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Differentiated Instruction to Support High-Risk Preschool Learners

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Differentiated instruction is a strategy for meeting the needs of diverse learners. In this article, we describe a differentiated instruction model and examine the effects on high-risk children. One hundred twenty-eight children and their teachers from 8 Head Start classrooms participated in the project. Teachers provided developmentally sequenced, tiered instruction primarily in small group formats. Children made gains on all areas assessed (vocabulary, emergent reading, alphabet knowledge, print concepts, phonological awareness, emergent math). A subgroup of higher risk children was defined as those who scored in the bottom 5th percentile on English vocabulary at the start of the school year. This higher risk group comprised 26% of the sample. Higher risk children made much larger gains on vocabulary over the course of the year than did their lower risk classmates and showed similar or slightly lower rates of change on other measures of early academic skills. Practical issues relating to the implementation of a differentiated instruction model are discussed.

Keywords: preschool curriculum, literacy, language/speech

Inequality in educational opportunities and outcomes is a shameful fact of American life and these disparities exist even for our youngest citizens. A number of interrelated risk factors such as family poverty, low parental education, living in an unsafe urban neighborhood, and linguistic or ethnic minority status are associated with lower levels of school readiness (Jordan, Huttenlocher, & Levine, 1994; National Center for Educational Statistics, 2001). As a group, at-risk children do not catch up to their more advantaged peers by the end of first grade (Vandivere, Pitzer, Halle, & Hair, 2004), and some data indicate disparities actually increase as children progress through elementary school (e.g., Alexander & Entwisle, 1988).

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Preschool attendance strengthens early academic skills and there is evidence that the benefits of preschool are stronger for at-risk children (Magnuson, Meyers, Ruhm, & Waldfogel, 2004). However, preschool *quality* is a key issue as only programs of exceptionally high quality are likely to result in long-term reductions in academic disparities (Magnuson & Waldfogel, 2005). Initiatives such as Early Reading First have been developed with the goal of significantly improving the quality of curriculum and instruction provided to at-risk preschool children in order to close the readiness gap.

Relatively little attention has been paid to the issue of achievement disparities *within* at-risk populations. Molfese et al. (2006) reported data from a preschool program serving low socioeconomic status (SES) children; they found that half of 4-year-olds made no gains in alphabet knowledge over the course of the school year. Compared with their peers who did improve, the low-growth children were younger and had lower fall assessment scores on vocabulary, letter identification, and general cognitive ability. Results of the 2000 Family and Child Experiences Survey (FACES) study revealed important variation within the Head Start population (Administration for Children and Families, 2003). In contrast to the Molfese et al. sample, Head Start children who started the school year in the lowest quartile made larger gains on vocabulary, alphabet knowledge, and math than did their peers in the highest quartile. In fact, children in the highest quartile showed declines over the year on standardized scores. Finally, Kaplan and Walpole (2005) reported results for kindergarten children from the Early Childhood Longitudinal Study, Kindergarten Class of 1998–1999 (ECLS-K) data. They found that 38% of children from families living below the poverty line entered kindergarten with minimal knowledge of the alphabet or phonological awareness. More disturbing, 63% of these children with low fall scores failed to make gains during the kindergarten year. Unfortunately, these studies do not provide a clear answer concerning which low-SES children are at risk for falling further and further behind. But they do indicate that current educational practices are not providing many at-risk children with the support they need.

DIFFERENTIATED INSTRUCTION

Children come to preschool with different home experiences, cultural backgrounds, readiness skills, interests, and learning styles. Because of this, children learn at different rates and need different kinds of instructional strategies. Variance among children may be especially great in Head Start classrooms due to the wide normative variation in developmental skills that is typical in early childhood and to the mixed-age population served. According to Tomlinson (2000),

> Differentiation consists of the efforts of teachers to respond to variance among learners in the classroom. Whenever a teacher reaches out to an individual or group to vary his or her teaching in order to provide the best learning experience possible, that teacher is differentiating instruction. (p. 1)

In a differentiated instruction model, all children are taught using the same curriculum and learning standards. However, children may be taught using different materials, learning activities, or levels of teacher scaffolding, and they may be allowed to show their understanding in different modes or formats. Hallmarks of differentiated instruction include small group teaching, flexible grouping, and continuous performance assessment to guide instructional modifications

(Tomlinson, 2000; Tomlinson & McTighe, 2006). As Purcell and Rosemary (2008) point out, differentiated instruction is integral to developmentally appropriate practice. Furthermore, when differentiated instruction is skillfully conducted, all children are taught within their zone of proximal development. According to Vygotsky (1978), this zone is the range of tasks that children initially cannot perform without support from a teacher or more skilled partner; these supports are gradually reduced as the child achieves independent mastery. Learning and development are thought to be optimized when instruction occurs within a child's zone of proximal development.

Research conducted with K–12 learners indicates that differentiated instruction improves children's motivation and achievement (Tomlinson & McTighe, 2006). This does not mean, however, that differentiated instruction is easy to do. Purcell and Rosemary (2008) describe some of the challenges to using differentiated instruction in preschool settings. First, teachers must be well versed concerning appropriate learning goals and the developmental sequencing of target skills. Second, teachers must be good observers and be able to use ongoing assessments of each child's learning as the basis of their instructional planning. Third, teachers must be able to appropriately scaffold their interactions with children, providing different levels of support as needed. Finally, environmental design and classroom management techniques need to be used to their full advantage so that children can independently engage in meaningful activities during those times that the teacher is involved in small group instruction.

