategies; strategies that are associated with positive changes in children's language growth. Specifically, additional research is needed on how individual strategies (e.g., narration, mapping, open-ended questions) relate to outcomes for children. Another area for future research should compare the features of professional development that are the change agents for improving teachers' implementation of language facilitation strategies. We still do not know which features (e.g., feedback, collective participation, teaming, prior content knowledge) are more likely improve outcomes for children. It is critical that we figure out the active ingredients that aid in the implementation of evidence-based practices in early childhood settings (Dunst, Trivette, & Deal, 2009). By designing studies that compare different features of professional development (i.e., dosage, feedback type, pacing of instruction) we can begin to assess the most effective and sustainable professional development practices for early childhood professionals.

Future research should also consider how the online delivery of instruction and the type of feedback impacts teacher practice related to implementation of language facilitation strategies. Feedback is a component of professional development that has shown great promise and should be further explored to support teachers' implementation

of evidence-based strategies such as language facilitation (e.g., Buysse & Wesley, 2006; Odom, 2009). We have seen increases in teacher knowledge related to language development and language modeling strategies. However, changing teachers' instructional practices associated with language facilitation has been much harder to demonstrate. Research should focus on how to improve teachers' implementation of language facilitation strategies throughout the classroom day. Lastly, more studies need to include child outcomes. Past research specifically related to online professional development has relied heavily on participant surveys and did not directly measure the impact on teacher instructional practice and conceptual knowledge or the outcomes for children in their classrooms (Lawless & Pellegrino, 2007). Future research should focus on directly assessing the relation between online professional and change in teacher behavior (i.e., knowledge and practice) that leads to improved outcomes for children.

### **Role of Teacher Level Variables on Professional Development**

**Teacher job level.** Little to no research has been conducted that directly compares learner characteristics that may be correlated to a teacher's job position. Lead and assistant teachers are often both included in early childhood research, however rarely have studies reported any possible differences in how assistants and lead teachers responded to and implemented the professional development content. The two groups are often reported as one group; rather than examining if there are differences in how they engage with the content and how it impacts their implementation of new skills. Further research is needed to better understand what types of characteristics may be associated with teachers' job positions that might moderate or mediate performance.

**Adult vocabulary levels and language facilitation.** Teachers are the primary language models for children in preschool settings. And yet, we currently do not measure the vocabulary skills and oral language abilities for the early childhood educators who have participated in research. It is critical that we have an understanding of teachers' oral language ability (e.g., syntactical complexity, vocabulary, literacy) and how that might influence the creation of language-rich environments in early childhood settings (Zaslow et al., 2010). Current studies do not directly assess or address low language and literacy skills in teachers might moderate or mediate their ability to provide language-rich environments for children (e.g., Halle et al., 2009; Phillips et al., 2003). What we do know is that Head Start teachers frequently score low on language modeling CLASS observations (Pianta et al., 2008). This is a major gap in early childhood research that needs to be addressed; both for its potential impact on the content and the delivery of professional development interventions for teachers.

## **Conclusion**

Additional research is needed on features of effective professional development related to language facilitation strategies for early childhood educators. Based on the current body of literature the next steps for professional development should focus on three main components: (a) online instruction (i.e., type of active engagement), (b) child outcomes related to improvement in teachers' conceptual knowledge and instructional practices, and (c) learner characteristics (i.e., lead vs. assistant teacher, expressive vocabulary skills). Several studies showed promise at changing teacher behavior related to their knowledge and practice using online instruction or a hybrid model (e.g., Landry et al., 2009; Powell et al., 2010). Hindman and Wasik (2011) noted that while they could

improve teacher conceptual knowledge it was not correlated with changes in teacher instructional practice and that is consistent with other findings in professional development literature (e.g., Zaslow et al., 2010). Future research should focus on creating both a change in teacher knowledge and their classroom practice. Lastly, several of the studies did not measure and report outcomes for children. It is critical that we as a field examine the impact that teacher professional development can have on child outcomes, since the ultimate goal is to effect change at the child level.

Currently there are gaps in research related to both performance and graphical feedback. The current study sought to extend the body of work related to the type of feedback teachers received. In addition, more research is needed around learner characteristics and how they may impact engagement and the moderate the potential effectiveness of online instruction related to language facilitation strategies. Also, attention should be made to increasing the amount of research related to the delivery of online performance feedback.

## CHAPTER III

### METHODS

The current study sought to answer four research questions related to the implementation of online professional development training for Head Start teachers.

#### **Main Questions:**

RQ 1. To what extent is the type of feedback (graphed self-reported vs. performance) related to teachers' implementation of language facilitation strategies? My hypothesis was that the type of feedback will have no significant effect the teachers' implementation of language facilitation strategies; both are associated with changes in adult behavior however, self-reported data may require less effort on the part of instructor (e.g., Barton et al., 2013; Hemmeter et al., 2011; Pellicchia et al., 2011).

RQ 2. To what extent is teachers' implementation of language facilitation strategies related to child language outcomes? My hypothesis was that teachers who demonstrate higher rates of increased opportunities to respond (i.e., language facilitation strategies) will lead to more opportunities for children to practice language, thus resulting an increase in positive outcomes in children (e.g., Hindman & Wasik, 2012; Hsieh et al., 2009).

#### **Exploratory Questions:**

RQ 3. Does the level of teachers' receptive vocabulary skills predict their usage of language facilitation strategies? My hypothesis was that teachers with higher vocabulary levels (pre-intervention) would implement the language facilitation

strategies at a greater frequency than teachers with lower vocabulary levels (Hart & Risley, 1995).

RQ 4. Does the frequency of implementation of language facilitation strategies vary between lead and assistant teachers? My hypothesis was that post-intervention lead teachers would implement the language facilitation strategies at a greater frequency than assistant teachers (Curby et al., 2012).

## **Participants**

**Recruitment of participants.** After receiving IRB approval, the 27 Oregon Head Start programs received a recruitment email. Emails were sent to all of the directors in the 27 programs across Oregon and an additional recruitment email was sent through the Oregon Head Start Association listserv. Six programs replied and demonstrated an interest in participating; those six programs then distributed the recruitment letter and consent forms to classroom teaching teams in their program.

**Teachers.** Initially, 40 teachers and assistants, in 20 classrooms, from Head Start programs in across the state of Oregon showed an interest. Fourteen classrooms, 28 teachers, signed the consent forms to begin the study. There were three inclusion criteria: (a) teacher, either assistant or lead, employed in only one Head Start classroom (not a rotating position); (b) work with children ages 3-5 years old; and (c) access to the internet. Please see Table 4 for teacher demographic data. All teachers were female and their average age was 34 (range 22 – 61). Each classroom was randomly assigned to one of two intervention conditions (i.e., graphed self-reported feedback or performance video-based feedback; no control group), meaning both the lead and assistant teacher were assigned to the same condition. However, eight classrooms (16 teachers) dropped

out before randomization occurred for the following reasons: staff was fired, maternity leave, too much stress to participate. The final sample was from 12 classrooms. Three assistant teachers dropped out of the study after they consented for different reasons: (a) one was fired before pretest data collection, (b) one went on maternity leave after pretest data collection, and (c) one consented and then changed her mind not wanting to be videotaped during pretest. Twenty-one teachers (12 lead teachers and 9 assistant teachers) were included in the final analysis.

**Child participants.** All families in the participating classrooms received a package with: consents, flyer explaining the study, and surveys. A total of 107 children consented to participate, which amounts to approximately 53% of children from the participating classrooms. Data was collected only for children whose families completed the consent forms and agreed to participate. The average age for consented children was 4 (ranging from 3-5 years old). All children were eligible to participate except those that were identified as non-verbal or with a severe disability that significantly limited their ability to complete standardized measures of language and early literacy performance ( $n = 0$ ). No consented children were identified by their teachers as being diagnosed with a severe disability that would impact their language performance and ability to participate in the assessment.

### **Setting**

All 27 Head Start programs, across the state of Oregon, were given the opportunity to participate in the study. Classrooms from four Head Start agencies volunteered to participate, creating a convenience sample. Oregon Head Start teacher-child ratios were on average 8:1 for classrooms serving children ages 3 to 5 years. All

Head Start locations followed the federal Head Start Early Learning Framework around child language development related to: attending to language by others; understand and respond to complex communication; varied information based on context; social communication skills; expressively use language; and increased complexity of vocabulary (<http://eclkc.ohs.acf.hhs.gov/hslc>, 2016).

### **Dependent Measures**

**Teacher language facilitation strategies.** The primary outcome measure was the frequency (i.e., number of times teachers use each language strategy) of teachers' use of language facilitation strategies. Their usage was measured at three different points in time (pre-intervention, post-intervention, and follow-up). Data was collected on the five strategies: (a) open-ended question, (b) narration, (c) self-talk, (d) expansion, and (e) repetition (Girolametto & Weitzman, 2002; Pianta et al., 2008). An example of an open-ended question might be "What do you think will happen next in the story?" Narration and self-talk to refer to when a teacher provides a description of either her own behavior (self-talk) or that of the child's (narration). Expansions are when an adult builds upon a child's utterance (i.e., adding descriptors). A teacher restating or repeating back a child's utterance (without adding new information) is a repetition. Observational data was collected from videos submitted by each of the teachers. In order to measure change in the teachers' implementation (i.e., frequency and variation of use) of language facilitation strategies, three 10-minute videos were submitted and during each of three phases (for a total of nine videos): pre-intervention (December/January), immediately after intervention (April) and approximately one month after intervention (May). During pre-intervention, the teachers set up a flip-camera, provided by the study, recorded

themselves engaged with children during three different classroom activities on the same day. The teachers were instructed to include 10 minutes from: (a) a mealtime, (b) a structured whole/small group, and (c) a free play activity. In an effort to reduce response effort, the first author visited and recorded the videos for each classroom during post-intervention and follow-up. As in pre-intervention, the same procedure was followed: three 10-minute videos of teacher engaged in (a) a mealtime, (b) a structured whole/small group, and (c) a free play activity. Four trained data collectors, undergraduate students, coded each phase of the videos for both frequency and variation of the teachers' implementation of language facilitation strategies. Please see Appendix A for an example of a data collection sheet.

