

# Profiles of Quality: Supports for Book Interactions and Early Writing Activities in Prekindergarten Classrooms

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## Abstract

Head Start teachers and their classrooms ( $N = 86$ ) were observed to determine the state of quality of the early literacy and language instruction and environments in prekindergarten. Cluster analysis was used to create profiles of prekindergarten teacher and classroom quality across two constructs: Book Supports and Writing Supports. Descriptive results showed that on average, classrooms received low scores for both reading and writing supports. However, cluster analysis revealed four distinct profiles: Profile 1 (High, High), Profile 2 (Low, Low), Profile 3 (Average, Average), and Profile 4 (High, Low). Results implicate a need for greater attention to language and literacy in general, but especially a need for an increase in early writing supports. Implications for person-oriented analysis (as opposed to variable-oriented analysis) and professional development are also discussed.

## Keywords

language, curriculum, education, social sciences, literacy, early childhood, educational psychology and counseling, teacher education, educational research

Since 1980, the U.S. Department of Education (DOE) has frequently assessed the academic performance of America’s schoolchildren on reading and writing tasks, as well as several other measures of school performance. Recently, the National Assessment of Educational Progress (NAEP), known as the Nation’s Report Card, analyzed data from fourth and eighth graders to report the current status of American schoolchildren’s literacy skills (NAEP, 2015; National Early Literacy Panel [NELP], 2008). Findings indicated that overall reading scores over the past 25 years have modestly improved (i.e., +6 points). However, only one in three American schoolchildren are currently reading at a proficient level.

More troubling is the fact that reading and writing performance deficits are most probable for children from low-income families. Children from families qualifying for the National School Lunch Program, a common indicator of poverty, read at significantly lower levels than their noneligible counterparts (NAEP, 2015). Concerns about poor performance on measures of achievement in elementary and middle school have resulted in calls for higher quality early schooling, especially prekindergarten (NAEYC, 2009).

far-reaching meta-analysis included results from 190 studies of prekindergarten programs, as well as language, shared-reading, and code-focused interventions. The NELP study had some primary goals pertinent to the current study. The first goal was to identify what early skills of young children predict later conventional literacy outcomes (i.e., decoding, oral language fluency, reading, writing, and spelling abilities). Analyses focused on early skills showed several variables representing early literacy ability carried medium to large predictive power. Accounting for socioeconomic status (SES) and IQ, young children who displayed competencies in alphabet knowledge, phonological awareness, rapid letter and object naming, and name writing became more competent readers and writers in elementary school.

Although prekindergarten children’s ability to write their name was associated with reading and writing outcomes, few studies have examined children’s early writing. In one analysis of 63 studies, the NELP found three that included a measure of children’s writing ability (NELP, 2008). A composite variable, letter and name writing, was used in analysis and described as children’s ability to write letters in isolation on request or to

## Early Literacy Skills as Predictors of Conventional Literacy Ability

Sustained interest in children’s early reading and writing ability led to a meta-analysis by the NELP (2008). This

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write one's own name. Even when controlling for alphabet knowledge, oral language, and IQ, children's ability to write letters and/or their name significantly predicted later decoding and comprehension skills. One particular study, not included in the NELP analysis, by Diamond, Gerde, and Powell (2008) examined Head Start children's writing skills (i.e., name writing) in relation to other emergent literacy skills. They found that children's ability to write their name was related to letter knowledge, concepts about print, and phonological awareness. As their writing abilities developed, the pace of development on other tasks equally improved. For example, children who wrote more letters in their name also named more letters compared with children who wrote fewer letters. Unfortunately, they found that only half of the children could correctly write their name by the end of the year.

Another goal of the NELP was to identify research-based interventions and instructional practices shown to improve children's emergent literacy skills (NELP, 2008). The NELP analyses evaluated code-focused, shared-reading and language enhancement interventions, parent/home-visiting, and prekindergarten/kindergarten programs. Generally, interventions and practices were effective in their respective subject-specific domains. For example, language enhancement interventions were positively related to oral language outcomes, but not decoding skills. However, code-focused interventions were significantly related to a range of conventional literacy skills (e.g., reading, writing, spelling). Very few of these studies included assessments of both instructional and environmental inputs.

## **Reading and Writing in Prekindergarten Classrooms**

### *Supporting Children's Interactions With Books*

In prekindergarten classrooms, instructional supports for early reading are teacher/child interactions that occur within the context of a book reading (i.e., defining words, asking questions, explaining concepts about print). Of all the opportunities to promote language development available on a daily basis, whole-group, shared book reading is among the most studied (NELP, 2008). Children's books generally contain both illustrations/photographs and text, both of which can act as a jumping off point for teacher/child discussions. Children may also benefit from ample opportunities to interact with books, on their own or with peers, in a variety of settings outside of whole-group (NAEYC, 2009; NAEYC & IRA, 1998). To promote children's independent involvement with books, adequate environmental supports for early reading are necessary (e.g., a variety of books throughout the classroom as well as in a well-stocked library center).

### *Supports for Early Writing*

Instructional supports for early writing are less studied than supports for book interactions (NELP, 2008), but are

nonetheless developmentally appropriate (NAEYC, 2009) and crucial to children's later success with literacy (Elbow, 2004). The extent of children's writing ability in prekindergarten often relates to fine motor skills, and letter and sound knowledge (Diamond et al., 2008). Instructional supports for early writing in prekindergarten classrooms include, but are not limited to, dictating children's words and directly instructing children's writing of names and small words. Further supports such as sufficiently stocked writing centers and writing materials in play areas can allow children to independently explore writing and to further discover its multiple uses (Morrow, 1990; Vukelich, 1994).