The purpose of this article is to describe a differentiated instruction model used in an Early Reading First project and to examine the effects on at-risk preschool learners. Because the project was conducted in Head Start classrooms, all children were at educational risk due to socioeconomic factors. However, within this low-SES group, we identified a subgroup of children who were especially vulnerable. We compare outcomes for this particularly high-risk group with those of their classroom peers. In our discussion section, we examine challenges that would need to be addressed in using our differentiated instruction model in typical preschool programs serving at-risk children. We also suggest directions for future research.

OVERVIEW OF THE LEARNING CONNECTIONS EARLY READING FIRST PROJECT

The *Learning Connections* Early Reading First (ERF) project was funded for 3 years, starting in the fall of 2005. The data presented in this report are from the third project year.

Curriculum

Our ERF classrooms implemented the *Learning Connections* (LC) curriculum as an enhancement to their ongoing use of the *Creative Curriculum* (Dodge, 2002). The *Creative Curriculum* addresses all developmental domains and focuses on establishing a learning environment modeled on the National Association for the Education of Young Children's (NAEYC) guidelines for developmentally appropriate practice via the use of 11 interest areas. LC is a research-based, experimentally validated enrichment curriculum that focuses on emergent literacy and emergent math. LC was developed in accordance with standards and recommendations of the NAYEC, the National Research Council, the International Reading Association, and the National Council

of Teachers of Mathematics. Because LC does not take the entire school day to implement, it serves as an ideal supplement to the more holistic *Creative Curriculum*. Teachers used LC for instruction in language, literacy, and math and the *Creative Curriculum* for instruction in other developmental domains.

LC has been subjected to two different field trials using a randomized-block, pre-post experimental design. These validation studies involved 300 Head Start children in 13 classrooms and compared LC with either a teacher-designed curriculum or the *Creative Curriculum*. Children in LC classrooms showed greater gains on standardized tests and performance measures of emergent reading, phonemic awareness, letter-sound correspondence, emergent writing, and math skills (DeBaryshe & Gorecki, 2005, 2007; Sophian, 2004).

The LC curriculum includes a series of over 140 developmentally sequenced classroom and home activities that address specific learning goals organized into seven major content domains. Examples of *oral language* activities include small group dialogic reading, story retelling, adult-child conversation about ongoing play, and intentional vocabulary instruction. *Phonological and phonemic awareness* skills are taught using a variety of activities that promote the recognition and generation of syllabification, rhyme, alliteration, and onset-rime and phoneme blending and segmentation. Examples include clapping syllables in spoken words and sorting objects into groups based on initial sounds. Phonemic awareness is addressed concurrently with alphabet and emergent writing activities because this integration enhances children's understanding of the alphabetic principle. *Alphabet knowledge, letter-sound correspondence, and print awareness* are developed via activities such as letter-matching games, letter sound collages, morning message, and neighborhood sign walks. Children are introduced to letter sounds as well as letter names with the expectation that knowledge of letter-sound correspondence transfers more easily into the use of invented spelling. Letters are introduced in clusters of several consonants and one vowel so that children can start to combine letters to form consonant–vowel–consonant (CVC) words. *Emergent writing* is supported through activities such as daily journaling and writing class or family books. Each child keeps a daily journal in which he or she responds to prompts about ongoing classroom and home activities. Teachers scaffold children's writing attempts, ensuring that each child starts with a planned, personally meaningful message, and gradually encourage children to use increasingly sophisticated levels of emergent writing.

Mathematics experiences move from activities that address a single mathematical domain to activities that integrate multiple domains as well as integrating math with conversation and problem-solving skills. Fundamental *numbers and operations* activities include counting objects, making sets, and matching numerals to quantities. *Geometry* foundations include recognizing shapes, finding shapes in the natural environment, building mosaics with pattern blocks, and using smaller shapes to fill in a larger pattern, such as the outline of an angular house. *Measurement* activities include sorting or ordering objects based on physical attributes, predicting which of a variety of containers would hold the most beans or water, and using standard and nonstandard units of measurement. An example of an advanced, integrated math activity is a lesson on area. Children made predictions about the relative area of a set of unusual angular shapes. They then measure the area of each larger shape by covering the large shapes with small identical plastic triangles. Together with the teacher, they group the shapes by area and make a graph of how many shapes had areas equal to three, four, or five small triangles.

Each day, teachers devote 60–90 min to explicit small group instruction in language, literacy, and math during learning center rotation periods. Additional instruction occurs in the context of

transition activities, circle time, extension activities, free choice periods, and outdoor play. Daily lesson plans specify (a) 10 to 15 min of large group activities; (b) four to six different small group LC learning activities (half for developmentally younger children and half for developmentally older children) amounting to approximately 30 min small group instruction time per child; (c) suggestions for integration of LC lessons with the classroom's ongoing thematic unit; and (d) suggestions for extension activities to use during transitions, outdoor play, and free play periods. Parents also contribute to their children's education by reading aloud and completing weekly home activities that build on topics children have covered in the classroom.

Professional Development

Our professional development package was designed and delivered by the ERF project leaders, who were also the authors of the LC curriculum. We provided three major forms of professional support.

