Effects of Coaching
on Preschool Classroom Quality and Child Children's Literacy Outcomes

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The literature on "best practices" in adult learning and in-service education suggests that teacher professional growth is a complex process. This process unfolds over time and relies on the interaction between many components (see Figure 1) (Birman, Desimone, Porter, & Garet, 2000; Clarke & Hollingsworth, 2002; Hanft, Rush & Shelden, 2004; Joyce & Showers, 1995; Lyons & Pinnel, 2001; Toll, 2005). These components are:

- *Teacher characteristics*: Teachers enter a professional development (PD) program with a preexisting set of knowledge, beliefs, and teaching skills. Typically the goal of PD is to change or strengthen knowledge, beliefs and skills relating to a target innovation.
- *Professional development:* A key aspect of PD is the *new information* or *content* that is introduced. However, there is increasing evidence that the *format* in which this content is delivered plays an important role. And when coaching or mentoring is the delivery format, the interpersonal *relationship* between the teacher and coach is crucial.
- *Application* or practice: Does the teacher enact the new strategies, how often, and how well? Does the teacher experiment with and vary the new practices, trying to make them his or her own?
- *Outcomes*: Here, seeing is believing. No long-term change will occur in teachers' attitudes or practices unless the teacher sees desirable changes in his or her own instruction or in children's motivation and learning.
- *Reflection:* Reflection, or analysis of the overall learning experience is the glue that connects each component and serves as the impetus for lasting change.

The purpose of this paper is to examine the effectiveness of the coaching and professional development process used in the University of Hawai'i 2005 Early Reading First project. Our professional development model combined aspects of (a) technical coaching (Joyce & Showers, 1995) (b) cognitive coaching (Costa & Garmston, 1994), and (c) comprehensive whole-school reform (Walpole & Meyer, 2008). *Technical coaching* focuses on developing specific skills, and an important issue is whether teachers can implement these new skills in the classroom with sufficient fidelity. *Cognitive coaching* focuses on the teacher's own self-reflection, critical thinking, and autonomous problem-solving about classroom goals and practices. Finally, *whole school reform* involves the implementation of new scheduling and/or curriculum.

The goal of the federal Early Reading First program is to development "preschool centers of excellence" that will enhance the school readiness of at-risk children. Each ERF grantee must provide professional development and curriculum that focus on providing a print-rich environment, and developing children's oral language skills, phonological awareness, concepts of print, and knowledge of the alphabet. Although literacy coaching is an established practice in K-12 settings, it is a relatively new addition to preschool in-service support. Preschool settings

bring additional challenges. These include(a) an alarming tendency for many settings to be of low to moderate quality, (b) highly variable and often low standards for teacher qualifications, and (c) high rates of teacher turn-over (Bowman, Donovan & Burns, 2001; Herzenberg, Price & Bradley, 2005; LoCasale-Crouch et al., 2007). Given the great variability in teacher pre-service experiences, coaching may be an especially important strategy for improving the quality of preschool education. Indeed, some studies have found that inservice training is as important as educational qualifications in predicting the quality of instruction and interaction delivered by preschool personnel (Tout, Zaslow & Berry, 2006).

The research questions addressed in our study are:
- Does PD improve the quality of the classroom environment?
- Does PD change teachers' declarative knowledge or beliefs?
- What do teachers value or dislike about PD?
- Does PD appear to be linked to child outcomes?

Method

Participants and Curriculum

Classrooms. 10 Head Start classrooms located on the island of Oʻahu participated in our ERF project from October 2005 to July, 2008. Cohort 1 consisted of five full-day, year-round classrooms. These sites participated in projects years 1 and 2, and were later invited to continue into year 3. Cohort 2 consisted of five part-day classrooms that followed the school year calendar. Cohort 2 classrooms participated in project years 2 and 3.

Curriculum. Our ERF classrooms used the *Learning Connections* (LC) (Gorecki & DeBaryshe, 2004) enrichment curriculum for instruction in language, literacy, and math and the *Creative Curriculum* (Dodge, 2002) for instruction in other developmental domains. LC emphasizes small-group instruction, differentiated instruction, and sequencing of learning goals and activities. LC has been subjected to two different field trials. Compared to children in matched control classrooms, children in LC classrooms showed greater gains on emergent reading, phonemic awareness, letter-sound correspondence, emergent writing, and math skills (effect sizes ranged from $d = .21$ to .81) (DeBaryshe & Gorecki, 2007; 2005; Sophian, 2004).