## **Examining Multiple Domains of Literacy**

Studies examining reading and writing outcomes, and the classroom supports that may promote them, have typically been considered independently (Diamond et al., 2008; Gerde & Powell, 2009). Very few studies, including those reported on by the NELP, have examined supports for both book interactions and early writing in their analyses. The disconnected approach to these two interrelated domains of literacy may be due to the traditional notion that reading comes before writing (Elbow, 2004), often indirectly supported by guidelines for recommended best practices (e.g., Head Start Child Outcomes Framework), or it might be due to the fact that teachers could be approaching domains of literacy in unique ways (O'Leary, Cockburn, Powell, & Diamond, 2010; Powell, Diamond, Bojczyk, & Gerde, 2008). Some studies have shown that reading and writing do not need to be treated independently (e.g., Dennis & Votteler, 2013), whereas others have found that, in many classrooms, structured writing activities lag behind similar reading activities. In light of such perspectives, it is possible that writing instruction may be deemphasized in prekindergarten classrooms when compared with reading and oral language instruction. In fact, there is some indication that teachers may approach certain domains of literacy, such as reading and writing, differently. For example, Head Start teachers reported that their approach to instructing letters and sounds was far more intentional compared with their generally spontaneous approach to promoting vocabulary knowledge (O'Leary et al., 2010).

Guidelines and recommendations for best practices may also encourage educators to provide more supports for book interactions than early writing. For example, in a major position statement from the National Association for the Education of Young Children (NAEYC) and the International Reading Association (IRA) on literacy, only a minute portion is dedicated to early writing, while the major focus is on early reading and language activities (NAEYC & IRA, 1998). Another example can be found in the U.S. Department of Health and Human Services (2015) Head Start Early Learning Outcomes Framework, where only five out of the 43 literacy indicators pertain to early writing. The fact that writing may be

deemphasized in prekindergarten is especially pertinent given that children's attitudes toward writing have been shown to be significantly more negative than their attitudes toward reading (Cunningham, 2008).

An intervention study by Justice, Mashburn, Hamre, and Pianta (2008) examined the instructional quality of both language (e.g., vocabulary) and literacy (alphabet knowledge) lessons in prekindergarten classrooms. Teachers attended a workshop designed to provide an overview of professional development in general, and the six target areas of the My Teaching Partner–Language and Literacy Curriculum (MTP-LL), which was to be implemented after the workshop. The MTP-LL targets included (a) phonological awareness, (b) alphabet knowledge, (c) print awareness, (d) vocabulary and linguistic concepts, (e) narrative, and (f) pragmatics and social language. There was no significant correlation between the quality of language lessons and the quality of literacy lessons, suggesting that teachers may have been approaching these two domains in an independent fashion.

### *Studies of Early Writing*

The few studies that have focused on writing have shown, from a child development perspective, that growth in writing occurs concurrently with growth in other areas of literacy (Diamond et al., 2008) and, from a teacher/classroom quality perspective, that the type of writing instruction can predict skills growth in areas such as spelling new words and phonological awareness (Diamond & Baroody, 2013). In general, research on children's early writing skills has lagged behind reading research, but a few important studies have found that writing ability early in life may affect later conventional reading and writing skills.

Although fewer exist, the studies of writing discussed here provide evidence that early writing instruction can promote, at least, some skills necessary to children's literacy acquisition, such as phonological awareness. An analysis of 22 writing interventions that took place between 1990 and 2013 showed that high-quality interventions with maximum adult involvement had the greatest impact on literacy skills (Hall, Simpson, Guo, & Wang, 2015). More studies are needed that acknowledge writing experiences and examine its relation to other more established predictors (e.g., vocabulary, decoding skills).

### **The Role of the Environment**

Children benefit not only from teacher-directed interactions but also from child-directed experiences in the prekindergarten classroom environment, either on their own or with peers (NAEYC, 2009). Issues surrounding the presence of literacy materials in the classroom environment are commonly addressed in textbooks (Morrison, 2007), but studies of early childhood literacy typically focus solely on instruction (NELP, 2008). Largely missing are studies of early literacy

that attend to both the quality of instruction and the quality of the environment; such studies can provide unique perspectives, a more comprehensive description of classrooms, and broader inquiries regarding the significant impacts of early childhood education (ECE).

One important study looked at the impact of several weeks of exposure to print in the environment on children's ability to recognize those words at a later date. Vukelich (1994) randomly assigned classrooms to one of three conditions to assess children's exposure to print over several weeks in the classroom environment. Condition placement was associated with children's ability to read those words at a later date, both in and out of the context in which they were introduced. In the two treatment conditions (i.e., "exposure only" and "exposure with adult guidance"), children's dramatic play centers were enriched with print, typically with signs and labels (e.g., SALE, EXIT). In the "exposure only" condition, children simply played as usual, with no adult input. In the "exposure with adult guidance" condition, the researcher and assistant, by taking appropriate play roles, directed the children's attention to the environmental print. A control condition did not receive any extra environmental print in their centers. When it came to reading the words in the context in which they had been exposed to the children, there were significant differences between all conditions. Importantly, children in the "exposure only" condition were able to read significantly more words than the children from the control condition suggesting that, even without adult guidance, a print-rich environment can affect children's early reading skills. A similar study by Neuman and Roskos (1993) also found that a print-enriched environment with the assistance of a more knowledgeable other resulted in the greatest increase in children's ability to read environmental print.