**Child language skills.** The language skills of all participating children in the classrooms were measured using: (a) Oral language (IGDIs; Wackerle-Hollman, Durán, & Rodriguez, 2016), and (b) the Teaching Standards (T.S.) Gold (Lambert, Kim, & Burts, 2013). All Head Starts in the state of Oregon use T.S. Gold as their progress-monitoring tool; it was included as a distal measure of language skills for children in the intervention classrooms. The classroom teachers collected the T.S. Gold scores, related to children's language development, as part of their annual progress monitoring. The first author visited each classroom three times (pre-intervention, post-intervention, and follow-up) to assess individual children using the IGDIs. The classroom teachers sent the first author the consented children's T.S. Gold data, which was also collected at three time points.

### **Pretest Measures**

The next section discusses the additional measures included in the current study, which were collected from teachers for additional exploratory analyses.

**Demographics.** The first author collected adult and child demographics using a multiple choice Qualtrics survey or a paper version when requested. Refer to Table 4 for the demographic data for the teachers. Teacher demographic data was collected for the following factors: age, job position, educational background, ethnicity, gender, and the number of years working at Head Start. Specific data was collected for child participants including: parental/care provider education level, age, number of years enrolled in a Head Start program, ethnicity, gender, and home language(s). Due to the low response numbers, less than 40% of families returned the questionnaires, that data has not been included.

**Teacher receptive vocabulary.** The Peabody Picture Vocabulary Test, Fourth Edition (PPVT-4; Dunn & Dunn, 1997) was administered to every teacher to measure the teachers' receptive vocabulary. The PPVT is a norm-referenced tool, with 228 items, used to measure the receptive language skills of both children and adults (age range of 2 years and 6 months to over 90 years old). Test-retest reliability for the PPVT-4 is  $M = .93$  and the internal consistency by age is reported as  $M = .94$ . The data was collected during the pre-test phase (December/January). The PPVT-4 was administered over Skype or Google Hangout with each teacher; it took approximately 20 minutes per participant to administer. The PPVT-4 was administered according to the five recommended themes for tele-practice: (1) audio/visual environment (i.e., using headsets with microphones), (2) examiner factors (e.g., practice administration prior to participant), (3), examinee factors (e.g., participant could hear and see everything), (4) test/test materials (e.g., used full

screen of items to eliminate distractions), and (5) other/miscellaneous (“Telepractice and the PPVT-4”, 2016).

**Teacher technology literacy.** All teachers completed a technology literacy survey which asked about their experiences and beliefs related to use of technology (i.e., computers, email) and online instruction. The current study used an adapted version of the Attitudes toward Web-based Professional Development Survey (AWPD; Kao & Tsai, 2009). The survey asked teachers about their frequency of use of technology, their past experiences with online instruction and their confidence in using technology for online learning. This survey was disseminated via Qualtrics one time before online training began and took two minutes to complete.

### **Intervention Measures**

**Teacher goal setting.** As part of the intervention, the first author asked all teachers to set a weekly goal for implementing the five language facilitation strategies. All teachers received access to an online module that walked them through the purpose and steps for: (a) monitoring their own behavior, and (b) setting a weekly goal. All teachers accessed the module through Obaverse. Once the teacher completed the self-monitoring and goal setting module, she then set a weekly goal for her anticipated use of the language facilitation strategies using an online form created for this study. Teachers were prompted via email to complete and submit the form on a weekly basis for four weeks; if the teachers did not reply a reminder email was sent. Please see Appendix B for an example of the form. The online form, created in Qualtrics, asked the teachers to provide information related to: (a) their goals selected for the previous week, and (b) the current week’s goal (i.e., strategy selected, time of day, goal for frequency, how to self-

monitor). The weekly goal was submitted electronically each week for four weeks during the intervention phase.

### **Posttest Measure**

Teachers completed an online social validity survey upon completion of data collection in late May. The survey was sent electronically using Qualtrics. The survey had questions for teachers about their experience throughout the study and how they felt about the outcomes. Specifically, teachers were asked about: (a) ease of use, (b) perspectives on the recommendation of others to participate, (c) recommendations for change, (d) particular aspects of the intervention that they found most and least helpful, (e) what knowledge they gained, (f) what knowledge did they hope to have gained but didn't, and (g) what, if any, changes did they notice in themselves or students.

### **Intervention**

All 21 teachers received access to Obaverse, the online website used to provide the intervention (i.e., language facilitation strategies and self-monitoring modules). The teachers had two weeks to register and watch all of the videos in each module. There was a module for each of the five language strategies (i.e., repetition, expansion, open-ended questions, narration, and self-talk) and an additional module related to self-monitoring their use of the strategies and how to use the "I Will" goal setting form - for a total of seven modules. Teachers received at least two emails reminding them to register and view the content. Technical support was provided as needed (e.g., creating screen grab directions for enrolling in the course, etc.). Each module took approximately 10 minutes to watch, for a total viewing time of 70 minutes. The teachers were required to view all modules at least one time, however they continued to have access during the next four

weeks while they received feedback (i.e., independent variables) on either (a) their weekly goals (graphed self-reported condition) or (b) weekly video submitted (delayed performance feedback condition).

**Independent variables.** The classrooms, including both lead and assistant teachers, were randomly assigned to one of two conditions: (a) graphical feedback based on self-reported data or (b) written performance-based feedback based on videos submitted by the teacher. Teachers in both conditions received weekly feedback and received prompts to continue self-monitoring and practicing the skills in the classroom. The teachers received feedback four times over the course of 4-6 weeks. The feedback cycle for both intervention conditions (i.e., teacher submits form/video, instructor responds with feedback) was less than 24 hours. Prior to starting the intervention, the first author planned to send everyone feedback every Friday. However, teachers often faced barriers to regular submission days, so the first author adjusted immediately and instead sent feedback to teachers within 24 hours of receiving their video or “I Will” online form submission.

*Graphed feedback condition.* Teachers in the graphed self-reported data feedback group received a weekly feedback email with: (a) bar graph of their frequency data from the weekly goal setting form (i.e., “I Will” form) and (b) suggestions for next week’s goal (e.g., how many language facilitation strategies to try for, which strategies to focus on next). Please see Appendix C for a sample email. The graphed data, from the goal setting form, was based on their self-report each week. Teachers set a weekly goal for their individual use of language facilitation strategies and then they recorded their progress via the online goal setting form.

*Performance feedback condition.* The teachers in the performance feedback condition received a weekly email with: (a) brief summary of the submitted video (i.e., specific examples of language strategies observed), and (b) suggestions for what to focus on next based on missed opportunities with students as observed in their submitted videos. See Appendix D for examples of a performance-based email sent.

## **Design and Procedures**

**Experimental design.** An experimental design with randomized assignment to one of two treatment conditions with repeated measures was carried out in the current study. As previously mentioned, there were two conditions: (a) graphed (self-reported data) feedback and (b) delayed performance feedback.

**Randomization procedures.** After the 12 classrooms were recruited and consented to participate, they were then randomized at the classroom level. Based on the sample, randomization occurred to control for within program agency differences because sampled classrooms from four different program agencies. Within each of the four Head Start programs, the classrooms were randomized to the treatment conditions. Each classroom (both the lead and assistant teacher) received access to the same intervention condition. The first author used a free online researcher randomizer.

**Coding training.** The first author trained four undergraduate data collectors to code the language facilitation videos collected at all three phases of the study (i.e., pre-intervention, post-intervention, and follow-up). The coders were blind the purpose of the study. We met in person to review the language facilitation strategies and practiced coding in person. Then each coder received access to six new videos, from a previous study, to use for their reliability assessment. An inter-rater reliability equal or greater than

Kappa .80 was used (Gast, 2010; Hugh, 2012). The coders had an average Kappa of .81 with a range of 76-95% reliability per practice video. Additionally, the first author randomly assessed for drift on 32% of the videos in both pre- and post-intervention phases, due to lengthen of time between training and coding post-intervention.

## CHAPTER IV

### RESULTS

#### Descriptive Analysis

The descriptive statistics for teacher and child reported outcome measures are in Table 5 and Table 6. Total frequencies of language facilitation usage, for both conditions, ranged from 14 to 121. Higher scores are considered more desirable; higher scores mean there is greater frequency of implementation of language facilitation strategies observed. After examining the standardized residuals for values greater than  $\pm 3$ , no outliers were present. The language facilitation frequencies were normally distributed, using Shapiro-Wilk's test of normality with the standardized residuals ( $p > .05$ ) for pretest, posttest, and follow-up.

IGDIs scores, for children in both conditions, ranged from 0 to 14 (15 being the highest possible score). Higher scores indicate that the teachers rated the children's language skills as more developed. No outliers were observed in the boxplots. Most of the IGDIs scores were normally distributed as measured by Shapiro-Wilk's test ( $p > .05$ ), except for performance at pretest ( $p = .021$ ) and posttest ( $p = .013$ ). Upon visual inspection of the two histograms, it is noted the both distributions are skewed slightly to the right.

T.S. Gold scores, for children in both conditions, ranged from 21 to 74. Higher scores indicate that the teachers rated the children's language skills as more developed. After examining the standardized residuals for values greater than  $\pm 3$ , no outliers were present. Most of the T.S. Gold scores were normally distributed as measured by Shapiro-

Wilk's test ( $p > .05$ ); except for children's scores in the graph condition at pretest ( $p = .02$ ).

## **IOA**

The first author trained four research assistants to code the teacher behaviors (i.e., language facilitation strategies used) to a criterion of Kappa .80 inter-rater reliability (Gast, 2010). Each research assistant independently collected data from the videoed sessions. Inter-rater reliability agreement was calculated for 20% of pretest, posttest and follow-up videos for all four coders. The Kappa was .82 (range .80 - .91), .83 (range .79 - .85), and .82 (range .81 - .83), for pretest, posttest, and follow-up, respectively.