Teachers. When fully staffed, our classrooms were served by 25 teachers. Due to turnover, a total of 30 teachers participated. Most lead teachers were experienced and well-qualified (mean years of teaching = 16, 30% AA, 70% BA). Assistant teachers were less experienced (mean = 5 years, one-third were new to the classroom) and had only modest levels of training in early childhood (22% high school, 41% high school plus a CDA, 6% AA, 18% BA). 89% were Asian American/Pacific Islander.

Children. Head Start has mixed-age classrooms. Children's mean age at the start of the school year was 45 months (range = $31 - 58$ months) and slightly more than half the children were kinderbound. Unlike most other Head Start programs, our children were predominantly Pacific Islander (46% Native Hawaiian, 22% Asian American, 20% other Pacific Islander such as Samoan, Micronesian, and 12% other). Over one-third of the children (36%) were English Language Learners (36%). Our children spoke a wide variety of languages. In project year 2, 25

foreign languages plus ASL were represented among our 10 classrooms. Since no teacher shared a native language with any of the ELL children, the program relied on an English immersion approach. The number of children with pre- and posttest data ranged from 87 to 153 per year.

Coaches. Over the course of the project, three different master's level early childhood educators serves as lead coach. We also had two apprentice coaches. The apprentices were experience Head Start teachers who had used the LC curriculum in the past. One had an AA degree in early childhood and the other was working on her M.Ed. The coaching team received biweekly supervision and participated in a monthly study group in which we discussed book and articles on coaching. Each coach also attended one professional seminar.

Professional Development Package

Our professional development package included four components:

Quarterly in-service workshops (42- 65 hours per year). Formal workshops were designed and conducted by the ERF team leaders, who were also the authors of the LC curriculum. Workshops covered SBRR principles; language, literacy and mathematical development; and classroom applications. These 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. 2-3 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.

O*n-site technical assistance*. Coaches provided each classroom with two technical assistance (TA) meetings per month. The first meeting was spent on follow-up to the in-service workshops, e.g., discussing readings, creating classroom action plans based on videotapes and ELLCO/CLASS data. The second meeting addressed curriculum implementation, e.g., practicing new curriculum activities, child progress monitoring, lesson planning.

College Coursework. Teachers were offered two tuition-free college courses on language and mathematics development and instruction. To create a community of learners, courses were open only to ERF participants and were attended by the LC coaches. Assignments required teachers to apply course content to the LC curriculum, evaluate their own classroom practices, and design new activities appropriate for LC.

Measures

  Teachers. We developed five measures of teacher knowledge, beliefs, and practices for the project. The *Literacy* and *Math Knowledge* tests each contained 25 multiple-choice items. These included both factual knowledge (e.g., How many phonemes are in the word "school?") and application items (e.g., sequence the following four phonemic awareness tasks in order of difficulty). This was administered at project entry and exit. The *Belief* survey included 14 items about developmentally appropriate practices relevant to the LC curriculum (e.g., "preschoolers can use invented spelling," "rote counting is important" (reverse coded)). The literacy stimulation and math stimulation scales had 21 and 14 items, respectively. Each measured the self-reported frequency of different classroom activities consistent with the LC curriculum (e.g., "recognition and/or generation of rhymes"). Once per year, an external evaluator administered satisfaction surveys to teachers and also conducted focus group discussions about their experiences in the project.

  Classroom. Three times per year, trained assessors collected data on classroom quality using the ELLCO (Smith & Dickinson, 2002) and CLASS PreK (Pianta, La Paro & Hamre, 2006).

  Children. Children were assessed at the start and end of each school year by trained staff using the *Peabody Picture Vocabulary Test, Third Edition* (PPVT-III) (Dunn & Dunn, 1997), the *Test of Early Reading Abilities, Third Edition* (TERA-3) (Reid, Hresko, & Hammill, 2001), the *PALS-PreK* (Invernizzi, Sullivan, Meier & Swank, 2004), and the mathematical operations and logical reasoning scale of the *Developing Skills* Checklist(CTB/McGraw-Hill, 1990).

Results

Classroom Quality

  Classrooms showed fairly steady, positive growth over time (see Figures 1-3). At baseline, classrooms scored at or (in the case of Cohort 1) well below published national comparative data on both the ELLCO and CLASS. By the end of year 3, classrooms scored 2 or more *SD* above published means for the ELLCO literacy environment (LEC) and literacy curriculum scales (LLC), and the CLASS instructional support scale.

Child Outcomes

  Pre- and posttest scores are shown in Figures 4-5. Children made significant gains on all tests for all years, with the exception of the TERA in year 1. The mean language quotient pre-post gains for the PPVT were 5.4, 4.0, and 7.0 points for years 1, 2, and 3, respectively. For the TERA, mean reading quotient gains were 0.7, 3.2, and 6.1. Thus, by the last project year, children's performance improved by almost .5 *SD* on age-adjusted norms. The DSC and PALS do not provide normative scores. In the absence of a control group, it is difficult to interpret the educational significance of pre-post gains achieved on these two instruments.