A study by Morrow (1990) sought to determine whether children's voluntary literacy play could be increased by adding more literacy-related materials (e.g., a variety of pencils, pens and paper; ready-made blank booklets) into their dramatic play areas. Four conditions were examined, including three treatment conditions and a control condition. In the "thematic play with guidance" condition, teachers made suggestions for literacy-related play in a kitchen-themed center (e.g., write recipe cards). In the "pencil and paper with guidance" condition, teachers also made suggestions for literacy-related activities, but there was no consistent theme in the center. In the "thematic play with no guidance" condition, teachers only introduced the literacy-related materials the first day. There was also a control condition, in which teachers neither introduced materials nor made suggestions for literacy-related play. Findings revealed that the addition of literacy-related materials to the classrooms' physical environment resulted in increased voluntary literacy play.

Cunningham (2008) examined relations between kindergartners' attitudes toward literacy, their literacy development, and their prekindergarten literacy environment, as measured by the Early Language and Literacy Classroom

Observation (ELLCO; Smith, Dickinson, Sangeorge, & Anastasopoulos, 2003). Classrooms that scored high on the ELLCO had children with more positive attitudes on four questions (e.g., “How do you feel when someone reads to you?” and “How do you feel about writing a message to a friend?”) on the Student Attitudes Toward Reading and Writing Survey (Trehearne et al., 2003). Importantly, children’s attitude toward literacy activities improved after spending time in classrooms with high scores on the ELLCO.

Neuman (1999) attempted to influence literacy outcomes by improving the classroom environment. She tested the effects of dramatically increasing the number of books available to children by stocking child care centers with books, approximately five new books per child in every classroom. Teachers were trained in how to create effective storybook routines, establish rules for conduct, and extend the stories beyond the text. Information about providing proper access to print was also part of the training. Teachers also were trained in techniques such as placing signs at children’s eye level and creating a writing center. Across classrooms, teachers changed their literacy environments such as providing more books, writing centers, and designated book areas. The increased presence of materials was related to improvements in children’s concepts of print, letter knowledge, and concepts of writing. Although training in storybook read-alouds was also associated with children’s outcomes, Neuman speculates that the materials were a significant factor in their growth as well.

## Teacher Credentials

A policy-sensitive question is whether teacher background variables are associated with profiles of prekindergarten classroom quality based on supports for book interactions and early writing. Teachers’ credentials such as type of degree earned, major of degree, and years of experience have been implicitly linked to classroom quality and children’s language and literacy growth (NAEYC, 2009), and have often been included in studies of children’s academic outcomes (Early et al., 2006; Gerde & Powell, 2009). Studies examining the association between teachers’ credentials and classroom environment and instructional quality have provided conflicting results.

LoCasale-Crouch et al.’s (2007) cluster analysis revealed that teachers’ credentials could somewhat predict their cluster membership. Teachers placed in the high instruction quality profile (31%), as determined by scoring approximately 1 standard deviation above the sample mean on each of the nine subscales, had more experience teaching pre-K but were similar to other profiles on other structural measures such as degree of major, student/teacher ratio, and length of program day. Pianta et al. (2005) also found years of teaching experience to be related to the quality of teachers’ interactions with children at the start of the program year, but only on one of the two measures used in the study. This association was

found on the teaching and interaction subscale of the Early Childhood Environment Rating Scale – Revised Edition (ECERS-R), but did not hold true for the instruction portion of the Classroom Assessment Scoring System (CLASS).

The results of Early et al.’s (2006) study are illustrative of inconsistent findings in the current research literature on teacher credentials. This study examined credentials in relation to the quality of prekindergarten classrooms, as measured by the CLASS and the ECERS-R. Preliminary analysis revealed associations between children’s academic outcomes and instructional and environmental quality. However, teachers’ credentials were not related to environmental quality and, with one exception, were not related to instructional quality. Compared with teachers with an associate’s degree, those with more than a bachelor’s degree had higher scores on the ECERS-R Teaching and Interaction subscale, but the association was marginal. These null findings were reinforced in a subsequent examination that included data from seven major studies of early child care and prekindergarten, which also found no association between credentials and quality (Early et al., 2007).

In response to several studies of teachers’ educational background (e.g., degree type, major) and classroom quality reporting null findings, some have raised questions about the interpretability of the findings and the lack of implications drawn from them (Bogard, Traylor, & Takanishi, 2008). Specifically, questions remain about why there are no consistent findings, what we can conclude from this research, and the directions policy officials and recommended guidelines should pursue. The authors who have raised these questions point to several reasons why significant associations may be difficult or even impossible to consistently detect. One reason for the inconsistent findings is the wide variety of higher education experiences. For example, studies of teacher quality do not recognize that teachers receiving an ECE degree from one institution may have very different experiences than teachers from a different institution. The authors also mention a lack of attention to social, emotional, and behavioral influences on children’s academic outcomes as another reason that studies have inconsistently linked classroom quality and teachers’ education. Finally, they remark on the implicit notion that some studies seem to ignore: that it is the quality of teacher–child interactions, which may not always be dependent on teacher education, that predict classroom quality.

## Research Questions

The purpose of the current study is to create distinct profiles based on two important domains of the prekindergarten classroom—reading and writing supports. The study examined three primary research questions.

**Research Question 1:** Can prekindergarten classrooms be grouped in multiple, homogeneous, distinct clusters



based on profiles of support for (a) Book Interactions and (b) Early Writing?

**Research Question 2:** If classrooms can be successfully grouped into distinct, homogeneous clusters, what are the multivariate patterns across supports for book interactions and early writing?

**Research Question 3:** How are variables representing teacher credentials distributed across clusters? Are there significant differences between teachers' background characteristics (i.e., years of experience teaching, type of degree, degree major, and recent participation in professional development) based on cluster membership?