## **Feedback Condition**

The first research question examined to what extent is the type of feedback (graphed self-reported vs. delayed performance) related to teachers' implementation of language facilitation strategies. Hierarchical linear modeling (HLM) was used to examine the relation by condition on teachers' use of strategies over time. HLM was selected due to the nested structure of the data (time nested within teacher). Specifically, the first author justified the use a growth model because data collection occurred at multiple time points (pretest, posttest, and follow-up). Time was coded as: pretest = 0, posttest = 4, and follow-up = 5). After finalizing the unconditional growth model, a set of conditional growth models examined the first research question about the effect of intervention condition (i.e., graphed self-reported vs. performance feedback) on teacher total use of language facilitation strategies across time (i.e., pretest, posttest, and follow-up).

**Unconditional means model.** An unconditional growth model was run for the dependent variable (total frequency of language facilitation strategy use). The ICC, for

this model was .18 for level 2, ( $\rho = \tau_0/(\tau_0 + \sigma^2)$ ); thus 18% of variation in teachers' total frequency of strategy use is attributed to differences within teachers. The continued use of HLM was justified because 18% of variation in teachers' total frequency was associated with differences within teachers.

**Unconditional growth model.** An unconditional growth model was run for the dependent variable (total frequency of language facilitation strategy usage) with time (i.e., pretest, posttest, and follow-up) as a level-1 predictor (see Table 7). The teachers' total frequency of language facilitation strategy usage at the intercept was 38.47,  $t(20) = 10.22, p < .05$ . Teachers used, on average, 5.40 more strategies over time per month,  $t(20) = 3.06, p < .05$ . After running a deviance test, to address the random slope ( $u_{1j}$ ), it was determined that it should remain in the model,  $\chi^2(2) = 10.22, p = .08$ . While not statistically significant, the random effect for level 2 will be retained due to the small sample size. The Pseudo- $R^2$  for level 1, after adding time in this model was .36; thus 36% of within-teacher variance is explained by time.

$$\text{Level 1: } \text{LangStrat}_{ij} = \beta_{0j} + \beta_{1j}(\text{time}_{ij}) + r_{ij}$$

$$\text{Level 2: } \beta_{0j} = \gamma_{00} + u_{0j}$$

$$\beta_{1j} = \gamma_{10} + u_{1j}$$

**Conditional growth model.** The outcome, total frequency use of language facilitation strategies, remained the same as the unconditional model. Next, intervention condition was added as a level-2 predictor of the slope to determine if the intervention condition (graphed or performance) contributed to changes over time in teachers' total implementation of language facilitation strategies.

$$\text{Level 1: } \text{LangStrat}_{ij} = \beta_{0j} + \beta_{1j}(\text{time}_{ij}) + r_{ij}$$

$$\text{Level 2: } \beta_{0j} = \gamma_{00} + u_{0j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}(\text{condition}_j) + u_{1j}$$

Teachers in the performance feedback condition used 4.83 fewer strategies over time, per month, then teachers in the graphed condition,  $t(19) = -1.61, p = .13$  (see Table 8). Statistically significant group differences were not demonstrated. The Pseudo- $R^2$  for level 2 after adding condition in this model was .183; thus 18% of between-teacher variance is explained by the interaction between time and intervention condition.

In addition, effect size, comparing posttest differences between intervention conditions, was calculated using Hedges'  $g$  (Feingold, 2009)  $\beta_{11}(\text{posttest})/SD_{\text{pooled}}$ , which suggested that teachers in the graphed condition outperformed teachers in the performance condition by 0.77 deviations at posttest. Also, an effect size was calculated, Hedges'  $g$  (Feingold, 2009)  $\beta_{11}(\text{followup})/SD_{\text{pooled}}$ , which suggested that teachers in the graphed condition outperformed teachers in the performance condition by 0.85 deviations at follow-up.

### **Child Outcomes**

Two different three-level growth models were employed, one for each child outcome measure (i.e., IGDIs and T.S. Gold). It was determined that a three-level HLM growth model was most appropriate because of the nested data structure (time nested in children, nested in classrooms). It is acknowledged that while the intervention conditions were randomly assigned at the classroom level, there are two teachers per classroom and that creates a challenge in parsing out variance in dyads (Maguire, 1999).

**Unconditional means model.** An unconditional model was run for the first dependent variable (IGDIs scores). The ICC, for this model was .50 for level 2, ( $\rho =$

$\tau_{00}/(\tau_{00} + \tau_{000} + \sigma^2)$ ), .06 for level 3, ( $\rho = \tau_{000}/(\tau_{00} + \tau_{000} + \sigma^2)$ ), and .55 for level 2 and 3 combined; thus 50% of variation in IGDI's scores is attributed to differences between-children and only 6% is attributed to classroom level traits. The 6% of variation in children's scores associated with the classroom justified the use continued use of HLM.

$$\text{Level 1: } IGDI_{ijk} = \psi_{0jk} + \varepsilon_{ijk}$$

$$\text{Level 2: } \psi_{0jk} = \pi_{00k} + e_{0jk}$$

$$\text{Level 3: } \pi_{00k} = \beta_{000} + r_{00k}$$

**Unconditional growth model.** An unconditional growth model was run for the dependent variable (IGDI's) adding time (i.e., pretest, posttest, and follow up) at level one (see Table 9). Children's IGDI's mean scores at pretest, the intercept, was 5.94,  $t(11) = 13.12, p < .05$ . Children increased, on average, their IGDI's scores by 0.75 points over time per month,  $t(11) = 9.16, p < .05$ . After running a deviance test (using FML), to address the random slope at level 2 ( $r_{00k}$ ), it was determined that it should remain in the model,  $\chi^2(2) = 15.91, p < .05$ . Due to the underpowered nature study ( $n = 12$  classrooms at level 3), the random effect ( $r_{01k}$ ) was removed, as a level-3 predictor. The Pseudo-R<sup>2</sup> for level 1, after adding time in this model was .69; thus 69% of within-teacher variance is explained by time.

$$\text{Level 1: } IGDI_{ijk} = \psi_{0jk} + \psi_{1jk}(\text{time}_{ijk}) + \varepsilon_{ijk}$$

$$\text{Level 2: } \psi_{0jk} = \pi_{00k} + e_{0jk}$$

$$\psi_{1jk} = \pi_{10k} + e_{1jk}$$

$$\text{Level 3: } \pi_{00k} = \beta_{000} + r_{00k}$$

$$\pi_{10k} = \beta_{100}$$

**Conditional growth model.** The outcome, IGDIs scores, remained the same as the unconditional model. Next, intervention condition was added as a level-3 predictor, to determine if the intervention condition (graphed or performance) contributed to changes over time in children's IGDIs scores.

$$\text{Level 1: } IGDIs_{ijk} = \psi_{0jk} + \psi_{1jk}(\text{time}_{ijk}) + \varepsilon_{ijk}$$

$$\text{Level 2: } \psi_{0jk} = \pi_{00k} + e_{0jk}$$

$$\psi_{1jk} = \pi_{10k} + e_{1jk}$$

$$\text{Level 3: } \pi_{00k} = \beta_{000} + r_{00k}$$

$$\pi_{10k} = \beta_{100} + \beta_{101}(\text{CONDITION}_k)$$

Children, whose teachers were in the performance feedback condition, scored 0.52 lower over time on the IGDIs than children in the graphed condition,  $t(85) = -2.57, p < .05$  (see Table 10). The Pseudo- $R^2$  for level 3, after adding condition in this model was 0.06; thus 6% of between-classroom variance is explained by condition.

In addition, an effect size, comparing posttest differences between intervention conditions, was calculated using Hedges'  $g$  (Feingold, 2009)  $\beta_{11}(\text{posttest})/SD_{\text{pooled}}$ , which suggested that children whose teachers received graphed condition outperformed teachers in the performance condition by 0.77 deviations at posttest. Also, an effect size was calculated at follow-up, Hedges'  $g$  (Feingold, 2009)  $\beta_{11}(\text{followup})/SD_{\text{pooled}}$ , which suggested that children whose teachers received the graphed condition outperformed teachers in the performance condition by 0.88 deviations.

**Unconditional means model.** An unconditional model was run for the second dependent outcome measure (T.S. Gold scores). The ICC for this model was .13 for level two ( $\rho = \tau_{00}/(\tau_{00} + \tau_{000} + \sigma^2)$ ), .28 for level three ( $\rho = \tau_{000}/(\tau_{00} + \tau_{000} + \sigma^2)$ ),

and .42 for level two and three combined; thus 13% of variation in T.S. Gold is attributed to differences between-children and 28% is attributed to classrooms level traits.

$$\text{Level 1: } TSGOLD_{ijk} = \psi_{0jk} + \varepsilon_{ijk}$$

$$\text{Level 2: } \psi_{0jk} = \pi_{00k} + e_{0jk}$$

$$\text{Level 3: } \pi_{00k} = \beta_{000} + r_{00k}$$

**Unconditional growth model.** Next, an unconditional growth model was run for the T.S. Gold adding time (i.e., pretest, posttest, and follow up) at level-1. Children's T.S. Gold mean score at the intercept was 39.76,  $t(11) = 23.24, p < .05$  (see Table 11). Children increased, on average, their T.S. Gold scores by 6.61 points over time per month,  $t(141) = 19.48, p < .05$ . The deviance test, using FML, determined that variance time contributed to change in students' T.S. Gold scores with the addition of a random effect at level 2 and thus was a better model than the means model, ( $X^2(2) = 34.80, p < .05$ ). The Pseudo- $R^2$  for level 1, after adding time in this model was 0.83; thus 83% of within-student variance is explained by time.

$$\text{Level 1: } TSGOLD_{ijk} = \psi_{0jk} + \psi_{1jk}(time_{ijk}) + \varepsilon_{ijk}$$

$$\text{Level 2: } \psi_{0jk} = \pi_{00k} + e_{0jk}$$

$$\psi_{1jk} = \pi_{10k} + e_{1jk}$$

$$\text{Level 3: } \pi_{00k} = \beta_{000} + r_{00k}$$

$$\pi_{10k} = \beta_{100} + r_{10k}$$

**Conditional growth models.** After finalizing the unconditional growth model, a conditional growth model examined the second research question about the effect of intervention condition (i.e., graphed self-reported feedback vs. performance feedback) on student T.S. Gold scores across time (i.e., pretest, posttest, and follow-up). This

conditional model introduced intervention condition as level-3 predictor, seeking to understand if the classroom's intervention condition contributed to changes over time in children's T.S. Gold scores. For children, whose teachers' received the performance condition they scored -1.93 points lower over time than children in the graphed condition ( $p = .14$ , see Table 12).