Quarterly In-Service Workshops. Between 40 and 65 annual hours of workshop training was provided, depending on the project year. Content included research-based principles for literacy and math instruction, developmental sequences and mechanisms, and classroom applications. The workshops were the main context for delivering new content knowledge. Subsequent coaching and technical assistance sessions built on this content and assisted teachers in putting their new knowledge into practice.

In-Class Coaching and Technical Assistance. Two to three times per month, an LC coach provided a full morning of in-class coaching. Coaches structured their sessions according to a consultation model. First, the coach and teachers would decide what the focus of the morning would be. Depending on the teachers' needs the coach would either (a) demonstrate lessons or instructional strategies; (b) engage in side-by-side teaching where the teacher and coach conducted the lesson together, with on-the-spot feedback as needed; or (c) observe the teachers as they implemented the LC curriculum. Individual debriefings occurred that same day, at a time that minimally disrupted the classroom schedule. Every 6–8 weeks the coaches conducted a structured fidelity observation of each teacher doing an LC activity. The fidelity ratings included lesson accuracy, scaffolding quality, appropriate match of activity to the participating children's needs, and children's engagement. Coaches also videotaped teaching interactions for later discussion and analysis.

Coaches provided each classroom with two technical assistance meetings per month. The first meeting was spent on follow-up to the in-service workshops, for example, discussing readings and creating classroom action plans based on videotapes and classroom quality data. The second meeting addressed curriculum implementation, for example, practicing new curriculum activities, child progress monitoring, and lesson planning.

College Coursework. Teachers were offered the chance to enroll in two tuition-free courses, one on emergent literacy and one on emergent math. These courses were open only to ERF participants and were attended by the LC coaches and Head Start supervisors. About 80% of teachers enrolled.

Assessment

Child Assessment Battery. At the start and end of each school year, children were administered a battery of standardized tests by trained assessors. As no alternative versions are available for the foreign languages used in our classrooms, all testing was conducted in English. Receptive vocabulary was measured using the *Peabody Picture Vocabulary Test–Third Edition* (PPVT; Dunn & Dunn, 1997) and emergent reading (e.g., alphabet knowledge, print tracking, recognizing environmental print, sight words) was measured using the *Test of Early Reading Abilities, Third Edition* (TERA; Reid, Hresko, & Hammill, 2001). Both instruments yield quotient-type standard scores, although the TERA norms are applicable only to children age 42 months or older. A variety of print-related and phonological awareness skills were measured using six of the seven subtests of the *Phonological Awareness Literacy Screening Pre-K* (PALS; Invernizzi, Sullivan, Meier, & Swank, 2004). To reduce the number of dependent measures, we created three composite PALS scores—alphabet knowledge (sum of the uppercase letter names and lowercase letter sounds subtests), phonological awareness (sum of the rhyme and beginning sounds subtests), and print concepts (sum of the name writing and print and word awareness subtests). Emergent math skills were measured using the mathematical operations and logical reasoning scale of the *Developing Skills Checklist* (DSC; CTB/McGraw-Hill, 1990). Results for the PALS and DSC were reported as raw scores. In addition, the PALS provides spring developmental ranges for 4-year-olds on each subtest and the DSC provides normal curve equivalent scores for children in the spring of the final preschool year.

Progress Monitoring Measures. Teachers administered two progress monitoring measures that were developed for the LC curriculum. The LC Probe is a short performance measure that covers basic literacy and math skills, for example, letter names and sounds; syllables, rhyme, and alliteration; counting; and recognizing numerals and shapes. The LC Child Observation Record (LC-COR) is a curriculum-based assessment used to document children's progress on all curriculum goals. The main source of input for the LC-COR are teachers' observations of children's performance on small group LC activities. A compact notational system allows each child's data to be recorded on two 5" × 9" cards. Curriculum activities are organized by content and sequence. There is also a section for rating specific core skills, that is, the names and sounds of all alphabet letters, counting quantities of 1–10. Each item is scored on a 4-point scale: 0 = *not yet exposed to this activity,* 1 = *introductory level of skill,* 2 = *progressing toward mastery,* 3 = *clear mastery.* Items are summed to yield total scores for both the literacy and math domains. LC-COR scores correlate in the range of .11–.52 with the different components of our standardized test battery, with most correlations being .4 and higher. This indicates the validity of the LC-COR as a measure of children's literacy and math knowledge. Convergent validity was lowest with the PPVT because the LC-COR had relatively few items relating to language development.

The LC Probe was given within the first 2 weeks of enrollment and again in January. At the start of the year, the LC Probe results were used to set up initial small learning groups of 3–5 children, based on similar skill profiles. The LC-COR was essential for lesson planning, individualization, and ongoing grouping. Teachers were asked to update the LC-COR weekly and were encouraged to look over the documentation cards before and after each learning center rotation period.

DIFFERENTIATED INSTRUCTION USING THE LEARNING CONNECTIONS CURRICULUM

Unlike several of the projects reporting in this issue, we did not provide extra instructional time to the most high-risk children. Rather, we followed a differentiated instruction model in which each child was taught within his or her zone of proximal development. Within each of the seven LC curriculum domains (e.g., oral language, phonological awareness, and measurement), learning activities are developmentally sequenced. Ideally, instruction for each child would be individualized to the extent that he or she would start at the appropriate place in the sequence for each curriculum domain, and progress through the sequence at a challenging, but appropriate pace. We expected that it would be difficult for teaches to achieve this ideal level of individualization; however, we attempted to approach this ideal by using the following differentiation strategies.

