An Experimental Validation of a Preschool Emergent Literacy Curriculum

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The purpose of this study was to evaluate the effectiveness of a preschool emergent literacy enrichment curriculum. Participants were 126 Head Start children, their teachers, and their parents. Matched centers were assigned to 1 of 3 conditions: experimental literacy, experimental math, or control. Teachers in both experimental groups implemented either literacy or math instruction in small groups on a daily basis, and parents and children completed supplementary learning activities at home. The control classroom implemented the ongoing Head Start curriculum. Children in the literacy condition showed the largest gains in phonemic awareness and emergent writing skills; they also made greater gains on emergent reading than did children in the math condition. There were no group differences on expressive vocabulary. Results are discussed in terms of curriculum design and practical issues involved in supporting preschools in the implementation of research-based instructional programs.

As an outgrowth of concern regarding the academic progress of America’s school children (e.g., No Child Left Behind Act of 2001; Snow, Burns, & Griffin, 1998), renewed attention has been paid to role of early childhood experiences in providing a foundation for later literacy development (Bowman, Donovan, & Burns, 2001; Neuman & Dickinson, 2001; U.S. Department of Education, 2005). A robust body of evidence indicates that preschool- and kindergarten-age children with strong oral language and emergent literacy skills show consistent advantages in reading, writing, spelling, and overall academic performance throughout the school years (Barnhardt, 1991; Scarborough, 2001; Snow et al., 1998; Vellutino &

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Such findings underscore the need to promote developmentally sensitive emergent literacy instruction in all early childhood settings.

Current federal education initiatives (e.g., Reading First, Early Reading First) stress the importance of implementing literacy curricula that are firmly grounded in “scientifically based reading research” (U.S. Department of Education, 2005). Although this is a worthy aim, such policy mandates practices that are not yet well supported by applied research evidence. Although the basic research literature is growing, experts know relatively little about the extent to which results from successful, short-term interventions delivered by research staff generalize to literacy instruction as delivered by preschool teachers in their classrooms.

In an effort to address this gap, we conducted an experimental study of a scientifically based reading research curriculum implemented by Head Start teachers. The purpose of this study was to evaluate a pilot version of Learning Connections (LC), an emergent literacy and mathematics enrichment curriculum for 3- to 5-year-old children. In the pilot year, the literacy and mathematics portions of the curriculum were implemented separately rather than as an integrated package. This article focuses on the language and literacy outcomes of the pilot testing year (see Sophian, 2004, for a detailed report on the mathematics curriculum and outcomes). It was hypothesized that children receiving the literacy curriculum would show greater gains on measures of literacy development than would the children in two different comparison conditions.

Curriculum Learning Goals

There is widespread agreement that preschool and kindergarten children need to acquire age-appropriate competence in the areas of oral language, phonemic awareness, alphabet knowledge, and print concepts (International Reading Association and the National Association for the Education of Young Children [IRA & NAEYC], 1998; Snow et al., 1998). Based on a review of the literature, we selected these general learning domains, as well as the additional domain of emergent writing, around which to build the curriculum (see Table 1). Each domain subsumed several more discrete learning goals. We included as learning goals only those skill areas for which there is strong correlational evidence linking skill attainment with later academic achievement and/or experimental evidence that specific instruction in these skills leads to demonstrable gains in current performance or future literacy outcomes.

Oral Language

The quality of teacher–child conversation affects children’s vocabulary growth, especially conversations that occur one-on-one or in small group settings (Beals,
DeTemple, & Dickinson, 1994; Dickinson & Sprague, 2001; McCartney, 1984). A context that is especially well suited to supporting rich verbal interaction is dialogic reading, in which children engage in active discussions of books as adults read aloud. The adult scaffolds the discussion by using leading questions and responsive conversational extenders, gradually giving the children more responsibility for lengthy and complex participation in the read-aloud session. Dialogic reading has been used effectively by teachers and parents, resulting in significant and lasting gains in expressive vocabulary, grammar, and the semantic complexity of children’s speech (Hargrave & Sénéchal, 2000; Whitehurst et al., 1994; Whitehurst et al., 1988). Based on this evidence, dialogic reading and adult–child conversations during free play activities were selected as the two main instructional strategies for promoting language development.