In addition, an effect size, comparing posttest differences between intervention conditions, was calculated using Hedges'  $g$  (Feingold, 2009)  $\beta_{11}(\text{posttest})/SD_{\text{pooled}}$ , which suggested that children whose teachers received graphed condition outperformed teachers in the performance condition by 0.70 deviations at posttest. Also, an effect size was calculated, at follow-up, Hedges'  $g$  (Feingold, 2009)  $\beta_{11}(\text{followup})/SD_{\text{pooled}}$ , which suggested that children whose teachers received the graphed condition outperformed teachers in the performance condition by 1.31 deviations.

$$\text{Level 1: } TSGOLD_{ijk} = \psi_{0jk} + \psi_{1jk}(\text{time}_{ijk}) + \varepsilon_{ijk}$$

$$\text{Level 2: } \psi_{0jk} = \pi_{00k} + e_{0jk}$$

$$\psi_{1jk} = \pi_{10k} + e_{1jk}$$

$$\text{Level 3: } \pi_{00k} = \beta_{000} + r_{00k}$$

$$\pi_{10k} = \beta_{100} + \beta_{101}(\text{CONDITION}_k) + r_{10k}$$

### **Teacher Receptive Vocabulary**

Three different analytic methods were employed to address the third exploratory research question, regarding the level of teachers' receptive vocabulary skills (i.e., PPVT-4 standard scores) predicting their usage of language facilitation strategies. First, the PPVT-4 standard scores were added as a level two predictor in the two-level HLM growth model. When unable to detect a statistically significant effect, it was decided to

conduct some exploratory analyses. Next, linear regression was run to test the predictive nature of PPVT-4 standard scores on teachers' pre-test language facilitation strategy usage. Last, a point-biserial correlation was run to further understand differences in PPVT-4 standard scores, such as the possible relation between teachers' roles (i.e., lead vs. assistant teacher) and PPVT-4 scores.

**HLM.** The teachers' PPVT-4 standard scores were entered as a level-2 predictor. The outcome, total frequency use of language facilitation strategies, remained the same as the previous growth models (see Table 13) except that the random effect for the slope (time) was dropped from this model due the underpowered nature of the study. The HLM software did not allow it to run when level2 predictors were added. This conditional model introduced PPVT-4 first as predictor of change over time and then the intercept; centered on the grand mean. The PPVT-4 scores estimated an additional 1.05 language facilitation strategy uses at the intercept,  $t(19) = 1.89, p = .07$ . Additionally, teachers' pretest PPVT-4 scores, on average, effected the change over time in frequency usage by .39 points  $t(38) = 1.74, p = .09$ . The Pseudo- $R^2$  for predicting the intercept, after adding PPVT-4 in this model was .799; thus 80% of pretest (intercept) variance is explained by the PPVT-4. Also, the Pseudo- $R^2$  for predicting the slope, after adding PPVT-4 in this model was .823; thus teachers' PPVT-4 standard scores explain 82% of between-teacher variance.

$$\text{Level 1: } L\text{ngStrat}_{ij} = \beta_{0j} + \beta_{1j}(\text{time}_{ij}) + r_{ij}$$

$$\text{Level 2: } \beta_{0j} = \gamma_{00} + \gamma_{01}(\text{PPVT4}_j) + u_{0j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}(\text{PPVT4}_j)$$

**Linear regression.** Linear regression was used to answer the third research question about the potential associative relation between teachers' PPVT-4 scores and their pretest language facilitation usage. A scatterplot of pretest language usage against PPVT-4 scores with superimposed regression line was plotted and visual inspection indicated a linear relation between the variables. The residuals demonstrated homoscedasticity and normality. The PPVT-4 scores significantly predicted teachers' pretest language facilitation total scores,  $F(1, 19) = 6.40, p < .05$ , accounting for 25.2% of the variation in language total scores with a medium effect size, adjusted  $R^2 = 21.3\%$  (Cohen, 1988). The regression equation was: predicted pretest language facilitation use =  $-27.26 + .46 \times (\text{PPVT-4 score})$ .

**Point-biserial correlation.** A point-biserial correlation was run to explore the potential relation between teachers' roles (lead or assistant) and their PPVT-4 scores. No outliers were observed in the data as assessed by a visual inspection of the boxplots. Homogeneity of variances for PPVT-4 scores for lead and assistant teachers were assessed using Levene's test for equality of variances ( $p = .065$ ). There was a statistically significant correlation between teachers' roles and PPVT-4 scores,  $r_{pb}(51) = .73$ , with lead teachers associated with higher PPVT-4 scores than assistants,  $M = 92.83 (SD = 4.37)$  vs.  $M = 83.33 (SD = 4.98)$ .

### **Role of Teacher**

The data was analyzed in multiple ways to address the fourth, and final, research question that investigated if the implementation of language facilitation strategies varied between lead and assistant teachers. First, the role was entered as a possible predictor of variance for teachers' language facilitation scores using a HLM growth model. An

additional exploratory analysis was conducted gain further understanding to the possible impact of role on language usage: point-bi-serial correlation.

**HLM.** A growth model was employed to examine the potential effect of teachers' roles (i.e., lead or assistant teacher) on their total use of language facilitation strategies across time (i.e., pretest, posttest, and follow-up). The outcome, total use of language facilitation strategies, remained the same as the previous growth model. This conditional model introduced role as both a predictor of both time and the intercept. Assistant teachers used 21.69 fewer total frequency of language facilitation strategy uses at the intercept, than lead teachers,  $t(19) = -3.58, p < .05$  (see Table 14). Additionally, assistant teachers, on average, used 5.67 less total strategies over time than lead teachers,  $t(38) = -1.74, p = .09$ . The Pseudo-R<sup>2</sup> for predicting the intercept, after adding role (assistant vs. lead) in this model was .70; thus 70% of pretest (intercept) variance is explained by teachers' role. Also, the Pseudo-R<sup>2</sup> for predicting the slope, after adding role in this model was .61; thus 61% of between-teacher variance is explained by role.

$$\text{Level 1: } \square \text{angStrat}_{ij} = \beta_{0j} + \beta_{1j}(\text{time}_{ij}) + r_{ij}$$

$$\text{Level 2: } \beta_{0j} = \gamma_{00} + \gamma_{01}(\text{role}_j) + u_{0j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}(\text{role}_j)$$

**Point-biserial correlation.** A point-biserial correlation was conducted to explore a potential association between teachers' role and their pretest and posttest total language facilitation strategies use. Using Levene's test for equality of variance ( $p = .91$ ), there was homogeneity of variances. Pretest total language facilitation use was not normally distributed (Shapiro-Wilk's test  $p < .05$ ). Due to one extreme outlier and the not

normally distributed data, the decision was made to use a non-parametric test (Kendall's tau b) for the point-biserial correlation. A statistically significant association between role and pretest language facilitation usage,  $\tau_b = -.41$ ,  $p < .05$ , demonstrated that associate teachers used less language facilitation strategies,  $M = 41.25$  ( $SD = 16.16$ ) vs.  $M = 25.67$  ( $SD = 11.98$ ). In addition, an effect size was calculated using Hedges'  $g$ , which suggested that for every one standard deviation of change for assistant teachers, there was a approximately 1.08 standard deviation change for lead teachers prior to intervention, Hedge'  $g = 1.08$ . During pretest, a statistically significant association between role and language facilitation usage remained,  $\tau_b = -.43$ ,  $p < .05$ , with associate teachers using less language facilitation strategies  $M = 65.64$  ( $SD = 23.89$ ) vs.  $M = 44.37$  ( $SD = 22.42$ ). However, when comparing posttest means the effect size decreased to Hedges'  $g = .88$ , slightly closing the gap between lead and assistant teachers' implementation of language facilitation strategies.

### **Social Validity**

Teachers were emailed a link to an anonymous social validity survey upon the completion of data collection. Sixteen of the twenty-one participants (76%) completed the survey. Teachers were sent three email reminders to complete the survey. See Table 15 for a sample of teachers' written responses to open-ended survey questions. When asked if they believed that they benefited from the online modules 56.25% strongly agreed, 37.50% agreed, and 6.25% felt neutral. In regards to the weekly "I Will" forms (i.e., online goal setting) 64.29% reported liking them and they believed that in order to make progress they should update their goals every 1-2 weeks. Teachers were asked about any perceived benefits of the intervention for the students in their classroom, 60%

strongly agreed and 20% agreed that there were benefits in regards to student language development, engagement with people, and engagement with activities. Lastly, 85.71% would recommend this intervention to other teachers.

## **CHAPTER V**

### **DISCUSSION**

The next section will discuss how the findings from this study contribute to early childhood professional development research. Specifically, research focused on the “how” and “why” professional development is, or is not, effective (Berkel, Mauricio, Schoenfelder, Sandler, 2011; Roberts et al., 2015). It is critical that we better understand the dynamic relation between content (i.e., knowledge, skills, or behaviors targeted), the delivery (i.e., how we present the content), and the context (i.e., participants’ characteristics). The current study examined the relation between the type of feedback provided in a professional development experience and how it impacted teachers’ use of language facilitation strategies and student language skills. First, this chapter will present how this study’s findings fit into existing professional development research. Second, the limitations of the study will be presented. Lastly, implications for future research will be addressed followed by a brief conclusion.