Tiered Lesson Plans

Based on the first LC Probe results, children were initially assigned to one of two developmental levels. Tiered lesson plans were written with different small group activities for Levels 1 (less advanced) and 2 (more advanced). Each day, the Level 1 and Level 2 lesson plans would address the same learning domains (e.g., all children might have one oral language, one phonemic awareness, and one numbers and operations activity). But the levels would differ in terms of the complexity of the target skill addressed. For example, at the start of the school year, the numbers and operation activity for Level 1 children might involve one-to-one correspondence, whereas Level 2 children might work on creating sets of 5 to 10 objects. It was possible for a child to be at different levels for literacy versus math, and it was also possible for a child to change levels over the course of the school year.

Level 2 children (29% of all children in project Year 3) were older on the average than Level 1 children and were more likely to be returning students participating in the project for the 2nd consecutive year. Lessons plans were developed on a monthly basis by the LC coaches and their supervisor. Although we had an expected scope and sequence of lesson plans for the school year, where we started in the sequence and rate of progress through the sequence was based on child assessment data and teacher input. All classrooms followed the same lesson plans.

Flexible Small Group Instruction

Teachers established flexible small learning groups of 1–5 children with similar skill levels. Teachers varied the size of the group depending on the needs of the children involved and the particular activity. One-on-one and very small group formats were used most often for children who were easily distracted, had minimal English proficiency, or had special learning needs.

Activity Variations

Each LC activity was designed to be offered at different levels of complexity. The curriculum manual included detailed suggestions for modifying each activity to make it either more or less

challenging while still addressing the core learning outcome. Teachers could use any variation of the core lesson they felt was most suitable for their small group of children; they could also use different variations for different children within the same small group.

For example, Mystery Box is a phonemic awareness activity that focuses on initial sounds. Children reach into a box and remove an object. At the simplest level, all objects in the box start with the same phoneme (e.g., ball, button, bell). The child is asked to name the object, and the teacher identifies the first sound in that word and asks the children to repeat. When all objects have been selected, the teacher draws attention to the fact that all object names started with the same sound. At a higher level of complexity, sets of objects would be used that start with two different sounds, for example, ball, bell, sock, soap. As children select an object, they are asked to identify the first sound and sort the objects into two alliterative groups. A higher level yet involves sorting objects using three or more different initial sounds; in addition, as children sort the objects into alliterative groups, each group is matched with a corresponding letter symbol.

Activity Options Within a Tier

As the school year progressed, we found that some children were well ahead of or behind their small group peers on particular skills areas. We did not want to hold back the small number of children who were quite advanced, nor did we want to frustrate the children who had made the least progress since the start of school. When this situation arose, we provided teachers with options within the day's Level 1 and Level 2 lesson plans. For example, there might be two choices of phonological awareness activities for the Level 2 children. Most Level 2 children would sort objects by first sounds, whereas a smaller number who had strong phoneme-level skills and alphabet knowledge could work with moveable letters to create CVC words. There might also be two choices of math activities for Level 1. If most Level 1children could count 10 objects and identify the numerals 1–10, the lesson plan would list the next math activity in the numeration sequence, which involved next associating numerals with the corresponding quantities. However, if some Level 1 children had not yet mastered counting sets of 1–5 objects, they would continue with this basic counting activity.

Responsiveness to Cohorts

Characteristics of enrolled children can vary from year to year. In our 3rd project year, we had an unusually high number of children who were developmentally and/or chronologically young. For example, 14% of children had not yet reached their 3rd birthday, each classroom had children who were not yet out of diapers, and many had language and social interaction skills more typical of children in toddler–2 classrooms than 3–4 classrooms. We quickly found that we needed to revise the first few sets of lesson plans to respond to these children's needs. Compared with prior project years, the initial Level 1 lesson plans included more activities that focused on vocabulary and oral language skills; this resulted in delaying the introduction of other learning goals, such as rhyming, letter-sound knowledge, and letter formation, until later in the school calendar. We also developed new learning activities that addressed fundamental skills, for example, listening to and recognizing environmental sounds as a precursor to early phonological awareness activities.

Finally, we adjusted the agenda for the fall workshops to include a review of early language stimulation strategies. We then had teachers apply this training by developing and implementing language support plans for selected children with the most limited communication skills. Most language support strategies were embedded in ongoing activities. For example, the teacher might make a point of using gestures to clarify verbal instructions with the target children. Or she might plan to spend time with each child in the dramatic play or block area, using self- and parallel talk to narrate their play and providing short verbal expansions of the child's comments.

PARTICIPANTS

Classrooms

Our partner agency was a Head Start program that serves the Honolulu metropolitan area. Eight Head Start classrooms participated. Three classrooms followed a full-day, year-round schedule and five followed a part-day, part-year schedule that matched the public school calendar. All classrooms but one were located on public elementary school campuses. The number of classrooms per site ranged from one to three.

Teachers

Part-day classrooms had one lead and one assistant teacher, whereas full-day classrooms had a second assistant teacher. On the average, lead teachers had over 16 years of teaching experience and most had a bachelor's degree (88%). Assistant teachers had an average of 9.4 years in the field. Most assistant teachers had a high school diploma (40%) or a diploma plus a Child Development Associate Credential (40%); 20% had a bachelor's degree. During the course of the school year, the staff turnover rate was 16%.