### Phonemic Awareness

Phonemic awareness is the ability to hear and manipulate the individual sounds (phonemes) of which words are composed (Snow et al., 1998; Whitehurst & Lonigan, 2001). Phonemic awareness is one of the most robust predictors of concurrent and future literacy skill (Adams, Treiman, & Pressley, 1998; Juel, 1988; Nation & Hulme, 1997; Stanovich, Cunningham, & Feeman, 1984), and children who enter school with high phonemic awareness usually learn to read and write well, regardless of the literacy instruction method to which they are exposed (Byrne & Fielding-Barnsley, 1995; Griffith, Klesius, & Kromrey, 1992). Experimental investigations in which trained research assistants conducted phonemic awareness activities with small groups of preschool, kindergarten, or

<table>
<thead>
<tr>
<th>Oral language</th>
<th>Has increased vocabulary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engages in conversations of increasing length and complexity</td>
<td></td>
</tr>
<tr>
<td>Phonological and phonemic awareness</td>
<td>Identifies syllables within spoken words</td>
</tr>
<tr>
<td>Recognizes and generates rhymes</td>
<td></td>
</tr>
<tr>
<td>Recognizes and generates words that start with the same sound</td>
<td></td>
</tr>
<tr>
<td>Alphabet knowledge and print conventions</td>
<td>Shows awareness of environmental print</td>
</tr>
<tr>
<td>Shows awareness of the usefulness of print</td>
<td></td>
</tr>
<tr>
<td>Identifies upper- and lowercase letters and knows letter-sound correspondence</td>
<td></td>
</tr>
<tr>
<td>Tracks print</td>
<td></td>
</tr>
<tr>
<td>Emergent writing</td>
<td>Attempts to convey meaning via writing</td>
</tr>
<tr>
<td>Shows increasingly higher levels of emergent writing</td>
<td></td>
</tr>
</tbody>
</table>
first-grade children have shown increased phonemic awareness in just 4 to 12 sessions (Bradley & Bryant, 1983; Byrne & Fielding-Barnsley, 1989, 1990, 1991; Cunningham, 1999). The more intensive phonemic awareness interventions show long-term effects (Bradley & Bryant, 1983; Byrne & Fielding-Barnsley, 1991, 1995). A small number of applied reports also indicate that phonemic awareness programs can be effectively implemented by classroom teachers (Blachman, Ball, Balck, & Tangel, 1994; Byrne & Fielding-Barnsley, 1995; Lundberg, Frost, & Petersen, 1988); however, gains are smaller than those found when researchers implement similar curricula.

Many different phonemic awareness skills emerge in a developmental sequence across the preschool to early elementary school years (Anthony, Lonigan, Driscoll, Phillips, & Burgess, 2002; Opitz, 2000). Based on this sequence, we decided to focus on three skills appropriate for preschoolers: syllable boundaries, rhyming, and alliteration. We designed activities to promote both receptive (recognition) and expressive (generation of novel examples) competence on the target skills. Examples include clapping out syllables in familiar words, playing a picture concentration game involving rhyming words, and going on an outdoor scavenger hunt to find objects starting with a target sound.

knowledge of the alphabet and print conventions

Phonemic awareness allows children to hear the sounds within spoken words, but beyond this, children need to know that these sounds can be represented by printed letters and that sound–grapheme correspondence is the key to generating and decoding written language. Although knowledge of letter names is a strong predictor of later reading performance (Scarborough, 2001), this skill in isolation is of limited practical use unless it is part of a broader understanding of the more general alphabetic principle. Thus, the more successful literacy interventions provide a combined focus on both phonemic awareness and letter–sound correspondence (Ball & Blachman, 1991; Byrne & Fielding-Barnsley, 1991, 1995; Yeh, 2003). Knowledge of the alphabet, in turn, is of limited use unless children also understand the main functions and conventions of print. Foremost among these is the understanding that print carries meaning that can be used for a variety of important purposes (IRA & NAEYC, 1998; Snow et al., 1989). Presumably, this understanding of the big picture helps motivate children to persist in the difficult tasks of learning to read and write.