#### **Content**

Content refers to the information provided during professional development that aims to effect change in knowledge, skills, or behavior (Desimone, 2009). For the current study, online learning modules provided content related to five language facilitation strategies and self-monitoring. The first research question asked about the potential impact of changing teachers’ conceptual knowledge (learning the strategies) and instructional practices (frequency of use). Both the quality (i.e., what is said) and quantity (i.e., how much is said) matter when it comes to language exposure (Dickinson & Caswell, 2007; Harms & Clifford, 1980) and it has been demonstrated that specific

language facilitation strategies (e.g., narration, expansion, open-ended questions) foster language-rich environments (e.g., Piasta et al., 2012; Vasilyeva & Waterfall, 2010). What we know less about, as a field, is the impact of quantity of exposure in early childhood settings on child outcomes. In the current study, participants in both intervention conditions increased their total frequency use of language facilitation strategies (performance, Hedges'  $g = .65$ ; graphed self-report, Hedges'  $g = 1.43$ ). These results were similar to Zaslow et al. (2010) where they demonstrated that professional development focused on language facilitation strategies resulted in an average effect size of  $d = 0.45$  (range from 0 - 2.05).

The teachers' pretest language strategy usage ranged from 14 to 83 and posttest ranged from 29 to 121. So, the range actually widens at posttest, presumably because some teachers improved marginally, while others gained substantially. Further research is needed to understand what teachers' characteristics (e.g., initial skill, role, etc.) that may lead to variation in treatment effects for professional development (e.g., Desimone & Hill, 2017; Robert et al., 2014; Schachter, Spear, Piasta, Justice, & Logan, 2016). For example, the current study found that assistant teachers, on average, used 21.69 fewer language facilitation strategies at pretest than lead teachers.

Results from this study demonstrated that the majority (85.7%) of teachers increased their implementation of language facilitation strategies when provided with content that includes examples of how and when to implement the strategies – the focus on both conceptual knowledge (i.e., language strategies) and instructional practice (i.e., self-monitoring). Previous research by Hindman and Wasik (2011) reported growth on teachers' conceptual knowledge only, but not their use of instructional practices. Previous

professional development research that has demonstrated positive child outcomes delivered content that increased both teachers' conceptual knowledge and their instructional practice as well (Zaslow et al., 2010). Understanding the components of professional that are linked to change in teacher practices, as well as knowledge, is one of the next big steps in research (LoCasale-Crouch et al., 2016).

Prior studies have demonstrated that including self-monitoring as part of an intervention produces sustainable changes in teachers' behaviors (e.g., Simonsen et al., 2012). In the current study, teachers reported that, in general, they found the self-monitoring component easy to implement and liked that it made them think about implementation "...it helped me focus on the areas I wanted to improve". Additionally, teachers reported increased engagement from students, "It has been helpful in bringing out the conversational skills of shy and quiet kids that sometimes get over shadowed by the other children." The current findings support prior research that increased awareness of behaviors combined with setting obtainable goals can result in changing behavior (Korotitsch & Nelson-Gray, 1999).

### **Delivery**

In the current study the delivery, type of feedback, was manipulated in the professional development to examine its impact on adult and child outcomes. Teachers were randomly assigned to feedback condition (graphed self-report vs. performance) and received weekly emails throughout the intervention.

**Adult outcomes.** Previous research has documented that both graphing teacher data and providing performance-based feedback is associated with change in teacher behavior (e.g., Powell et al., 2010; Reinke et al., 2007). So, the finding in this study that

there wasn't a statistically significant difference by condition isn't surprising. However, it is meaningful to note that teachers in the graphed condition used more language facilitation strategies at posttest than teachers in the performance feedback condition (Hedges'  $g = .68$ ). Most likely this large effect size wasn't found to be statistically significant due to the small, underpowered, sample size (McNeish, Stapleton, & Silverman, 2016). Future iterations of this study might consider using a larger sample size (more classrooms and teachers) to examine the effect of the type of feedback on adult outcomes.

**Social Validity.** When asked in the social validity survey, one teacher reported she would recommend the intervention to others because “They can learn other techniques to implement in class.” and felt it was “doable” – particularly the weekly goal setting. LoCasale-Crouch and colleagues (2016) noted that interventions that align with teachers' beliefs, receive stronger buy-in leading to higher rates of engagement. When asked, 87% said they would recommend an intervention like this to other early childhood educators. One reason, cited by nine of the teachers, was that they saw the connection between the professional development and child outcomes. Interventions emphasizing not just change in teacher conceptual knowledge and practice, but also the connection to child outcomes can increase teachers' responsiveness to the professional development (LoCasale-Crouch et al., 2016; Zaslow et al., 2010). It is important to make the connection between the professional development content and child outcomes very explicit to teachers.

**Child outcomes.** Prior studies have demonstrated that children whose teachers participated in professional development have been found to make statistically significant

gains compared to children in control conditions (Yoon et al., 2007). In the current study, the majority of children, in both conditions, increased their picture naming knowledge (IGDIs scores) (graphed, Hedges'  $g = 0.47$ ; performance, Hedges'  $g = 0.53$ ). Children, whose teachers received graphed self-reported feedback improved slightly more than children in the performance condition (Hedge's  $g = 0.77$ ). However, by follow-up a difference in IGDIs scores could not be detected between the two groups. This could have been caused by a ceiling effect; the picture naming IGDI scores range from 0 to 15 and 22 out of 107 children scored a 15 by pretest. The IGDIs is well-established screener of child language skills, and may not have been sensitive to detecting growth in child language since it is designed to identify students that are at risk in their language skills (i.e., a screener) and not to detect growth (Wackerle-Hollman, Durán, & Rodriguez, 2016). In future research, child outcome measures that have been associated with measuring growth should be employed. For example, a measure such as the mean lengthen of utterance (MLU) would potentially have been more closely associated with language facilitation intervention and provided a more robust metric of growth. Additionally, future iterations of this study could examine the IGDI data using the IGDIs categorization levels of risk status to determine if students' risk status changed in response to the treatment, rather than only looking at a change in score (i.e., potentially fewer students would be considered at-risk). One should remain cautious in reporting outcomes related to language growth in young children; this could be partially related to maturity. The addition of a control group and perhaps more sensitive measures would allow for stronger conclusions to be drawn about the effectiveness of this language intervention on child outcomes.

Additionally, child outcomes were also measured using the T.S. Gold. Again, children in both conditions demonstrated growth in their language scores after their teachers participated in the professional development (graph, Hedges'  $g = 0.55$ ; performance, Hedges'  $g = 0.59$ ). So, despite the robust sample size for children ( $N = 107$ ), additional classrooms may have allowed for the detection of a statistically significant effect of condition on child outcomes. To detect differences, it is recommended that at least 30 classroom units are present at level-3 for HLM analysis (McNeish et al., 2016), the current study had only 12 classrooms leading to an underpowered study.

### **Context**

Context refers to participants' characteristics that may moderate or mediate the effect of interventions (Borko, 2004). Recent studies have started to focus more on how contextual factors need to be considered when designing, delivering and examining the effect of professional development (e.g., Desimone & Hill, 2017; LoCasale-Crouch, 2016). The current study explored the potential moderating effect of teachers' receptive language skills and teachers' role in the classroom (lead or assistant) on implementation of language facilitation strategies.

**Receptive language skills.** We as field need to gain greater insight into the potential moderating role that teachers' language skills play in the creation of language-rich environments (Halle et al., 2009; Phillips et al., 2013). In the current study, teachers' receptive language skills were measured using the PPVT-4. The average PPVT-4 score was 92.75 for lead teachers and 83.60 for assistant teachers. The PPVT-4 scores predicted lower pretest language facilitation use (adjusted  $R^2 = 21.3\%$ ) and accounted for

25.2% of variation in the teachers' pretest language facilitation use. The teachers' limited receptive language skills may have moderated the impact of the intervention and future research should consider the impact of this learner characteristic when designing professional development. It is critical that we better understand the teachers we work with and create professional development experiences that met their learning needs.

Additionally, the interaction between time and PPVT-4 also approached statistical significance ( $p = .09$ ). A larger sample size may have increased variance and allowed the detection of a statistically significant interaction (McNeish et al., 2016). Little research has examined the predictive nature of teachers' receptive language skills. What we do know is that Head Start teachers frequently score low on language modeling (Pianta et al., 2008) and that early childhood educators are associated with lower adult literacy rates when compared to their K-12 counterparts (Halle et al., 2009). Some research has shown correlations (ranging .56 to .88) between the PPVT-III and Wechsler Intelligence Scale for Children-III (e.g., Hodapp & Gerken, 1999). More research is needed to examine the possible connections between adult receptive language skills and verbal IQ. While measuring receptive language skills does not fully capture all language and literacy skills, one could use this a proxy measure for intelligence and/or language skills. Receptive language skills could be a variable that mediates responsiveness to interventions (Dane & Schneider, 1998; LoCasale-Crouch et al., 2016). The language skills of the recipients of an intervention should drive not only the potential content, but also how the content is delivered and at what skill level it is delivered to match the participants' skills. If the content language is too advanced for the participants to understand easily, it could moderate the effectiveness of the intervention. Future research should continue to

examine the moderating, and possibly mediating effects of teacher characteristics (i.e., receptive language skills) on intervention effectiveness.