Children

Pre- and posttest data were available for 128 children (90% of all children who completed the school year). All Head Start classrooms serve mixed age groups. At the start of the school year, children ranged in age from 32 to 55 months, with a mean age of 43.9 months. Slightly more than half the children (57%) were kinder-bound. (In Hawaii, a child is eligible to enroll in kindergarten as long as he or she turns 5 by December 31 of the kindergarten year.) There were more boys (58%) than girls (41%). Slightly more than half the children (56%) were Native Hawaiian, 14% were of other Pacific Island heritage, 26% were Asian American, and less than 2% each were White, African American, or Native American. About one third of children (35%) were English Language Learners (ELLs). Nineteen different foreign languages were spoken in children's homes; the more prevalent languages were Chinese dialects, Filipino dialects, and various languages from Micronesia (e.g., Chuukese, Marshallese, Pohnpean). Six percent of children had diagnosed special needs. An additional 19% of children were referred for evaluation

during the school year; these children were either deemed ineligible for services or their evaluation had not been completed by the end of the school year.

For the purpose of this article, a risk status classification was developed based on pretest score on the PPVT. The *higher risk* group was defined as those who had a standard score of 75 or less at pretest; this represents the bottom 5% based on national norms. Thirty-three children (26%) met the higher risk criterion. The *lower risk* group consisted of the remaining classroom peers, that is, those children with PPVT pretest scores greater than 75. Risk status was not evenly distributed across classrooms. The percentage of higher risk children in each classroom was as follows: 6%, 13%, 21%, 25%, 27%, 31%, 38%, and 44%.

Children in the higher risk and lower risk groups were similar on most demographic characteristics. However, higher risk children were much more likely to be ELLs (72% vs. 22%, $\chi^2 = 27.96$, $df = 1$, $p < .0005$). As expected, higher risk children scored significantly lower than their lower risk peers on the PPVT and all other pretest assessment measures. Note that higher risk status was defined after the school year was completed. Thus, the higher risk children had not been specifically identified as such to their teachers. However, all higher risk children had been assigned to the Level 1 tier of the LC lesson plans; overall, higher risk children comprised one third of the Level 1 instructional group.

RESULTS

Progress Monitoring Measures

Results for the LC-COR are shown in Table 1. By the end of the school year, higher risk children were exposed to fewer literacy and math activities than were their lower risk peers (although the difference for the total number of literacy activities was only marginally significant). Higher risk children also showed lower levels of competence on the activities to which they were exposed, as indicated by a lower percentage of activities rated by their teacher as being at the intermediate or mastery levels of proficiency. In other words, the higher risk children moved through a smaller portion of the curriculum sequence and were less likely to master the subject matter to which they were exposed.

TABLE 1
Analysis of Variance Results for LC-COR Data

Variable	Higher Risk	Lower Risk	F	Partial η^2
Number of literacy activities introduced	86.54 (29.81)	101.53 (38.62)	3.01†	.03
Number of math activities introduced	78.43 (25.59)	90.65 (25.31)	4.04*	.04
% literacy activities at intermediate or mastery level	55.28 (24.00)	73.54 (22.02)	11.85**	.11
% math activities at intermediate or mastery level	60.52 (30.51)	82.39 (14.99)	21.28***	.19

Note. Means are followed by standard deviations in parentheses. All tests are two-tailed.
$^{\dagger}p < .10$. *$p < .05$. **$p < .001$. ***$p < .0005$.

TABLE 2
Analysis of Variance Results for Child Test Scores

Variable	Higher Risk			Lower Risk			Effects	*Partial* η^2
	Pre	Post	Gain	Pre	Post	Gain		
PPVT	59.48 (13.00)	74.42 (12.93)	14.94	89.97 (10.31)	94.24 (9.53)	4.27	G****	.59
							T****	.36
							GT****	.15
TERA	77.33 (6.28)	79.57 (9.40)	2.24	87.92 (12.58)	95.21 (14.38)	7.39	G****	.20
							T***	.13
							GT†	.04
PALS Alphabet	1.88 (4.22)	9.70 (11.08)	7.82	7.07 (11.47)	17.63 (15.32)	10.56	G**	.06
							T****	.44
							GT	.02
PALS Phoneme	0.82 (1.45)	4.91 (5.48)	4.10	3.05 (4.23)	9.40 (6.64)	6.35	G****	.11
							T****	.38
							GT†	.03
PALS Print	2.48 (2.36)	7.88 (4.07)	5.39	5.19 (4.32)	11.15 (3.54)	5.96	G****	.12
							T****	.70
							GT	.01
DSC	5.24 (4.49)	11.64 (5.75)	6.40	9.05 (7.30)	17.27 (7.88)	8.25	G***	.09
							T****	.64
							GT†	.03

Note. G = main effect for group; T = main effect for time; GT = group by time interaction. Pre- and posttest means are followed by standard deviations in parentheses. On the TERA, n for high-risk and peer groups = 21 and 66, respectively; for all other tests, n = 33 and 95. All tests are two-tailed.
† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$. **** $p < .0005$.