## Method

### Participants

Observations included in analyses came from 86 Head Start classrooms in urban and rural centers in the Midwest. All of the classrooms' lead teachers (98% female) volunteered to participate in classroom observations as part of a professional development early literacy intervention (Powell, Diamond, Burchinal, & Koehler, 2010). On average, teachers had been teaching in a prekindergarten classroom for 9.6 ( $SD = 7.4$ ) years; their years of experience teaching ranged from 0 to 31 years (kurtosis =  $-.05$ ; skewness =  $.84$ ). Regarding educational backgrounds, most teachers had received a 4-year bachelor's degree (52.8%), 2-year associate's degree (29.2%), or postbaccalaureate degree (11%) in ECE or a related field (e.g., elementary education; 75%). The minority of teachers had received less than a 2-year degree (1%) and/or a degree in a field other than ECE (25%).

### Measures

**ELLCO.** The ELLCO (Smith et al., 2003) is intended to serve as a toolkit for recording observations of language and literacy practices in prekindergarten and early elementary classrooms. Items included in the current study's analyses were taken from the ELLCO's Checklist and the Literacy Activities Rating Scale.

The Environmental Checklist is comprised of five categories (21 total questions): Book Area, Book Selection, Book Use, Writing Materials, and Writing Around the Room. Each category has between three and seven items in question form that ask the observer to verify the presence of literacy centers (e.g., library, writing center), materials (e.g., writing tools, paper, books), and activities (examples of teachers' and children's writing). The Classroom Observation contains 14 items that require observers to rate classrooms from 1 (*deficient*) to 5 (*exemplary*) on the quality of language and literacy supports such as the presence of books, facilitation of home literacy activities, and approaches to children's writing. The Literacy Activities Rating Scale is comprised of nine questions divided into two categories: reading and

writing. Questions ask observers to verify whether certain literacy-related activities (e.g., whole-group book reading, children writing in their play) occurred over the course of the observation. All items from the Environmental Checklist and the Literacy Activities Rating Scale are posed in question form. To create equivalent scales, all ordinal items were transformed into dichotomies prior to analyses (see "Item transformations" subsection).

The second measure, the Group Time Observation, is an observation tool designed for whole-group instruction in Head Start classrooms and was created specifically for the previously mentioned professional development intervention study. All items from the Group Time Observation are posed in question form, and they focus on early literacy instruction including conventions of print (e.g., Did the teacher ask the children where to begin reading?), vocabulary (e.g., Did the teacher define a novel word?) and oral language (e.g., Did the teacher ask any open-ended questions?), knowledge, and letter/sound awareness (e.g., Did the teacher point out rhyming words?). Items from the Group Time Observation have been used in another study and were found to be a useful tool for measuring multiple aspects of literacy instruction during whole-group time (Powell et al., 2010). All items on the Group Time Observation are written in question form with a dichotomous response option, *no* or *yes* (scored 0 and 1, respectively). Prior to classroom visits, research team observers were trained and assessed ( $>90\%$  interrater reliability) on the proper administration of the ELLCO and the Group Time Observation.

**Item transformations.** As mentioned, all items on the Group Time Observation are dichotomous as are many of the items on the ELLCO. A goal of preliminary analysis was to create two scales, as equivalent to one another as possible. To obtain comparably scaled items, scores on all ordinal items from the ELLCO were collapsed into the same *yes* or *no* dichotomous response option as the Group Time Observation. When the possible range of scores was 0 to 3, item scores of 0 and 1 were recoded as 0 and item scores of 2 and 3 were recoded as 1. When the range of scores was 0 to 2, the mean of the variable was used to determine the cut point that would provide the most balanced distribution and variance. Any questions asking *how many* were changed to *are there any* or *are there more than* questions to accommodate the *yes* or *no* dichotomous response. A total of 10 ordinal items were transformed into dichotomous response items (five from Book Interactions and five from Early Writing).

**Item selection.** The following paragraphs describe the process of determining all items eligible for inclusion in analysis, as well as the rationale for decisions on excluding items to shape the final set of items. Appendices A and B list items to be included in two final composite scales: Book Interaction Supports Scale (BISS) and Early Writing Supports Scale (EWSS), respectively. Items for both scales reflect the fact

that, in prekindergarten classrooms, supports for book interactions and early writing can be found in features of the instruction provided by the teachers, as well as the presence, and quality, of appropriate materials in the physical environment (NAEYC, 2009).

**Book interactions.** Supports for early reading in this study are centered on the opportunities teachers provide for children to interact with books, either on their own or in teacher-led, whole-group shared book reading. Considered for inclusion in the BISS were all items from the ELLCO and the Group Time Observation related to books. All items are similar in the sense that they inquire about activities or materials related to books, including oral language opportunities, exposure to print conventions, and the presence, quality, and availability of books for children to explore outside of shared book readings.

Possible items representing the instructional elements of supports for book interactions were taken from the Group Time Observation. Items related to the instructional quality of reading sessions selected for the initial pool of items included those related to the conventions of print, the introduction of new vocabulary, and the promotion of oral language skills. Items related to opportunities to interact with books outside of whole-group shared book reading were taken from the ELLCO. Aspects of supports for book interactions in the physical environment considered for this study include the availability of a sufficient number of books throughout the classroom, as well as a well-stocked, distinct, inviting, and orderly library center.