**Teacher role.** Lead and assistant teachers play important roles in early childhood classrooms (Sosinsky & Gilliam, 2011) and while research has shown that lead and assistant teachers often use different types of language (directive vs. facilitative) with children (Curby et al., 2012; Fraser & Meadows, 2008) little research has examined how the two groups might interact differently with language-based professional development interventions (Curby et al., 2012). In the current study, assistant teachers, on average, implemented 21 fewer language facilitation strategies at pretest ( $p = .002$ ) than lead teachers. Also, an interaction between the teachers' role and time ( $\beta = -5.67, p = .09$ ) may have been detected if the sample had been larger. The interaction could mean that assistant teachers may improve less than the lead teachers over time; further supporting the notion that this participant characteristic (lead vs. assistant) may mediate the effect of an intervention and should be considered in both the design and analysis of professional development. Lastly, teachers' PPVT-4 standard scores were also highly correlated ( $r_{pb(51)} = .73$ ) with the role of the teacher (lead or assistant); lower scores associated with assistant teachers. Teacher characteristics, such as role and receptive language skills, could be moderating the effect of the intervention.

### **Limitations**

Several limitations existed in the current study and future research should address these going forward in order to understanding the effect of professional development on child and adult outcomes.

**Control group.** The current study randomly assigned classrooms into one of two treatment conditions. The presence of a control condition would have strengthened the design and provided a comparison for adult and child outcomes.

**Sample size.** As previously mentioned the small sample size (21 teachers nested in 12 classrooms) left the study underpowered (e.g., McNeish et al., 2016) and at potential increased risk of Type II error (Raudenbush & Bryk, 2002). The lack of power makes it difficult to detect statistically significant effects.

**Child outcome measures.** Both of the child outcome measures (i.e., IGDIs and T.S. Gold) provided challenges. First, the T.S. Gold is a progress-monitoring tool collected by teachers, not a member of the research team. While, the teachers have received training and regularly use T.S. Gold, it is difficult to know, with certainty, the reliability and validity of the data reported. This could create differences in classroom related to teacher variability rather than actual differences in student performance. Additionally, the IGDIs has been traditionally used an expressive vocabulary screening measure (i.e., picture naming) across a school year. So the tool may not have the level of sensitivity necessary to detect changes correlated with observed changes in teacher language facilitation behaviors as a result of the intervention in such a short amount of time.

### **Implications for Research**

A series of next steps are presented as a consideration for future research. The next section will address research ideas based on the current literature base, the study's findings, and the limitations previously mentioned. This section has been broken up into two areas: (a) context and measurement, and (b) delivery and content.

**Context and measurement.** Several of the limitations of the current study relate to measurement issues. Let us first examine a few practical changes for future research related to professional development. Perhaps the simplest next step would be to address the need for additional participants, the combination of larger sample size and more sensitive outcome measures, would increase the power to detect an effect of the intervention on adult and child outcomes and better understand the impact of the intervention.

Also, as we continue to create and refine our professional development experiences, we need to ensure we have technically adequate and sensitive measures of student development (Zaslow et al., 2010). Specifically, changes in child behavior that could be directly correlated with language facilitation interventions. Much of the research related to language outcomes has focused on children's vocabulary or broadly their expressive language (e.g., Assel et al., 2007; Powell et al., 2010). Making a shift to more intensive observational data collection procedures might give us a richer understanding of the changes associated with professional development. For example, this study's teachers reported students being more engaged, so perhaps the inclusion of measures of on-task or engagement behaviors might have captured changes not typically associated with language interventions. Capturing those types of behavioral changes in children may give us a more nuanced sense of the impact of teachers' use of instructional practices related to language. Along the same line, having behavioral measures designed to capture different types of language development (e.g., MLU, vocabulary, response to questions) may provide insight to how specific language facilitation strategies (i.e., open-ended, narration, self-talk, expansion, extension) impact language development in better, or

worse, ways. For example, when teachers implement more open-ended questions do we observe an increase in the frequency of children's responses? It has been established that increasing the frequency of child-teacher interactions leads to positive outcomes for children (Roberts et al., 2015).

Future research might also consider the inclusion of additional coding schemes for adult language – specifically coding schemes that capture instructional practices when teachers are not implementing the language facilitation strategies. One might hypothesize that a moderating factor of the current intervention could be teachers' pretest expressive language patterns. More specifically, teachers could be categorized into one of four groups based on their pretest differences in characteristics: (1) uses high rates of language facilitation and low rates of directive language, (2) uses low rates of language facilitation and high rates of directive language, (3) uses low rates of both, or (4) high rates of both. So perhaps a more sensitive tool would measure not only frequency, but also code for different types of language instructional practices (i.e., directive and facilitative). Understanding the patterns of teachers' expressive language use in classrooms (e.g., frequency and qualities) might begin to explain the variation in teachers' responsiveness to professional development (e.g., Desimone & Hill, 2017; Roberts et al., 2015). The goal of professional development shouldn't only be to increase teachers' use of strategies, but also, potentially, the variability and purpose with which they use language facilitation strategies to impact student outcomes. We need to be open to measuring these more nuanced aspects of teacher behaviors rather than only frequency counts.

Also, this type of examination may identify threshold points (higher/lower skilled) for participants that may explain response to the intervention (Harn, Parisi, &

Stoolmiller, 2013). In this study, some of the teachers were observed to have high rates of language facilitation strategy use at both pre and posttest, so they may not have benefited/needed the intervention compared to teachers with fewer skills. One teacher reported that she was aware of the strategies prior to the intervention, and then implemented the strategies with more purpose after the intervention. When looking at the data for the three highest performing teachers at pre-test, all maintained high levels of strategy use at post-test; however, what was noted is that they used a wider range of strategies at post-test. So, creating a more nuanced coding scheme might assist in determining what the “gold standard” of quantity and quality of exposures during a given activity should be in early childhood classrooms. We currently have yet to settle on one (Hindman & Wasik, 2012; Justice et al., 2008; Zaslow et al., 2010).

The current findings suggest future research should continue to explore the moderating or possibly mediating effects of teacher characteristics (i.e., receptive language skills and role) on professional development. First, receptive language skills may moderate the effect of professional development for early childhood teachers because they are associated with lower language facilitation use a pretest. Future work will include the investigation of the moderating effect of receptive language skills on teachers’ implementation of language facilitation with a larger and perhaps more diverse sample. No studies have currently reported on the relation between teachers’ receptive language skills and modeling of language for young children. Similarly, future research will pursue the characteristics associated with a teacher’ role that may explain why language facilitation strategy implementation was lower for assistant teachers. Trying to answer the question - how exactly does one’s role impact their responsiveness to

interventions? Future work should consider how role impacts a teacher's ability to respond (LoCasale-Crouch et al., 2016; Roberts et al., 2015) to the professional development; it is critical that we understand the "who" factor and how that shapes the content and delivery of professional development in early childhood settings.

**Delivery and content.** We understand the importance of establishing language-rich environments (e.g., Hart & Risley, 1995; Hindman & Wasik, 2012; Vasilyeva & Waterfall, 2010), however we have yet to consistently create language-rich environments for all children (e.g., Harms & Clifford, 1980, Piasta et al., 2012). So future research should continue to examine the impact of language facilitation focused professional development on teachers' conceptual knowledge and instructional practices.

Future adaptations of the current study will look at the effect of dosage, based on feedback received from the current teachers. Several teachers felt that they needed more time to view the learning modules (currently given two weeks) and half of the teachers said they thought that setting a goal every other week would work to change their behavior. We have yet to determine the most effective, and efficient, feedback dosage for professional development, it varies greatly (e.g., once per week, once a month) (Zaslow et al., 2010). Future work might include a comparison of feedback dosage and the relation to teacher responsiveness.

Lastly, understanding the impact of conceptual knowledge and instructional practice is critical to the "how" and "why" of professional development (e.g., Berkel et al., 2011; Desimone & Hill, 2017; Hindman & Wasik, 2011). Teachers' understanding of the concepts being presented (conceptual knowledge) and how to implement or teach them (instructional practice) are two variables that should be addressed when planning

professional development. Recent work has examined how teachers' prior conceptual knowledge moderates the impact of the professional development (Desimone & Hill, 2017; Hindman & Wasik, 2011). Teachers may increase their conceptual knowledge, but not change their behavior because of low instructional practices (Hindman & Wasik, 2011). Future professional development research should assess for both conceptual knowledge and instructional practice prior to the intervention and then provide content targeted to the area a teacher needs more support in.

### **Conclusion**

Head Start teachers participated in an intervention focused on improving language facilitation skills, which demonstrated that feedback (self-reported graphed or delayed performance) with the addition of self-monitoring shows promise as a strategy to change teachers' instructional practices. The majority of teachers (in both conditions) increased their frequency of implementation of language facilitation strategies compared to their pretest totals. A line of inquiry to examine contextual factors such as the moderating effect of teacher role and receptive vocabulary skills on professional development should be continued. Examination of the dynamic relation between participants' characteristics and the features of professional development is essential to strengthening our early childhood workforce, ultimately promoting improved positive long-term outcomes for children.

**APPENDIX A**

**LANGUAGE FACILITATION STRATEGIES DATA SHEET**

<b>Teacher:</b>	
<b>Expansion</b>	Following a child’s utterance, the teacher provides an extension within 3 s. This includes adding new <i>descriptive</i> information to the utterance. Not required that the child responds.
<b>Narration</b>	Teacher verbally describes the actions of a student(s). Not required that the child responds
<b>Open-Ended</b>	Teacher verbally prompts with a question that does not require a one-word response. Expected that a child will verbally responds using at least a two-word utterance.
<b>Repetition</b>	Following a child’s utterance, the teacher provides a repetition within 3 s. This includes (a) repeating words in the child’s utterance. Not required that the child responds
<b>Self-Talk</b>	Teacher verbally describes his/her actions. Not required that the child responds.