Intervention studies of print referencing during adult–child book reading (e.g., the adult tracking print with his or her finger as he or she reads aloud, discussing parts of the book such as the title, pointing to separate words on the page) have shown that significant gains in children’s print concepts can be obtained in only 4 to 8 weeks of shared reading sessions (Justice & Ezell, 2000, 2002). Somewhat
longer interventions (i.e., 14–16 weeks) that combine instruction in letter knowledge with phonological or phonemic awareness activities have shown marked gains on skills including letter–sound correspondence, alphabet recognition, letter naming, letter writing, and novel word reading for both native English speakers and English-language learners (Roberts & Neal, 2004; Roberts, 2003; Yeh, 2003). There is some debate as to whether it is more useful to teach children letter names or letter–sound correspondences (Treiman & Rodriguez, 1999). Both are important predictors of early elementary decoding skill (Lonigan, Burgess & Anthony, 2000; Schatschneider, Fletcher, Francis, Carlson, & Foorman, 2004); however, we decided that knowledge of letter sounds would allow children to start using invented spellings more readily than would knowledge of letter names. For this reason, our alphabet instruction focused on letter–sound correspondence rather than on letter naming.

We designed activities to support the development of print tracking, letter sound correspondence, and use of environmental print. These skills were taught within the context of sharing messages and information that was meaningful and personally relevant to the children. Examples include jointly composing a morning message that was written by the teacher, who then asked a child to track the print as she reread the message to the group; exploring a mystery box full of alliterative objects representing two to four first sounds, which children sorted by group and matched with the corresponding letter symbol; and producing a class book of signs and other environmental print located in the school neighborhood.

Emergent Writing

Emergent writing is a fruitful area that has received little attention in the research-based reviews of recommended instructional practices (e.g., Snow et al., 1988). Children’s emergent writing attempts follow a reliable developmental progression (Sulzby, Barnhart, & Hieshima, 1989), and emergent writing levels correlate concurrently and predictively with conventional measures of spelling and reading processing (Barnhardt, 1991; McBride-Chang, 1998). One method for encouraging emergent writing is to have children keep a daily journal. Although journal writing has not been subject to experimental scrutiny, qualitative evidence suggests that journaling is an enjoyable activity that increases understanding of print functions and helps children progress to more advanced levels of emergent writing (Baskt & Essa, 1990; Fang & Cox, 1999; IRA & NAEYC, 1998; Pontecorvo & Zucchermaglio, 1989). Our curriculum activities included daily journaling, in which children were provided with prompts that encouraged them to integrate recently introduced alphabet and phonemic awareness skills into their journal entries. Children also wrote their own books, both in class and at home, which they read to their teachers and peers.
METHOD

Participants

Participating children were enrolled in 11 year-round, full-day Head Start classrooms located on the urban island of Oahu in that state of Hawaii. Classrooms were housed at nine different sites (seven sites had only one classroom, and two sites had two classrooms) administered by the same Head Start program. Complete pre- and posttest data were available for 126 children. (Note that 26% of the original sample was lost to attrition, almost all due to children leaving two of the control classrooms before the end of the school year. There were no differences on age or any pretest score for those children who completed the school year vs. those who left Head Start.) Children’s mean age at pretest was 47.10 months (range = 31-56 months); 52% were boys. The ethnic background of the sample was 43% Asian, 37% Native Hawaiian, 10% White, 5% not reported, 3% Hispanic, and 2% Black. According to Head Start records, 9% of the children were English-language learners, and 6% had identified special needs.

All lead teachers had a Child Development Associate credential, and 4 held bachelor’s degrees. Most of the original teachers (88%) remained in their classrooms throughout the course of the study. Three teachers took maternity leave, and 1 aide left due to dissatisfaction with her employment; all but one case of staff turnover occurred at the same literacy site.

Measures

Children were administered a pretest battery consisting of three measures and a posttest battery consisting of four measures. The Expressive One-Word Picture Vocabulary Test (Brownell, 2000) was used pre and post to measure expressive vocabulary size. This test shows high internal consistency (α = .96) and test–retest reliability (r = .85) for preschool children, as well as convergent validity with other measures of vocabulary. Items involve showing the child a colored drawing and asking the child to name the picture. Target words include nouns, collective nouns (e.g., anything), adjectives, and verbs. Language quotient scores (i.e., age-adjusted deviation scores based on a mean of 100 and standard deviation of 15) were used.