**Early writing.** Supports for early writing in this study are centered on the availability of materials and observations of current, or evidence of prior, writing activities. All items related to early writing in the classroom were taken from the ELLCO. Instructional and environmental features of interest included teachers writing words themselves, modeling writing (e.g., taking dictation and describing writing as it happens) for children, and directly instructing children on how to write something. Other indicators of early writing instruction include evidence of writing activities such as previous writings from teachers and children (e.g., used chart paper, children's name writing attempts on artwork) on display in the classroom. Elements of supports for early writing can also be found in the presence of writing materials (e.g., pencils, paper) in a distinct writing area that includes materials used to assist children's writing (e.g., word cards, clearly visible alphabet).

**Evaluating items.** Items included in the BISS and the EWSS were determined using several steps. First, the authors' intent of the questions, determined by the questions' wording and/or placement in relevant category, drew first consideration for inclusion in the initial pool of items. Items were considered if authors specifically included the words *reading* or

*writing* in the actual item. For example, Questions 13 and 19 from Appendix A both specifically mention reading in the sentence, so both were automatically considered for inclusion. Other items considered for inclusion may not mention the words *reading* or *writing*, but were still considered because the items were placed by the authors in a portion of the assessment categorized as reading or writing. For example, neither Question 1 nor 2 from Appendix B specifically mention writing, but these items were included in the initial pool of items because Smith et al. (2003) placed them in writing materials portion of the ELLCO, and these items reflect the presence of materials that assist children's writing attempts (i.e., alphabet and word cards). A total of 57 items (41 Reading, 16 Writing) were included in the initial pool.

After deciding the total possible number of items related to reading and writing, it was necessary to remove any *bad* items from the initial pool. There were several criteria used to determine whether a question was *bad*, and thus should be removed from the pool of items. According to DeVellis (1991), *bad* items include those that do not directly measure the construct at hand or carry a heavily skewed distribution of scores.

Some questions that include the words *reading* or *writing* and/or were placed in a relevant category were excluded from analysis because they do not directly relate to the specific intent of this study. For example, a question concerning the presence of puzzles with words on them was placed by the ELLCO's authors in the Writing Around the Room category. This puzzle item was not selected for inclusion because the question does not align with either of the two focal points for writing supports (i.e., the presence of materials such as pens, paper and templates, and/or observed or evidence of prior writing activities). The Group Time Observation also had items excluded in analysis because they did not directly relate to the study's intent. For example, a set of questions related to letter (e.g., *Did the teacher point to a letter?*) and sound (*Did the teacher point out rhyming words?*) awareness were all excluded from the item pool because they did not directly align with the other focal point of this study (i.e., opportunities for children to interact with books, either on their own or in teacher-led, whole-group shared book reading).

Next, items with drastically skewed distributions were not included in any analysis. For a scale to be considered reliable, most items need a relatively high level of variance to be considered for inclusion. Items carrying low variance values do not discriminate between participants. For this study, any item for which less than 10% of teachers received either a *yes* or a *no* response was withdrawn. A total of six items were excluded from analysis because of skewed distributions. Also, there were several items that were eliminated from consideration due to redundancy. For example, there were originally four items that rated teachers' attention to print concepts: *Was attention drawn to the illustrator's name?* *Was attention drawn to the author's name?* *Did the teacher show*

*the children the cover of the book?* and *Was attention drawn to the book's title.* Each of the four items essentially measured one construct, concepts about print. Therefore, only *Was attention drawn to the author's name?* was used in the final analysis because it carried the highest internal consistency coefficient.

Finally, internal consistency reliability was calculated for the scales for book interactions and early writing supports. Acceptable measures of internal consistency range from .70 to .90 (DeVellis, 1991). Scale reliability analysis revealed respectable coefficients of internal consistency for the final scales: BISS (18 items;  $\alpha = .70$ ) and EWSS (12 items;  $\alpha = .70$ ).

**Credentials.** Teachers' experience teaching prekindergarten was measured in years. The degree types for each teacher fell into one of six categories: high school, Child Development Associate (CDA), associate's degree, bachelor's degree, some graduate coursework taken, or graduate degree. Responses for degree major fell across a wide range of options and were collapsed (see "Plan of Analysis" section).

## Procedures

Data used in this study were collected as part of Classroom Links to Early Literacy, a randomized controlled trial intervention study aimed at improving Head Start children's early literacy skills. Teachers attended two full-day workshops and received coaching from an early literacy specialist, as well as web-based hypermedia and literacy-specific informative resources over one semester of the Head Start program year. All classroom observations were conducted by Purdue University researchers, including the author, and completed in the fall, winter, and spring of the program year. Data used in analyses in this study were gathered during the winter collection period. Researchers typically arrived in the classroom before breakfast, or before lunch in afternoon-only schedules, and observed for approximately 2 hr. All observations included whole-group shared book reading, free play, and circle time.

## Plan of Analysis

**Determining clusters of classroom profiles.** The current study aimed to create multiple, distinct profiles based on two dimensions of literacy (i.e., book interactions and early writing) supports in Head Start classrooms. Hair and Black's (2000) six-step cluster analysis decision process was used to ensure that clusters are properly formed and interpreted, and the results are sufficiently validated.

*Step 1: Objectives and variables.* All ELLCO and Group Time Observation items directly related to supports for book interactions (Appendix A) and early writing (Appendix B) were included in the analysis. Classroom profiles were created by clustering teachers with similar

multivariate patterns across the two scales: Book Interactions and Early Writing.

*Step 2: Design issues and similarity measure.* Data standardization and the treatment of outliers are two preliminary design issues. All items were dichotomous, so there was no need to standardize any data. A profile is considered to be an outlier if it is unique to each cluster profile, which often means extremely high or low scores across the entire set of variables. The goal of the professional development intervention was improving the quality of early literacy supports and measures were designed to assess quality (i.e., higher scores indicate the desired outcome for each item), so the magnitude of scores was the deciding factor in determining cluster membership.