Child Assessment Battery

Data from the standardized assessment battery were analyzed using a series of 2 (higher risk vs. lower risk) × 2 (pre vs. post) analysis of variance models. Results are shown in Table 2. A significant group effect indicates that the lower risk group outperformed the higher risk group, aggregated across time periods. A time effect indicates that children's scores (aggregated across the higher and lower risk groups) increased over time. A group by time interaction indicates that the rate of growth from pre to post was different for the higher versus lower risk groups. The magnitude of these effects is expressed as partial eta squared, which represents the proportion of variance in overall scores accounted for by group, time, and the group by time interaction, respectively.

On all measures, the lower risk group scored higher than the higher risk group, and children's scores in both groups improved over time. Of more interest are the findings for the Group x Time interactions. These interactions are shown graphically in Figures 1 and 2. For the PPVT, growth over time was steeper for the higher risk group; the higher risk children started with much lower scores and showed larger average gains (roughly 15 vs. 4 points, respectively). The groups did not show differential growth on the PALS alphabet knowledge or print concepts. There was a

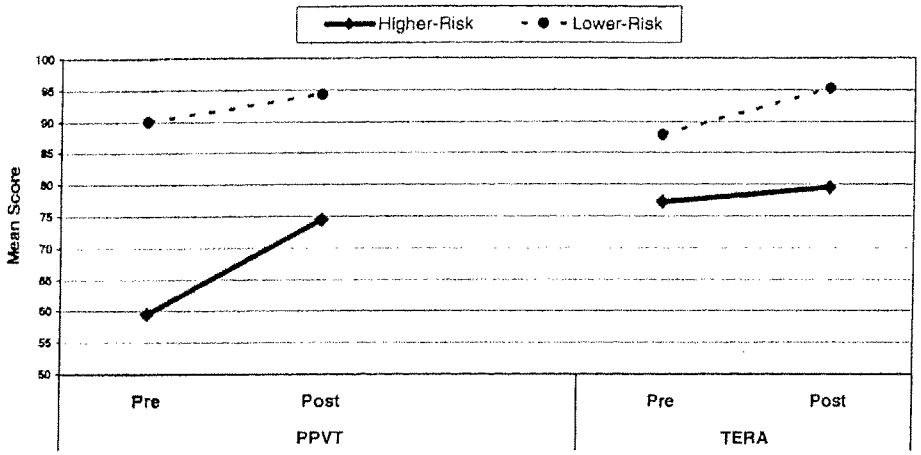

FIGURE 1 Pre- and posttest PPVT and TERA scores by group.

nonsignificant trend in the direction of greater growth for the lower risk children (i.e., $p < .09$) on the TERA, PALS phonological awareness, and DSC.

In summary, the higher risk group started the school year with lower scores on all assessment measures. The higher risk group showed greater gains over time on the PPVT and the magnitude of this change was quite large, about 1 standard deviation. Results for other outcomes showed some evidence of greater gains by the lower risk group. However, these differences were modest in magnitude and did not reach traditional levels of statistical significance.

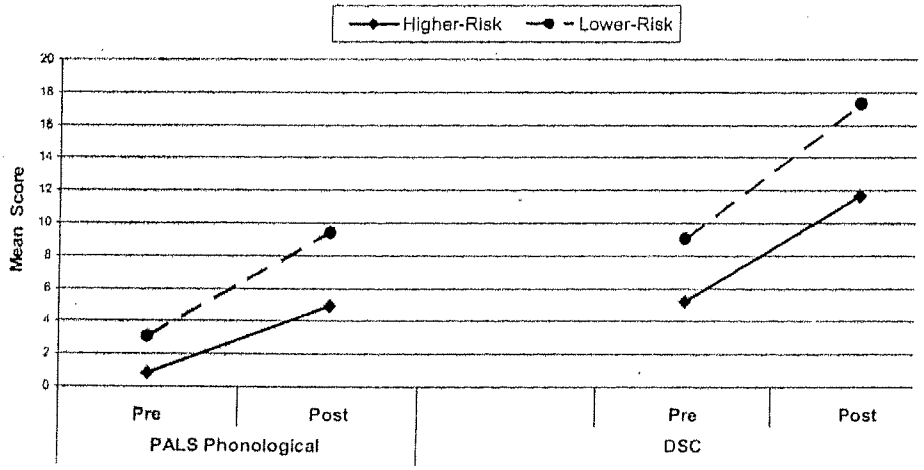

FIGURE 2 Pre- and posttest phonological awareness and DSC scores by group.

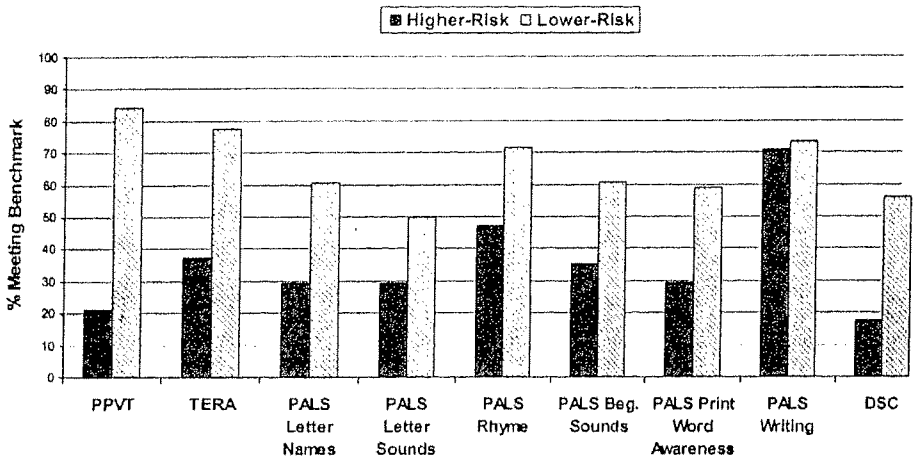

FIGURE 3 Percentage of children meeting spring benchmarks by group.