The Test of Early Reading Abilities 3, Form A (TERA-3; Reid, Hresko & Hammill, 2001) was used pre and post to measure emergent reading skill. The TERA-3 shows high internal consistency and test–retest reliability with 3- to 6-year-old children (α = .91 and r = .98), and adequate convergent validity (rs = .52–.67) with other measures of reading skill has been demonstrated for early elementary school children. Unlike many other instruments that assess reading, the TERA-3 includes content relating to the use of environmental print, print concepts,
and print genres in addition to knowledge of the alphabet and basic word reading. Items include distinguishing among food or beverage labels, distinguishing letters from numerals, indicating where on the page to start reading, and identifying letters. Although the TERA-3 does provide reading quotient scores, the instrument is normed for children aged 3.5 years and older. Roughly 15% of our sample was too young at pretest to be assigned a reading quotient score; for this reason, we used total raw scores (summed across the three TERA-3 subscales) and adjusted for age in the analysis.¹

At pretest, children were administered a phonemic awareness battery based on a prepublication version of the Preschool Comprehensive Test of Phonological Processing (Lonigan, personal communication). This measure consisted of two subscales of nine items each, in which children selected pairs of pictures from an array of four that showed either rhyming or alliterative words. At posttest, two additional subscales were added, each including four items, in which children were asked to generate a word that rhymed with or started with the same sound as a stimulus word. The internal consistencies of the phonemic awareness measure (based on either two- or four-subscale scores) were α = .69 at pretest and α = .74 at posttest. Raw scores were used, as no age-based norms are available.

Finally, an emergent writing sample was administered at posttest only. After a warm-up item in which children were asked to write their name, the children were asked to write a list of “all the words or letters you know.” This sample was scored for (a) the level of emergent writing based on Sulzby et al. (1989); (b) the number of unique, recognizable upper- and lowercase letters; and (c) the number of unique, recognizable words written using either conventional or invented spelling. Each of the three scores was converted to z scores and summed to form a composite writing score. As no pretest writing score was available to serve as a covariate, we used the raw score from the TERA-3 alphabet subscale; this subscale assesses letter identification and letter-sound correspondence, which were the most closely related skills for which a pretest measure was available.

At the end of the school year, teachers, Head Start supervisors, and parents in the two LC conditions were administered a short, anonymous satisfaction survey. The teacher/supervisor survey included six open-ended items (e.g., “What changes, if any, did you see in the children since you began the LC program?”) and an overall satisfaction item answered on a five-point scale ranging from 1 (very dissatisfied) to 5 (very satisfied). The parent survey included six closed-ended items ranging from 1 (strongly disagree) to 5 (strongly agree) or 1 (poor) to 4 (excellent), and two open-ended items (e.g., “What did you like best about LC?”).

¹Data were also analyzed for the older children using reading quotient scores. Results were almost identical to those reported in Tables 2 and 3 for raw scores in the full sample.
Procedures

Starting with a pool of 12 year-round, full-day sites, 9 sites were matched as closely as possible for teacher qualifications (both educational credentials and observed teaching quality), rural versus urban locale, child ethnicity, number of classrooms, percentage of English-language learners, and percentage of children with special needs. Three sites were dropped because they were not a match with any other site. Once satisfactorily matched trios were obtained, sites within each trio were randomly assigned to one of three conditions. Thus, our design was one of blocked random assignment. For the two sites with multiple classrooms, both classrooms were assigned to the same treatment condition. This resulted in four literacy classrooms, four math classrooms, and three control classrooms.