*Step 3: Assumptions.* In this stage, it is pertinent to determine whether there are multicollinearity issues. In cluster analysis, variables that are multicollinear are more heavily weighted; thus, such analysis reveals inaccurate representations of the data's structure. Two steps can be taken to reduce multicollinearity. Initially, with any significantly correlated items, one of the items can be eliminated, unless they are deemed conceptually unique.

*Step 4: Algorithm.* Ward's (1963) hierarchical clustering method was used. First, it uses an ANOVA procedure to determine the clusters' position relative to other clusters as well as the entire sample.

*Step 5: Interpreting clusters.* Each cluster's distance from the mean score on Book Interactions and Early Writing were estimated in terms of standard deviations (i.e., 1 *SD* above or below the mean was considered High and Low, respectively). Next, if clusters were less than 1 *SD* above or below the mean, the clusters were interpreted and labeled based on the group's multivariate distance from the sample's mean characteristics (e.g., +.41 *SD* = Positive).

*Step 6: Validating results:* When sample sizes are relatively low or there is limited access to similar studies, a common technique for validating hierarchical results is to replicate the analysis and compare the results using a non-hierarchical clustering technique (e.g., deKruif et al., 2000; Stuhlman & Pianta, 2009). For this study, an iterative technique called *k*-means clustering was used to validate the initial results.

**Examining teacher credentials.** An aim of this study is to determine whether, once teachers are clustered based on similar multivariate patterns of classroom quality, any differences in terms of educational background and/or experience exist between clusters. Four variables related to teachers' experience and educational background, years of teaching experience, degree major, degree type (i.e., associate's, bachelor's), and participation in an intervention (i.e., beginning of intervention, end of intervention), were used to determine whether significant intercluster differences exist. Over the course of the study, more than a dozen *degree majors* were reported by



teachers. Although most teachers (75%) earned degrees in ECE or a related field (e.g., Elementary Education), nearly 25% of teachers studied in fields unrelated to early education, or did not receive a degree. Therefore, *degree major* was collapsed into three categories: early childhood degree, other degree, or not applicable.

To determine whether teachers were differentially related to cluster membership, a multinomial logistic regression analysis was undertaken. In this study, the dependent variable is the cluster membership. A reference variable was chosen based on the cluster's average scores. The cluster with the average scores closest to the group mean was the reference group. Average scores on Book Interactions and Early Writing for Profile 3 were the closest to the mean of the entire sample, and thus, it became the reference category in the outcome variable. Therefore, results reflect the difference between each of the other profiles and Profile 3.

## Results

### Preliminary Analysis

*Standardization, outliers, and multicollinearity.* Profile names were determined by estimating the distance between each mean cluster score and the mean of the entire sample. To aid interpretation and description of clusters in relation to the sample mean, Book Interactions and Early Writing were standardized. Although some observations did score quite high on both scales of support, all observations were similar to other observations in terms of magnitude, indicating that no outliers exist within the dataset. Correlational analyses revealed that Book Interactions and Early Writing were significantly correlated  $r = .59$ , which is considered moderate (Kachigan, 1991).

### Analysis

Across all classrooms, the average score on Book Interactions was 9.87 ( $SD = 3.34$ ) out of a possible 18, or 55% of the responses on the reading scale were positive (i.e., the desired response was achieved). The average score on Early Writing was 6.33 ( $SD = 2.83$ ) out of a possible 12, or 53% of the responses on the writing scale were positive.

*Determining the number of clusters.* Cluster analyses were conducted according to procedures set forth by Hair and Black (2000). Following preliminary steps previously described, Ward's (1963) hierarchical clustering algorithm was applied, clusters were examined and interpreted, and a replication of the results was attempted using  $k$ -means non-hierarchical methods. To determine whether classrooms from this sample could be partitioned into multiple distinct profiles, a squared-Euclidian distance algorithm (Ward's) was employed using SPSS statistical software. Due to the relatively small sample size, prior to analysis, the solution

possibilities were limited to between three and five clusters. Three steps were taken to determine the final number of clusters. First, the dendrogram output was analyzed. The dendrogram output showed extremely small branches beyond the three- and four-cluster solution, indicating that a five-cluster solution did not effectively discriminate between clusters. Next, the three- and four-cluster solutions were examined side-by-side. A close examination revealed that Profiles 1 and 2 were identical in both solutions. Furthermore, Profile 3 ( $n = 43$ ) from the three-cluster solution was comprised solely of classrooms from Profile 3 ( $n = 35$ ) and Profile 4 ( $n = 8$ ) from the four-cluster solution. Finally, it was determined that the four-cluster solution provided more homogeneity within groups (smaller  $SD$ s).

Descriptive statistics for book interactions and early writing supports and teacher credentials for each of the four profiles are provided in the following paragraphs.

A series of ANOVAs revealed significant differences between clusters on scores on the BISS,  $F(3, 85) = 96.22, p = .001$ , and the EWSS,  $F(3, 85) = 58.12, p = .001$ . Significant differences ( $p$  values ranged from .001 to .05) were found between each of the profiles for scores on *both* scales of support for early literacy, with two exceptions. Profiles 1 and 4 did not differ significantly in terms of scores on the supports for early reading, and Profiles 3 and 4 did not differ significantly on the writing supports.