In addition to knowing the magnitude of the gains that children made over the school year, it is important to know whether they attained desired levels of proficiency or whether they still fell below performance benchmarks at the posttest period. Federal ERF accountability standards define age-appropriate performance on the PPVT as a standard score of 85 (the 16th percentile) or higher. We used this benchmark for both the PPVT and TERA. For the DSC, we used a normal curve equivalent score of 28 (equivalent to the 16th percentile) or higher. For the PALS subtest benchmarks we used the spring developmental ranges provided in the PALS manual. Due to the age range of the normative samples, the TERA benchmark was applicable only to children 42 months or older and the DSC and PALS benchmarks were applicable only to kinder-bound children.

Results for the benchmark data are shown in Figure 3. Despite the large average gains made by the higher risk group, only 21% of high-risk children met the PPVT posttest benchmark, compared with 84% of the peer group. On five benchmarks (PPVT, TERA, letter names, print word awareness, and DSC), a significantly larger percentage of lower risk children met the benchmark threshold, based on chi-squared tests. For rhyme and beginning sounds, there was a nonsignificant trend ($p < .09$) favoring the lower risk group. And for letter sounds and name writing, group comparisons were nonsignificant.

Individual Differences Within the High-Risk Group

Within the higher risk group, children showed different rates of progress. Sixteen of the higher risk children (48%) had posttest PPVT scores above 75; these "large gainers" no longer met the criteria for membership in the higher risk group at the end of the school year. On average, children who moved out of the higher risk group gained 21.23 points on the PPVT as compared with an average gain of 9.40 points for children who still met the higher risk criterion at the end of the school year ($F = 6.61$, $df = 1, 31$, $p < .02$).

What distinguished the large gainers from the children who remain at high risk? The larger gainers started off at less of a disadvantage; they had higher pretest scores on the PPVT (Ms = 63.82 vs. 54.87, $F = 4.31$, $df = 1, 31$, $p < .05$), PALS print concepts ($Ms = 3.29$ vs. 1.62, $F = 4.58$, $df = 1, 31$, $p < .04$), and DSC ($Ms = 6.94$ vs. 3.44, $F = 5.78$, $df = 1, 31$, $p < .003$). The large gainers were less likely to be ELLs (37% vs. 89%, respectively, $\chi^2 = 6.92$, $df = 1$, $p < .01$). Their parents were more likely to read aloud to them at home (an average of 1.49 books per week vs. 0.70, $F = 5.76$, $df = 1, 31$, $p < .02$) and had a nonsignificant trend toward completing a higher percentage of the LC home learning activities (71% vs. 49%, $F = 3.83$, $df = 1, 31$, $p < .06$).

DISCUSSION

The differentiated instruction model used in our ERF project appears to be a promising approach to promoting early academic skills for the full range of children who attend Head Start. Children in our higher risk group (i.e., those who started the year with very weak English vocabulary skills) made impressive progress in this target area, achieving a steeper rate of change than their classroom peers. The higher risk children also made gains on emergent literacy and math skills, showing rates of change that were similar to or only slightly less than their peers.

Although the higher risk children made statistically significant gains, most did not reach benchmark levels of performance by the end of the school year. It may be unrealistic to expect that achievement gaps can be erased after only 1 or 2 years of preschool participation (Magnuson & Waldfogel, 2005). Eliminating achievement gaps may be especially difficult for young ELLs, who typically do not acquire the English fluency required for full classroom participation before third grade (Ballantyne, Sanderman, D'Emilio, & McLaughlin, 2008). Although it is necessary to hold high expectations for all children, it is also important to have well-grounded information on how much change can reasonably be achieved through early education alone, particularly if high-risk children transition into low-quality K–12 settings.

Our project did not include a control group. Therefore, we cannot clearly attribute the gains we saw to either our ERF project as a whole or to particular project components. Can we conclude that differentiated instruction was especially effective in promoting vocabulary growth for our higher risk children? Regression to the mean is a statistical phenomenon that complicates the interpretation of pre- and posttest data: children with very low scores tend to score higher when assessed for the second time, whereas those who have very high starting performance tend to show lower scores at the second assessment. Our finding that our higher risk children showed much greater gains on the PPVT is consistent with regression to the mean. However, we did not find this same pattern on the other assessment measures, which suggests that our results for the PPVT were not a statistical artifact.

National data from the 2003 Head Start Family and Child Experiences Survey (FACES; Zill, Sorongon, Kim, Clark, & Woolverton, 2006) provide a potentially informative basis of comparison with the outcomes of our ERF project. FACES child assessments are conducted in English only for those children who pass an English competency screen. Thus, the FACES results are most comparable to the results of our lower risk group. In 2003, Head Start children gained an average of 2.9 standard score points on the PPVT and 1.5 points and 0.7 points on the Woodcock-Johnson math and writing, respectively. There was no significant pre to post change for early reading,

phonological awareness, or print concepts. This suggests that children in our ERF project showed larger and more widespread gains than is typical for Head Start participants.