The control condition implemented the ongoing Head Start curriculum, which was organized around the Head Start Performance Standards and allowed considerable autonomy for each classroom. Teachers were free to select classroom teaching approaches and specific activities, as long as the general content standards were addressed. Teachers and parents in the literacy condition implemented a pilot version of the LC literacy curriculum. Teachers and parents in the math condition implemented a pilot version of the LC math curriculum. The literacy and math teachers received equal amounts of curriculum-specific support, including two inservice training workshops, weekly lesson plans and specific learning activities, required teaching materials, and weekly in-class supervision by a master’s-level mentor. Parents in the literacy and math conditions received instructions and materials for completing weekly home learning activities with their child. Teachers and parents in the control condition received no special support. Thus, the math condition served as a strict attentional control group for the literacy curriculum, and the regular Head Start condition served as a more traditional control. This design allowed us to tease apart the effects of the literacy and math curricula per se from possible halo effects, or generalized effects of increased supervision and professional support.

All children were administered the pre- and posttest battery by a trained research assistant in a quiet area adjacent to the classroom. Teachers in the literacy and math conditions implemented the relevant portion of the LC curriculum from October through April. All classroom materials were provided, as were detailed instructions for each curriculum activity. Teachers were given daily lesson plans that included a morning circle activity and three small-group activities to be done in small groups during a learning center rotation period. Each day, children in the literacy pilot group participated in dialogic reading; journaling; and either an alphabet, print awareness, or phonemic awareness activity. Children in the math pilot group participated in one circle activity and one math activity per day. The learning activities were game-like, short in duration (5–10 min), and children’s learning was supported by teacher conversation and scaffolding of instructional
supports. Activities were developmentally sequenced and lesson plans were developed to move children through the activity sequence at a pace that was consistent with each classroom’s needs. Materials were available to the children for free exploration throughout the day. Teachers were also given suggestions for transition activities and extension activities to be used across the school day.

To extend children’s learning to the home setting, parents in the literacy and math conditions were given a weekly home activity to do with their child. The home activities built on what children had recently been learning in class. Parents in the literacy group were also encouraged to borrow books from their child’s classroom on a weekly basis. Most activities resulted in a product (e.g., a homemade book that parents placed in their child’s classroom portfolio). We used the number of returned home activities as an index of parental participation. Families received support in implementing the home curriculum. We attended the ongoing monthly parent meetings held in each Head Start classroom. At these meetings, we discussed language and literacy development or math development, modeled upcoming home activities, and facilitated group discussion about parents’ experiences observing and working with their children.

Teachers were also provided with extensive ongoing support. Two inservice workshops were provided, a 1.5-day training session in September and a half-day refresher training in January. A master’s-level mentor teacher visited each LC classroom on a weekly basis to observe teachers using the curriculum and to provide coaching and feedback. Finally, the mentor teacher and lead researcher met with each classroom every third week to model upcoming classroom activities, discuss children’s progress, answer teachers’ questions, and suggest strategies to overcome any challenges.

RESULTS

Treatment Fidelity

Treatment fidelity in the literacy condition was moderate to good. Children in the literacy group completed an average of 344.4 circle-time and small-group literacy activities, or 72% of the activities indicated on the daily lesson plans. (Both child absences and teachers’ not following the lesson plans could contribute to this total being less than 100%.) Even though two literacy classrooms were affected by teacher turnover, all but one site was informally judged by the mentor teacher as implementing the curriculum with an acceptable to excellent level of quality. One literacy site had low rates of adherence to the daily lesson plans, and the lead teacher at that site did not implement the activities in the desired manner. Parents returned an average of 40.1% of the home activities; the overall return was lowered by minimal returns from the low-compliance site.
Gains in Children’s Language and Literacy Skills

The analysis of children’s posttest literacy skills was conducted in two steps. First, each independent variable was analyzed using an omnibus analysis of covariance, in which condition (literacy vs. math vs. control) was the between-groups factor, and child age and pretest score were the two covariates. Effect size estimates for each covariate and the condition factor were computed using $\eta^2$. The omnibus analysis was conducted to assess the relative contributions of age, pretest, and curriculum condition to explaining variance in the dependent variable.

Because only two of the three pairwise comparisons were of interest, treatment effects were examined by computing planned comparisons (Keppel, 1982). The first comparison contrasted the LC literacy condition with the LC math condition. The second comparison contrasted the LC literacy condition with the control condition. Because the original hypotheses were directional, one-tailed tests were used. In all cases, the dependent variable was an adjusted posttest score, controlling for child age and pretest. Effect sizes for the planned comparisons were computed in standard deviation units using a weighted pooled variance based on the omnibus analysis of covariance (Lipsey & Wilson, 2001).