### Classroom Profiles

*Profile 1—Overall highest quality.* Classrooms ( $n = 27$ ) in Profile 1 had high mean scores on both scales of support for early literacy. Classrooms averaged a score of 12.78 out of a possible 18 on Book Interactions, and averaged a score of 9.63 out of a possible 12 on Early Writing. Once scores were standardized, it was revealed supports for book interactions in classrooms from Profile 1 were 0.89 standard deviations above the sample mean, and scores for Early Writing were approximately 1.17 standard deviations above the sample mean. Compared with those in other profiles, classrooms in Profile 1 had significantly more teachers who had recently completed a professional development intervention compared with classrooms in Profile 2,  $\chi^2(3, N = 86) = .47, p = .001$ .

*Profile 2—Overall lowest quality.* Profile 2 contained 16 classrooms and averaged the lowest scores on both scales of support for early literacy. Classrooms in this profile had mean scores of 5.00 out of a possible 18 on Book Interactions, and 3.56 out of a possible 12 on Early Writing. Analysis of standardized scores revealed that classrooms in Profile 2 scored well below the sample mean on both Book Interactions ( $-1.46 SD$ ) and Early Writing ( $-0.98 SD$ ).

*Profile 3—Below average reading/Below average writing.* Profile 3 ( $n = 35$ ) contained the most number of classrooms of all clusters and generally performed below average in terms of



provided supports for early literacy. Classrooms in this profile had average scores of 9.03 out of a possible 18 on Book Interactions, and scores for Early Writing were 5.29 out of a possible 12. Standardized data showed that teachers in Profile 3 scored near but below the sample mean on supports for book interactions ( $-0.25 SD$ ) and early writing supports ( $-0.37 SD$ ).

**Profile 4—High reading/below average writing.** Classrooms in Profile 4 ( $n = 8$ ) varied in terms of support for early literacy. Classrooms in Profile 4 averaged a score of 13.50 out of a possible 18 on Book Interactions, and averaged a score of 5.38 out of a possible 12 on Early Writing. Once scores were standardized, scores on Book Interactions were 1.08 standard deviations above the sample mean, and scores for Early Writing were approximately 0.34 standard deviations below the sample mean.

**Teacher credentials.** Teachers varied greatly in terms of credentials. Teachers from classrooms in Profile 1 averaged the most years of experience teaching prekindergarten (12.5 years). Behind Profile 1, teachers from classrooms in Profile 4 averaged the most amount of prekindergarten experience. On average, classrooms in Profile 2, the profile rated as the least amount of supports for book interactions and early writing, had teachers with the least amount of prekindergarten experience (7.35 years) but also had the highest proportion of teachers with an ECE degree (88%). Compared with the other profiles, classrooms in Profile 3 had teachers with the widest variety of educational experiences.

**Logistic regression.** The results of the multinomial logistic regression examining the role of teachers' credentials showed that differences in teachers' credentials did not increase the likelihood of belonging to any one particular cluster or profile, with the exception being Profile 1. When compared with Profile 3, teachers in Profile 1 had significantly more years of teaching experience,  $b = 0.86$ , Wald  $\chi^2(1) = 4.24$ ,  $p > .04$ ; were more likely to have recently completed a professional development program,  $b = -2.13$ , Wald  $\chi^2(1) = 9.71$ ,  $p > .01$ ; but were less likely to have an ECE or related degree,  $b = -1.68$ , Wald  $\chi^2(1) = 4.20$ ,  $p > .04$ . Odds ratio showed that as the years of experience increased one standard deviation (7.43 years), teachers were 11.6 times more likely to be placed in Profile 1. The odds ratios also showed that if a teacher had just finished a professional development program, he or she was .47 times more likely to be in Profile 1. However, the odds ratios also showed that teachers in the highest profile were .60 times less likely to have an ECE or related degree.

**Replication and validation.** To validate the results of the cluster analysis, a k-means clustering technique was employed to determine whether the results of the original analysis could be replicated. In a k-means cluster analysis, observation points are partitioned into clusters based on the nearest mean.

The k-means analysis was limited to four clusters a priori, and results revealed four profiles similar to the original clusters in terms of scores and standard deviation on the BISS and the EWSS. Each observation was visually inspected to determine whether it remained in the same cluster or moved to a different one. Approximately 77% of classrooms remained in the original clusters.

## Discussion

Four distinct profiles, each with a unique pattern of scores derived from observation-based scales of supports for book interactions and early writing, emerged from the analysis. The results of this person-oriented study complement the large body of variable-oriented research on early literacy education (e.g., NELP, 2008), and also add depth to a body of similar research on multiple profiles of classroom quality (e.g., LoCasale-Crouch et al., 2007).

Using the group mean for all 88 teachers/classrooms, approximately half of the measured supports for both early book interactions and early writing in this study were provided. This is encouraging for advocates of the importance of early writing as guidelines for recommended practices often emphasize early reading activities (Head Start Child Outcomes Framework; NAEYC & IRA, 1998). Position statements that provide educators with more suggestions for book activities compared with early writing activities may still guide teachers and administrators today, but more recent calls for increases in the amount of high-quality supports for early writing may be affecting current practices (Elbow, 2004).

Less encouraging is the fact that classrooms in Profiles 2 and 3, characterized by lower amounts of quality supports, comprised nearly two thirds of all teachers in this sample. That means, similar to other studies reviewed in this article, the majority of classrooms in this study (60%) provided less than half of the included support indicators for both book interactions and writing. Justice et al. (2008) found similar results; approximately half of the teachers in their study had low scores on measures of either language and/or literacy.

It is perhaps not surprising that Profile 4, and to a certain extent Profile 2, was characterized by inconsistent levels of quality in each of the domains of early literacy examined in the current study, especially in light of several studies of early literacy that have found that some teachers have reported or were observed providing unbalanced instruction (Justice et al., 2008; Powell et al., 2008). Furthermore, teachers have reported approaching different aspects of early literacy (e.g., vocabulary and letter knowledge) with varying degrees of emphasis and intentionality (O'Leary et al., 2010).