Minute s	Date: Coder:					Date: Coder:					Date: Coder:				
	E X	N R	O E	R E	S T	E X	N R	O E	R E	S T	E X	N R	O E	R E	S T
1-5															
6-10															
11-15															
16-20															
21-25															

## APPENDIX B

### I Will GOAL SETTING

1. What I will. Select a language strategy:

- |                                     |                                    |   |
|-------------------------------------|------------------------------------|---|
| <input type="checkbox"/> Narration  | <input type="checkbox"/> Self-talk | <input type="checkbox"/> Open-Ended Questions |
| <input type="checkbox"/> Repetition | <input type="checkbox"/> Expansion |   |

2. When I will. Select the activity:

- |   |  |
|---|--|
| <input type="checkbox"/> Circle/meeting   | <input type="checkbox"/> Meal time     |
| <input type="checkbox"/> Whole group      | <input type="checkbox"/> Transitions   |
| <input type="checkbox"/> Small group      | <input type="checkbox"/> Reading books |
| <input type="checkbox"/> Free play/choice | <input type="checkbox"/> Other _____   |

3. How I will. State your goal.

I will use (paper/pencil, clicker, tally marks): \_\_\_\_\_

Last week I used the \_\_\_\_\_ strategy \_\_\_\_\_ times.

My goal for this week is \_\_\_\_\_ times for \_\_\_\_\_ strategy.

## APPENDIX C

### EMAIL TEMPLATE FOR GRAPHICAL FEEDBACK

(Hemmeter, Snyder, Kinder & Artman, 2011)

Hi Robbie,

*(positive opening + acknowledgement of efforts related to self-monitoring & strategy use)*

You have been working hard this past week! I know how busy it can be during this time of year.

Glad to see you have been keeping track (self-monitoring) of the language strategies from the Obaverse modules.

*(present updated graph & review progress – making note of changes from prior weeks)*

*(positive descriptive praise about at least 1 increase in strategy use)*

*(2 suggestions for goal setting next week – related to strategy, time of day, or frequency of use).*

*(reminder & positive closing statement)*

Robbie, I look forward to viewing your goal setting and progress next week. You are doing a wonderful tracking your use of strategies and setting attainable weekly goals.

Keep up the hard work!

Kate

## APPENDIX D

### EMAIL TEMPLATE FOR PERFORMANCE FEEDBACK

(Hemmeter, Snyder, Kinder & Artman, 2011)

Hi Robbie,

*(positive opening + acknowledgement of efforts related to self-monitoring & strategy use)*

You have been working hard this past week! I know how busy it can be during this time of year.

Glad to see you have been videotaping and practicing of the language strategies from the Obaverse modules.

*(positive descriptive praise about at least 1 usage of strategy from video clip)*

*(2 suggestions for next week – related to strategy, time of day, or frequency of use).*

*(reminder & positive closing statement)*

Robbie, I look forward to seeing your video from next week. You are doing a wonderful job engaging with the students.

Keep up the hard work!

Kate

Table 1.

*Examples of Language Facilitation strategies*

Language Facilitation Strategy	Example
Extension	A child states, “puppy” and the teacher responds, “Yes a brown puppy.”
Expansion	A child reaches for milk on the table and the teacher responds, “You want milk.”
Open-ended question	Teacher asks, “What do you think will happen next in the story?”
Self-talk	Teacher states, “I’m putting the cups on the table.”
Narration	Child building in block area. Teacher states, “you’re putting the blocks on top of each other.”

Table 2

*Articles by Type of Feedback Delivered During Professional Development*

Type of Feedback	Reference	Study Design	Dependent Variables	Frequency	Delivery	Reported Results
Graphical	Casey & McWilliams (2008)	SSRD	Teacher use of incidental teaching	Weekly	Electronic	↑ level & trend related to graphical feedback
	Leach & Conto (1999)	SSRD <sup>a</sup>	Teaching strategies & student engagement	Weekly	In-person	↑ level & trend related to process feedback
	Noell et al., (2005)	GD <sub>a</sub> – experimental (n=45)	Treatment integrity for intervention plans	Varied by condition	In-person	Performance feedback condition ( $\eta^2 = .81$ )
	Noell, Duhon, Gatti & Connell, (2002)	SSRD <sup>a</sup>	Percentage of treatment integrity for intervention plans	Daily	In-person	↑ teachers' treatment integrity
	Pellechia et al., (2011)	SSRD	Teachers' number of possible data points collected	Daily - weekly	In-person	↑ teachers' data collection
	Reinke, Lewis-lmer, & Martin (2007)	SSRD <sup>a</sup>	Rate of teacher's use of behavior-specific feedback given	Daily	In-person	↑ probability for all teachers ↑ overall use of behavior-specific vs. general praise
	Witt, Noell, LaFleur, & Mortenson, (1997)	SSRD <sup>a</sup>	Percentage of treatment integrity of permanent products	Daily	In-person	↑ teachers' treatment integrity
	Zoder-Martell et al., (2013)	SSRD <sup>a</sup>	Treatment integrity of literacy interventions	Weekly	In-person	↑ teachers' treatment integrity

for ¾ of teachers

Performance						
Artman-Meeker & Hemmeter (2013)	SSRD	Teacher preventive practices & child challenging behaviors	Weekly <sup>b</sup>	Electronic	↑ transition prep & social emotional strategies ↓ challenging behaviors	Mixed results
Barton & Wolery (2007)	SSRD	Verbal expansions & descriptive praise	Weekly	Electronic	Mixed results	↑ child engagement
Dennis & Horn (2013)	SSRD	Dialogic reading, print referencing & child engagement	Weekly	Electronic	↑ teacher use of descriptive praise ↓ child challenging behaviors	Effects found only for: specific coaching ( $d = .97$ ) & child focused ( $d = 1.02$ )
Hemmeter, Snyder, Kinder, & Artman (2011)	SSRD	Descriptive praise & children's challenging behavior	Weekly	Electronic	Increase teacher language support skills ( $d=.92$ )	Range of effects for child outcomes ( $d = .17$ to $d = .29$ )
Marturana & Woods (2012)	GD – quasi-experimental (n = 18)	Caregiver coaching strategies and varied routine embedded instruction	Monthly	Electronic	↑ CLASS scores associated with consultancy model	Poverty moderating effect on classroom
Powell, Diamond, Burchinal, & Koelher (2010)	GD – experimental (n = 88)	General classroom support, literacy and language supports & child literacy/language skills	Bi-weekly <sup>b</sup>	Electronic compared to in-person		
Pianta, Mashburn, Downer, Hamre, & Justice (2008)	GD – Experimental (n = 113)	Quality of classroom interactions	Bi-weekly	Electronic		

					outcomes
Ruble, McGrew, Toland, Dalrymple, & Jung (2013)	GD <sup>a</sup> – Experimental (n = 49)	Collaborative Model for Promoting Competence and Success (COMPASS)	Every 5 weeks	Electronic compared to in-person	No statistically significant differences between web-based & face-to-face conditions

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Note. SSRD = single subject research design. GD = group design. Subscript a = elementary, primary school or high school setting. Subscript b = feedback based on videos submitted by participants.

Table 3

*Professional Development Related to Language Facilitation for Early Childhood Settings*

Reference	Study Design	Content	Features	Teacher Outcomes	Child Outcomes
Assel, Landry, Swank, & Gunnewig (2007)	Experimental (n = 603)	Skills & practice	IS M	+ change in use teacher fidelity of curriculum implementation	Expressive vocabularies ( $d = .68$ to $d = -.52$ ) related to type of classroom
Dickinson & Caswell (2007)	Quasi-Experimental (n = 70)	Knowledge & practice	IS	Treatment group correlated to higher literacy and language scores ( $r = .32$ to $r = .60$ )	NR
Domitrovich, Gest, Gill, Bierman, Welsh, & Jones (2009)	Quasi-experimental (n = 44)	Skills & Practice	IS CO	+ change in measurement of teachers' linguistic support ( $\beta = .12, p < .001$ ), behavioral support and emotional support (sup .12, $p < .001$ ) related to REDI curriculum	NR
Gianoumis, Seiverling, & Sturmey (2012)	SSRD	Skills & practice	CO	↑ level of percentage of teachers' use of correct natural language paradigm steps	↑ level of percentage of child appropriate vocalizations
Hindman & Wasik (2011)	Experimental (n = 27)	Knowledge & skills	IS CO	↑ teachers' knowledge of writing, booking reading, language, phonemic awareness, alphabetic knowledge (gaging with the st Teacher knowledge related to teacher skills ( $r = .14, p = .071$ )	NR
Hindman & Wasik (2012)	(n = 16)	Knowledge & skills	IS CO	↑ language and literacy environment in the classroom ( $\beta = 7.87, p < .001$ ) ↑ Quality of classroom ( $\beta$ Quality $p = .006$ )	↑ vocabulary ( $\beta = 6.19, p < .001$ ) ↑ alphabet ( $\beta = 5.99, p = .039$ ) ↑ sound awareness ( $\beta = 2.02, p = .41$ )

Justice, Mashburn, Hamre, & Pianta (2008)	Descriptive <sup>b</sup> (n = 35)	Skills	IS	Language modeling 2.69 out of 7  Quality of language instruction negatively associated with teachers' education level ( $d = .06$ )	NR
Justice, Pence, & Wiggins (2008)	Experimental (n = 14)	Knowledge & skills	IS	No impact on teacher skill or knowledge found	No impact on child outcomes
Landry, Anthony, Swank, & Monseque-Bailey (2009)	Experimental <sup>b</sup> (n = 242)	Skills & practice	IS M	↑ teachers' skills related to phonological awareness, writing instruction, book reading, print/letter knowledge & oral language ( $t(69) = 2.45, p < .05, ES = .86$ ) $d = .84$ for total teacher behaviors in intervention group (language, literacy, responsive teaching practices & classroom organization)	Overall children increased skills related to print awareness, phonological awareness and composite language
Landry, Swank, Anthony, & Assel (2011)	Experimental <sup>b</sup> (n = 220)	Skills & practice	IS M		Overall children increased skills related to print awareness, phonological awareness and composite language
McDonald, Proctor, Gill, Heaven, Marr, & Young (2015)	SSRD (n = 8)	Skills & practice	IS CO	5/8 teachers ↑ use of communication facilitating and modeling strategies 2/8 teachers ↓ only in conversation-hindering strategies 1/8 teachers showed no change in use of any strategies	NR
Milburn, Girolametto, Weitzman, & Greenberg (2014)	Experimental (n = 20)	Skills & practice	IS CO	↑ rate of teacher behaviors related to open questions ( $F(1,18) 4.419, p < 0.05, \eta^2 = 0.197$ ) and responsive comments ( $F(1,18) 12.061, p < 0.003, \eta^2 = 0.401$ )	NR