Results of the main analyses are shown in Tables 2 through 4. For each of the four dependent variables, pretest was a significant covariate, accounting for 10% to 56% of variance in posttest scores. The association between pre- and posttest was strongest for expressive vocabulary and weakest for phonemic awareness. Age was a significant covariate for phonemic awareness and emergent writing, with older children having higher posttest scores. Age was not a significant covariate for expressive vocabulary, which was measured in an age-normed metric.

Contrary to our expectations, there were no group differences on expressive vocabulary. Results were more positive, but still mixed, for emergent reading. Children in the literacy condition had higher reading scores than did children in the math condition ($M = 3.52, d = .34$), but the literacy group was no different from the control group on the emergent reading outcome.

In contrast, clear treatment effects were found for phonemic awareness and emergent writing. Children in the literacy condition had higher phonemic awareness scores than did children in both the math ($M = 3.10, d = .50$) and control conditions.
TABLE 2
Means, Standard Deviations, and Adjusted Means for Literacy Outcome Measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>Literacy (n = 51)</th>
<th>Math (n = 44)</th>
<th>Control (n = 30)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>Adj M</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>90.2</td>
<td>14.6</td>
<td>90.3</td>
</tr>
<tr>
<td>Emergent reading</td>
<td>18.6</td>
<td>10.6</td>
<td>18.0</td>
</tr>
<tr>
<td>Phonemic awareness</td>
<td>13.2</td>
<td>7.0</td>
<td>13.1</td>
</tr>
<tr>
<td>Emergent writing</td>
<td>0.7</td>
<td>2.7</td>
<td>0.6</td>
</tr>
</tbody>
</table>

Note. Adjusted means control for age and pretest score. Vocabulary scores are language quotients, reading and phonemic awareness scores are raw scores, and writing scores are composite z scores.

TABLE 3
Analysis of Covariance Table

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>F</th>
<th>p</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expressive vocabulary</td>
<td>0.06</td>
<td>.81</td>
<td>.00</td>
</tr>
<tr>
<td>Age</td>
<td>150.99</td>
<td>.001</td>
<td>.56</td>
</tr>
<tr>
<td>Pretest</td>
<td>0.36</td>
<td>.70</td>
<td>.01</td>
</tr>
<tr>
<td>Condition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emergent reading</td>
<td>3.51</td>
<td>.06</td>
<td>.03</td>
</tr>
<tr>
<td>Age</td>
<td>83.39</td>
<td>.001</td>
<td>.41</td>
</tr>
<tr>
<td>Pretest</td>
<td>3.84</td>
<td>.02</td>
<td>.06</td>
</tr>
<tr>
<td>Condition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phonetic awareness</td>
<td>10.33</td>
<td>.002</td>
<td>.08</td>
</tr>
<tr>
<td>Age</td>
<td>12.77</td>
<td>.001</td>
<td>.10</td>
</tr>
<tr>
<td>Pretest</td>
<td>5.74</td>
<td>.004</td>
<td>.09</td>
</tr>
<tr>
<td>Condition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emergent writing</td>
<td>17.67</td>
<td>.001</td>
<td>.13</td>
</tr>
<tr>
<td>Age</td>
<td>51.39</td>
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<td>.30</td>
</tr>
<tr>
<td>Pretest</td>
<td>5.12</td>
<td>.007</td>
<td>.08</td>
</tr>
<tr>
<td>Condition</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ditions (M = 3.73, d = .60). They also had higher scores on emergent writing (M = 1.14, d = .47 for literacy vs. math; M = 0.76, d = .31 for literacy vs. control).

Predicting Individual Differences in Treatment Outcome

Any intervention is unlikely to have uniform effects for all children. We were interested in identifying which children gained the most from LC. To this end, we conducted stepwise regression analyses to predict growth in literacy skills. Indep-
age; the total number of LC activities each child had completed in class; the total number of home activities returned; the relevant pretest score; and three dummy variables representing whether the child spoke English as his or her first language, had special needs, or was in his or her first or second year of Head Start. We expected that, controlling for the other independent variables, posttest scores would increase as a function of treatment dosage. However, this expectation was not supported by the data in all but one case. Growth in phonemic awareness skills was higher for children whose parents completed more of the home literacy activities ($\beta = .38, p = .006$). For expressive vocabulary, emergent reading, and emergent writing, the number of LC activities completed at home or at school was unrelated to child outcomes. Note that there was limited range in the number of classroom activities completed, as all teachers followed the same lesson plan.