Another important finding is that there were no significant associations between teachers' credentials and profile membership. Despite teachers from Profile 1 averaging over 3 years more experience teaching prekindergarten than teachers from the rest of the classrooms, there were no

significant differences between any two profiles on the *years of experience* variable.

### Limitations

Three design limitations restrict the extent to which this study can be generalized to other Head Start populations. First, the relatively small sample size made it impossible to replicate the results using traditional means such as splitting the sample and conducting two cluster analyses. Also, to maximize the sample size, the analysis used data collected during the midpoint of the Head Start program year after some of the teachers had completed an early literacy professional development program. Their participation in the professional development intervention may have contributed to observed quality in the participating classrooms and thus influenced profile membership. For example, teachers may have been primed to perform to researchers' expectations or simply were more informed by the workshops and coaching, resulting in inflated observation scores. Finally, transforming variables (e.g., from ordinal to dichotomous) can limit validity because it carries inherent error with it. As mentioned, this limitation was acknowledged and extensive thought was put into all item selection and transformation.

### Implications

The fact that the majority of classrooms in this study provided lower quality literacy supports does not bode well for the entire education community, which has roundly nominated prekindergarten as crucial to promote children's emergent literacy development (NAEYC, 2009). Several other recent studies provide evidence that there are multiple, distinct types of early childhood classrooms in terms of emotional and instructional climate (Stuhlman & Pianta, 2009) and teacher-child interaction behaviors (deKruif et al., 2000). This study adds to the early childhood field in general and, specifically, to other person-oriented cluster analyses by confirming that early childhood classrooms are also distinct in terms of early literacy supports. Intervention research, policy discussions, and guidelines for teacher preparation and practice must acknowledge the possibility that some domains of support for early literacy receive more attention than others. In addition, teachers may be competent in one domain, but provide inadequate supports in another (e.g., current study; Justice et al., 2008). If proficiency in both reading and writing is the end goal of literacy education, then flags should be raised in light of the fact that two of the profiles exhibited consistently low scores, and two profiles exhibited inconsistent patterns of support across reading and writing. However, it is encouraging that a sizable Profile 1 ( $n = 27$ ) provided a high proportion of writing supports (80%). Future studies of early literacy should include supports for early writing, both instructional and environmental, in their analyses. Such findings could

result in more balanced early literacy experiences for children in prekindergarten classrooms.

Other variable-oriented studies (e.g., Gerde & Powell, 2009), whether they find significant relations or not, may benefit from a better understanding of distinct profiles within samples that cluster analysis offers. The idea that a small group of observations with either extremely low or high scores can sway the entire sample's average score has been established by basic descriptive statistics. Profiles 1 and 2 are quite different from one another in terms of provided supports for book interactions and early writing. It would ultimately be inefficient to provide the same types of professional development content to these very different classroom types. The fact that the current study found more experienced teachers and those with ECE degrees were more likely to be in the highest rated profile also supports the use of more person-oriented analyses in studies of teacher quality. This is because studies of teacher quality typically examine sample populations in their entirety, rather than individually examining smaller clusters of teachers with more similar attributes. Future work can dig even deeper, but focusing on patterns found within individual clusters, creating a complimentary approach such as the one suggested by Bergman and Trost (2006). Such work could provide insight into ways of providing even more individualized support for teachers. For example, administrators may be interested if their highest performing teachers consistently scored low on a specific item. Further studies should attempt to utilize this type of person/variable-oriented research.

The wide range of instructional and environmental quality found in prekindergarten classrooms, in both the current study and several others mentioned, may be a reflection of the varying levels of quality found in higher education experiences. Not a new idea by any means, ongoing professional development may be the best way to ensure teachers provide high-quality supports for children's early literacy development (Hyson, Biggar Tomlinson, & Morris, 2009). The fact that the teachers who had recently completed a professional development program were more likely to be in the highest rated group lends more credence to this notion.

## Appendix A

### Book Interactions Supports Scale

1. Was attention drawn to the author's name?
2. Did the teacher ask the children to repeat a novel word?
3. Did the teacher ask children one or more closed-ended, follow-up questions about the book?
4. Did the teacher ask children one or more open-ended, follow-up questions about the book?
5. Did the teacher ask the children one or more open-ended questions other than as follow-up to book reading?

6. Did the teacher define a novel word during a book reading?
7. Did the teacher respond to spontaneous questions or comments?
8. Is an area set aside just for book reading?
9. Does the area where books are located have soft materials?
10. Is the area where books are located orderly and inviting?
11. Are there three or more books related to the current theme?
12. Are there more than five books that convey factual information?
13. Are there any books in the science area?
14. Are there any books in the dramatic play area?
15. Are there any books in the block area?
16. Are there any books in any other areas?
17. Is there a place for children to listen to recorded books/stories?
18. Is time set aside for children to look at books alone or with a friend?

## Appendix B

### Early Writing Supports Scale

1. Is a distinct area set up and functioning for writing?
2. Are there word cards with names or familiar words?
3. Are there templates or tools to help children form letters?
4. Is there paper available for writing?
5. Are there writing tools available?
6. Is an alphabet visible?
7. Is there teacher dictation on display in the classroom?
8. Is there children's writing on display in the classroom?
9. Are there writing tools in the dramatic play or block area?
10. Are there props that prompt children to write in the dramatic play or block area?
11. Did the teacher help a child write?
12. Did the teacher model writing?

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