What challenges are preschool programs likely to face in implementing a differentiated instruction model? We foresee four likely issues. The first relates to the collection of progress monitoring data. Our teachers did not complete the ongoing progress monitoring measure as often as we asked. They reported that marking the LC-COR cards on a daily or weekly basis was too much of a burden, even though teachers felt better informed about each child's progress when they did keep this information up to date. This made the LC-COR data less valuable for lesson planning than it could have been. When progress monitoring data were incomplete, the coaches had to rely on teachers' input and on their own knowledge of the children in order to select the upcoming lessons. We attempted to increase use of the LC-COR by asking teachers to present data on 1 or 2 focal children at the technical assistance meetings. However, the regularity of progress monitoring varied across classrooms and appeared to be a function of teacher buy-in. Perhaps not coincidentally, children's gains were largest on all outcome measures in the two classrooms that faithfully completed the LC-COR.

Teachers were not averse, however, to administering the LC Probe. Perhaps this was because it was done only twice per year. In addition, most progress monitoring tools such as the Dynamic Indicators of Basic Early Literacy Skills (Early Childhood Research Institute on Measuring Growth and Development, 1998) and our own LC Probe assess a small number of target skills. This may make the results easier for teachers to understand and value. However, an instrument with a very narrow scope is of little use in differentiating instruction across all areas of the curriculum. Assessing a limited set of skills may also have unintended negative consequences. For example, if teachers assess only letter recognition and counting, they may start to assign a disproportionate value to these particular learning outcomes and focus on them at the expense of other learning goals.

A second challenge we faced was meeting the needs of our ELL children. The children in our classrooms were quite linguistically diverse, but their teachers were not. In most cases, teachers were not able to differentiate their instruction for ELL children by teaching the children in their native language. Unfortunately, these circumstances required us to use an English immersion approach rather than the preferred full bilingual instruction model (Restrepo & Dubasik, 2008). However, we did give teachers training and assistance in using instructional strategies that are helpful for dual language learners, including reduced conversational complexity, concrete representations to accompany verbal input, and encouraging families to conduct the LC home activities in their native language.

The third challenge we anticipate is that a focus on small group instruction would require procedural changes for many classrooms. National data indicate that the typical preschool child spends 23% of his or her day in teacher-led, whole group instruction but only 6% of the day in a small group instruction setting (FPG Child Development Institute, 2005). Small group formats and tiered lesson plans require more time to prepare and implement than does a schedule that relies on large group, nondifferentiated activities. Our teachers often felt pressed for time, especially those in half-day classrooms. Teachers reported that they would prefer to do only one to two small group activities per day. However, it is unlikely that this low level of intensity would provide enough focused teacher-child interaction to result in learning gains of the desired magnitude. Providing additional adults in the classroom who could supervise children in free choice activities (e.g., parent or community volunteers, paraprofessional aides) could free teachers to spend more time

in small group interactions. Ensuring that teachers have adequate paid preparation hours would also reduce the perceived burden of planning and preparation.

Finally, ERF provides resources that are beyond the means of many preschool organizations. Our teachers received a variety of supports—practical assistance such as monthly lesson plans and classroom materials and broader professional enrichment in the form of ongoing coaching and formal training. Both sustainability and replication are important issues for any demonstration program. It would likely be difficult for a preschool program to replicate our work in its entirety without an infusion of resources. However, selected aspects could be introduced in an incremental manner. Tomlinson et al. (Tomlinson, 2000; Tomlinson & McTighe, 2006) provide detailed suggestions for those who are interested in implementing differentiated instruction. Their overarching message is to think big but start small. They suggest laying the groundwork with study groups or training that focuses on the big picture—the broad goals and desired outcomes of differentiated instruction. But subsequent plans for new classroom practices should focus on only one or two small changes at a time, such as trying tiered instruction for one particular learning activity and observing how children respond. As teachers become comfortable and successful with the new steps, additional and larger changes can be added.

Clearly, additional research is needed to refine and test models of differentiated instruction for preschool learners. The goal would be to develop a set of practical strategies that benefit children across the spectrum of risk found in typical preschool settings. As a first step, smaller scale studies could demonstrate whether particular supports and strategies help teachers implement differentiated instruction with high fidelity. For example, consistent use of progress monitoring tools appears to be a challenge for most teachers; support strategies could include setting a dedicated time to complete these assessments or enlisting the center director or other support staff as additional assessors. Observation tools could also be developed to assess the use of specific differentiation strategies, such as varying the complexity of activities for different children or providing nonverbal cues for ELLs. Multiple baseline studies could show whether providing feedback on observed differentiation strategies increases teachers' use of target behaviors and whether these new teaching behaviors maintain over time or transfer occurs to additional differentiation techniques that were not the original target of intervention. Such feasibility studies can identify the setting conditions under which effective differentiated instruction is likely to occur. The next step would be to conduct randomized experiments (i.e., efficacy studies) to compare teacher practices and child outcomes in classrooms that use the same curriculum but differ on the use of differentiated instruction. Should these results look promising, the final step would be to implement large-scale field trials (i.e., effectiveness studies) to ascertain whether differentiated instruction still yields positive results across the range of real-world teachers and programs.

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