Consumer Satisfaction

Surveys returned from 38 LC literacy parents (a 75% return rate) indicated high levels of satisfaction with the pilot literacy curriculum. There were no differences on any demographic or child pretest measures for literacy parents who returned a satisfaction survey versus those who did not. All literacy parents (100%) agreed or strongly agreed that their child “learned a lot from the LC classroom activities.” We found that 90% of literacy parents felt that their child “learned a lot from the LC family activities,” 89% agreed or strongly agreed that the home activities were “clear and easy to follow,” and 92% said the family activities were “fun to do.” When asked about the overall program quality, 45% of literacy parents rated LC as excellent, 50% as good, and 5% as fair. Literacy parents’ open-ended comments indicated that their children enjoyed the home activities and that working on them together had increased their understanding of their children’s capabilities. Literacy parents also appreciated that the home activities provided “quality” one-on-one time, in addition to increasing their children’s skills.

### TABLE 4
Planned Contrasts

<table>
<thead>
<tr>
<th>Variable</th>
<th>Literacy vs. Math</th>
<th>Literacy vs. Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SE$</td>
</tr>
<tr>
<td>Expressive vocabulary</td>
<td>0.59</td>
<td>1.68</td>
</tr>
<tr>
<td>Emergent reading</td>
<td>3.52</td>
<td>1.33</td>
</tr>
<tr>
<td>Phonemic awareness</td>
<td>3.10</td>
<td>1.13</td>
</tr>
<tr>
<td>Emergent writing</td>
<td>1.14</td>
<td>0.36</td>
</tr>
</tbody>
</table>

*Note.* Means and standard errors are adjusted for pretest and age. Tests are one-tailed.
Teachers were less uniformly enthusiastic, although still positive. In all, 25% of LC literacy teachers and their supervisors said they were very satisfied with LC, 67% were satisfied, and 8% felt neutral about the program. Supervisors’ ratings were more positive than those of the classroom teachers. In their open-ended comments, literacy teachers indicated that the children had made good progress on the target LC skills, especially in the areas of writing and emergent spelling. The prepared lesson plans and materials, inservice training, and in-class mentoring were appreciated. Several literacy teachers felt that the curriculum was too academic and/or interfered with their autonomy in deciding the content of the school day. Some requested that a wider range of activities be provided for younger and less skilled children.

**DISCUSSION**

Results suggest that the LC emergent literacy curriculum was more effective than were ongoing Head Start practices. Compared to children exposed to teacher-developed curricula, children in LC classrooms showed greater gains in the areas of phonemic awareness, emergent writing, and, to a lesser extent, emergent reading. Effect sizes were generally moderate in magnitude, ranging from .31 to .60 standard deviations. This pilot study confirms that with adequate mentoring and support, Head Start teachers and parents can serve as change agents by delivering a research-based literacy enrichment curriculum with adequate fidelity.