Ota & Austin (2013)	Experimental (n = 48)	Skills & practice	IS M	Compared to the control overall both treatment groups increase linguistic inputs (information talk, questions, expressive utterances, and teaching utterances)	NR
Ottley, Coogle, Rahn, & Spear (2016)	SSRD (n = 8)	Skills & practice	IS PC	↑ level of frequency of dyads' use of targeted language strategies for 2/4 dyads	NR
Pence, Justice, & Wiggins (2008)	Experimental (n = 14)	Skills & practice	IS	Treatment group rated higher than control related to instructional fidelity range of effect sizes ( $d = .35$ to $d = .98$ )	NR
Powell, Diamond, Burchinal, & Koehler (2010)	Experimental <sup>b</sup> (n = 88)	Skills & practice	IS CO	Treatment group increased use of language modeling skills ( $d = .12$ to $d = 2.05$ ) ↑ teachers' overall classroom environment ( $d = .99$ ) and supports for literacy & language ( $d = .92$ )	Letter knowledge ( $d = 0.29$ ), blending skills ( $d = 0.18$ ), writing ( $d = 0.17$ ), and print concepts ( $d = 0.22$ ) No change in oral language skills
Scarinici, Rose, Pee, & Webb (2015)	Quasi- experimental <sup>a</sup> (n = 42)	Knowledge & skills	IS	↑ Teachers' pre-post change in knowledge of language development ( $z = 4.894$ , $p \leq .001$ ) ↑ Teachers' pre-post change in knowledge of language promoting strategies ( $z = 2.436$ , $p = .015$ )	NR
Wasik & Bond (2001)	Experimental (n = 4)	Skills & practice	IS M	Main effect found for condition by word usage	↑ receptive and expressive language for children in

Wasik, Bond, & Hindman (2006)	Experimental (n = 16)	Skills & practice	IS CO	90% of teachers in treatment group increased generalization of skills used to elicit child language	treatment group compared to control ↑ receptive ( $d = .73$ ) and expressive ( $d = .44$ ) language for children in treatment group compared to control
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Note. SSRD = single subject research design. GD = group design. IS = In-service training. M = Mentoring. CN = consultation. CO = coaching. WBM = web-based modules. A superscript = no comparison group. B superscript = online or hybrid delivery of professional development.

Table 4

*Demographics for Teachers*

	Graph Condition		Performance Condition	
	Lead ( $n=6$ )	Assistant ( $n=4$ )	Lead ( $n=6$ )	Assistant ( $n=5$ )
Number of years at Head Start				
<1	2	0	1	0
1	3	1	1	0
2	0	0	2	3
3	0	0	1	0
4	1	2	1	2
5+				
Educational background				
High School	0	1	0	1
GED	0	1	0	2
Associates	2	1	1	2
Bachelors	3	1	2	0
Masters	1	0	3	0
Ethnicity				
White	6	2	5	1
Asian	0	0	1	0
Hispanic/Latino	0	2	0	3
Other	0	0	0	1
PPVT-4 Standard Scores	M = 92.17 (87 – 93)	M = 83.00 (76 - 89)	M = 93.50 (89 – 100)	M = 83.60 (76 – 87)

Table 5

*Means, Standard Deviations, and Sample Sizes for Teacher Language Facilitation Strategy Frequency of Usage*

Language Facilitation	Graphic				Performance			
	$n$	$M$	Range	SD	$n$	$M$	Range	SD
Total								
Pretest	10	32.50	17-63	14.4	1	37.90	17-83	17.70
Posttest	8	65.88	30-121	31.0	1	50.00	29-83	18.57
Follow Up	9	64.44	30-101	33.7	1	50.00	14-86	22.66

Table 6

*Means, Standard Deviations, and Sample Sizes for Student IGIDs and T.S. GOLD Scores*

Score	Graphic			Performance		
	<i>n</i>	<i>M</i>	SD	<i>n</i>	<i>M</i>	SD
<b>IGDIS</b>						
Pretest	47	6.26	3.67	60	5.53	3.36
Posttest	41	7.83	2.85	55	7.13	2.58
Follow Up	45	8.55	2.90	51	8.55	2.97
<b>TSGOLD</b>						
Pretest	44	40.18	12.53	55	37.69	9.28
Posttest	47	47.53	13.77	57	42.89	8.21
Follow Up	29	59.72	7.88	50	46.78	7.04

Table 7

*Unconditional Growth Model for Teacher Total Language Facilitation Usage*

	Fixed effects				Random effects			
	Coefficient	t	df	<i>p</i>	Estimate	Chi-square	df	<i>p</i>
<b>Language Facilitation</b>								
Intercept	27.66	4.40	20	<.001	22.86	20.59	19	.37
Time	10.80	3.52	39	.007	91.97	29.18	19	.06

Table 8

*Conditional Growth Model for Teacher Total Frequency Language Facilitation Usage*

	Fixed effects				Random effects			
	Coefficient	t	df	<i>p</i>	Estimate	Chi-square	df	<i>p</i>
<b>Language Facilitation</b>								
Intercept	27.48	3.76	20	.001	56.15	20.28	19	.38
Time	19.64	5.60	38	.002	76.16	27.00	18	.08
Condition x Time	-5.67	-1.74	38	.09				

Table 9

*Unconditional Growth Model for Child IGDIs Scores*

	Fixed effects				Random effects			
	Coefficient	t	df	p	Estimate	Chi-square	df	p
IGDIs Score								
Intercept	4.36	9.59	11	<.001	13.23	437.99	89	<.001
Time	1.50	11.53	93	<.001	.90	220.87	100	<.001

Table 10

*Growth Model for Child IGDIs Scores*

	Fixed effects				Random effects			
	Coefficient	t	df	p	Estimate	Chi-square	df	p
IGDIs Score								
Intercept	4.27	10.34	11	<.001	13.92	438.67	89	<.001
Time	1.71	11.04	92	<.001	.89	220.62	100	<.001
Time x Condition	-0.52	-2.48	92	.02				

Table 11

*Unconditional Growth Model for Child T.S. Gold Scores*

	Fixed effects				Random effects			
	Coefficient	t	df	p	Estimate	Chi-square	df	p
T.S. Gold Score								
Intercept	33.25	14.47	11	<.001	67.58	295.33	89	<.0001
Slope x Time	6.59	7.10	93	<.001	6.99	198.73	100	<.001

Table 12

*Conditional Growth Model Child T.S. Gold Scores*

	Fixed effects				Random effects			
	Coefficient	<i>t</i>	<i>df</i>	<i>p</i>	Estimate	Chi-square	<i>df</i>	<i>p</i>
Language Facilitation								
Intercept	33.24	17.40	11	<.001	67.78	295.94	89	<.001
Time	6.62	11.55	92	<.001	7.00	198.97	100	<.001
Condition x Time	-1.93	-0.08	92	.14				

Table 13

*Conditional Growth Model for Teacher Total Frequency of Language Facilitation Usage*

	Fixed effects				Random effects			
	Coefficient	<i>t</i>	<i>df</i>	<i>p</i>	Estimate	Chi-square	<i>df</i>	<i>p</i>
Language Facilitation								
Intercept	27.76	3.78	19	.001	111.62	33.22	19	.02
PPVT-4 x intercept	1.05	1.89	19	.07				
Time	10.65	3.38	38	.002				
PPVT-4 x Time	0.39	1.74	38	.09				

Table 14

*Conditional Growth Model for Teacher Total Frequency of Language Facilitation Usage*

	Fixed effects				Random effects			
	Coefficient	<i>t</i>	<i>df</i>	<i>p</i>	Estimate	Chi-square	<i>df</i>	<i>p</i>
Language Facilitation								
Intercept	27.98	3.40	20	<.001	39.48	23.88	20	.25
Role x intercept	-21.69	-3.58	19	.002				
Time	3.40	4.4	38	<.001				
Role x Time	-5.67	-1.74	38	.09				

Table 15

*Sample Written Responses from Social Validity Survey*

Question	Examples
<p>How did you feel about the weekly action plans?</p>	<p>“I liked them, because it helped me to be mindful about my teaching and using the strategies I learned and apply them throughout the day in each area.”</p> <p>“Helpful, because I had to think about how I was going to use each strategy and build on it each week. It was helpful for me to think Oh I use open ended questions the most how can I add expansion to my conversations.”</p> <p>“I felt neutral about them because, we have a lot other things to do at work but I think if a organize better my time it will be fine”</p> <p>“I did not like them because, it took getting used to”</p>
<p>Overall, how as it been to use the new techniques you have learned in this intervention in the classroom?</p>	<p>“I am worked a lot harder on fully listening to exactly what my students are saying so that they know they are being heard.”</p> <p>“Some harder than others but overall it was great to learn and use”</p> <p>“I find them helpful to review and think about as a way to enhance the skills my children have been developing all year. Its been great to see some of the quieter kids starting and or having conversations that I know they wouldn't have done 4 months ago.”</p> <p>“I did not have enough time to do this and my class work”</p>
<p>What, if any, differences/changes did you notice in your classroom and students?</p>	<p>“These strategies will improve language modeling and also helps children to be more focused and engaged during circle and activity time.”</p> <p>“It has been helpful in bringing out the conversational skills of shy and quiet kids that sometimes get over shadowed by the other children.”</p> <p>“The children sometimes noticed when I would repeat them which showed them being attentive.”</p> <p>“Children seemed more interested in what was happening during an activity where the teacher was engaged in their conversations.”</p>

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