LC had the most effect on children’s phonemic awareness and emergent writing. This was seen in both the magnitude of the effect sizes and the finding that LC classrooms showed greater gains than did both comparison groups. These two areas of the curriculum are perhaps less familiar to teachers (Hawken, Johnston, & Donnell, 2005) and may have represented a new emphasis in classroom learning activities. To the best of our knowledge, only 1 teacher outside the LC literacy pilot group made use of daily journal writing. Nor did teachers outside the LC literacy pilot group expose children to activities that strengthen phonemic awareness beyond the use of finger-plays, rhyming books, and songs. However, all classrooms had a daily read-aloud session that was similar to the LC dialogic reading activity with the major exception of group size (in most control classrooms, books were read to the class a whole, not to small groups of children). This fact could explain the lack of treatment effects for expressive vocabulary. It is less clear why the literacy group outperformed the math group, but not the control condition, on emergent reading. All classrooms worked with children on alphabet recognition on a regular basis (although LC literacy classrooms taught both letter names and letter sounds), which may have contributed to more similar performance on the emergent reading test. It is also possible that teachers in the math condition reduced the amount of time and attention devoted to this aspect of literacy to focus on the LC math.
In addition to being exposed to more frequent and repeated experiences with writing and phonemic awareness, children in the LC literacy condition were provided with literacy instruction that was mutually reinforcing. Phonemic awareness, letter recognition, letter–sound correspondence, and emergent writing are not skills that develop independently. For example, there is evidence that teaching phonemic awareness in combination with letter recognition is more effective than focusing on phonemic awareness alone (Ball & Blachman, 1991; Treiman & Baron, 1983; Yeh, 2003). And although a level of both phonemic awareness and letter knowledge is certainly needed to use invented or phonetic spellings, attempting to write phonetically (thus invoking the alphabetic principle) also increases one’s sensitivity to phonemes (Adams et al., 1998). In a typical LC classroom week, children would engage in all of the following experiences: (a) be introduced to the grapheme \( m \), (b) learn its associated phoneme \( /m/ \), (c) have several concrete experiences listening to and generating words containing that sound, (d) go on scavenger hunts at home to find objects with names that include that sound, (e) be encouraged to try to write a recognizable version of the letter, and (f) be prompted to write a story in their journal about something important to them that starts with the sound \( /m/ \). By addressing several literacy skills simultaneously, it is possible that children progressed further than they would have had each skill been taught in isolation.

An important obstacle to implementing the pilot curriculum was the lengthy learning curve on the part of the teaching staff. Almost half of the pilot period had passed before new classroom routines were established and teachers and children circulated through the LC activities smoothly and efficiently. Because this was an experimental evaluation, participating teachers did not volunteer to adopt the LC curriculum, and, initially, there were divided opinions about the wisdom of the program. First, asking teachers to work in small learning groups for portions of the day required some classrooms to make changes in their schedules and strategies for sharing responsibilities within the classroom teaching team. For example, some classrooms had minimal time in the schedule slated for learning centers or planned instruction, and some lead teachers expected their assistant teachers to assume a primarily custodial role. In order for each child to have 20 to 30 min per day of small-group or individual attention, classroom staff had to spend more time actively scaffolding children’s learning and less time monitoring larger groups. Second, teachers had to become familiar with new concepts (such as the distinction between letter names, letter sounds, and phonemes; or understanding that different types of verbal questions place different levels of linguistic and cognitive demand on the child) before they were able to clearly see how the LC activities were linked to specific child learning goals. Third, some teachers started with the belief that intentional teaching activities could not be developmentally appropriate. This concern mirrors a high-profile debate that is currently engaging the early childhood community, namely, the relative merits of explicit versus embedded instruction (McGee & Richgels, 2003; Yeh, 2003). Most LC activities used instruction that could be described as embedded within ongoing meaningful activities (e.g., dialogic reading,
print tracking during morning message), whereas others were more distinct and focused (e.g., table games in which children were asked to generate rhyming words). Nationally, Head Start teachers report using many indirect teaching strategies, such as environmental design, or supplying a range of materials to encourage independent exploration to meet program literacy goals; in contrast, teachers report less frequent use of strategies that involve direct teacher–child interaction (Hawken et al., 2005). Finally, the teachers in our study were at many different places in their own professional development and ranged widely in terms of formal preparation in early childhood education, years of classroom experience, knowledge of child development, and confidence in taking on a new challenge.

We did not design the evaluation process to closely track changes in teachers' knowledge, skills, and attitudes. However, our personal reflection on the process led us to make three general conclusions relevant to the successful implementation of classroom- and home-based interventions. First, achieving change in adult–child teaching interactions takes time. Second, implementing a complex curriculum enrichment program such as LC probably requires a mentoring component. And finally, teachers and parents do not automatically embrace a new curriculum, especially if they have reservations about pedagogical techniques or the amount of time and effort the curriculum requires. Appreciating a new curriculum, as well having confidence in one's ability to implement new techniques, is in large part an outcome of trial-and-error experience, in which teachers and parents come to see for themselves how their new efforts result in greater gains than they had previously come to expect from preschool children.

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