Classroom Quality as a Predictor of Child Outcomes

Multi-level modeling was used to investigate the effects of classroom quality on children's learning gains in project year 2. (Year 2 was selected because it was the only year with 10 classrooms, a minimum *n* for level 2 units.) In these analyses, level 1 (child) variables were English language status (native speaker vs. ELL) and age at pretest. Level 2 (classroom) variables were classroom, percentage of children in the classroom who were native English speakers, the mean pretest age of children in the classroom, and total scores on the CLASS and ELLCO. The CLASS and ELLCO scores were averaged across the three waves of observation. The dependent measure was the individual differences in rate of change, which was calculated by taking standardized residual scores from a regression model where pretest score predicted posttest score (McHale, Kim, Dotterer, Crouter, & Booth, in press). Each of the four child outcome measures were tested separately.

Results are shown in Table 2. Controlling for child- and classroom-level age and English-language status, CLASS scores were significantly associated with gains on the PALS (coefficient = .67, *SE* = .20, *p* < .05) and marginally associated with gains on the DSC (coefficient = .44, *SE*= .21, *p* < .09). The ELLCO was not a significant predictor of gains on any of the four child outcome measures.

Teacher Satisfaction

Teachers reported high levels of satisfaction (means of 3.5 to 3.8 on a 4-point scale) with their coaches, the in-service training, the LC curriculum, and children's motivation and progress in class. The lowest levels of satisfaction (means of 2.4 to 3.2) were reported for the time required to prepare and deliver LC lessons, the usefulness of the LC curriculum-based assessment rubric, and parents' progress in understanding their children's development. Most teachers (88%) teachers reported that participating in the project increased their focus on literacy and math instruction and 67% reported an increase in 1:1 and small group teaching. These results were very consistent with comments made in yearly focus group discussions.

As part of the year 3 focus group, teachers were asked to reflect on their cumulative experiences in ERF. The consensus was that teachers were more confident and intentional in their work. Teachers also saw improvements in their ability to assess children's learning and to provide stimulating questions and conversations. They felt the coaching and professional development were essential to their success. In fact, half of the teachers wished that the technical assistance meetings could continue. Most teachers said that they would continue to implement LC activities, but on a reduced schedule (i.e., cut back on the number of activities per day).

Discussion

Most research on classroom quality has focused on structural features (e.g., ratios, teacher qualifications) rather than process features (e.g., conversation, teacher responsiveness, instructional interactions). However, it is becoming increasingly clear that process quality plays the more direct causal role in children's learning and development (LoCasale-Crouch et al., 2007). Our results suggest that in-class coaching delivered in the context of a larger curriculum

and professional development package can be highly effective in improving classroom process quality and children's learning outcomes.

The main focus of our coaching was on curriculum implementation and instructional interactions. Thus, is it not surprising that classrooms made large gains on the ELLCO LEC, ELLCO LLC, and CLASS instructional support scales. Although we did not make behavior management strategies a focus of our coaching or training, we did work with teachers on scheduling and environmental design. We also held the expectation that all children should be engaged in purposeful activities. As a result, there was a decrease in classroom noise, inappropriate behavior, down time, and aimless wandering. These changes were reflected in gains on the ELLCO GCE and CLASS management scales. What was more surprising was the finding of positive change in the affective aspects of the classroom environment (i.e., the CLASS emotional support scale). Clearly, increasing the academic focus of the classroom day was not detrimental to children' socio-emotional functioning.

Our results indicated that CLASS scores predicted gains in literacy skills as measured on the PALS, and to a lesser extent, math skills. Usually, classroom quality is a good predictor of children's learning. Why did we find only modest evidence for the association in our sample? With only 10 classrooms, we had limited power to detect classroom effects. In addition, at baseline the intraclass correlations for children's test scores were low (all around .10); this indicates that there was much less variance in language, literacy, and math scores between classrooms than there was within classrooms. Finally, the goal of our project was to have classrooms attain the same high standards of quality. Through professional development, we made the classrooms quite similar to each other, thus reducing the range of variation typically found across classrooms. For all these reasons, it is not surprising, or even discouraging, that we found limited evidence for classroom quality effects.

Should other Head Start programs emulate ERF? Our results suggest that Head Start programs can greatly improve instructional quality and children's outcomes by implementing a focused, intentional curriculum along with comprehensive, ongoing, hands-on professional development. Based on our experiences, we raise the following issues for consideration:

- Many classrooms do not use their time in ways that efficiently maximize learning. Programs may need to scrutinize their schedules to see how much time is spent in unproductive activity. This does *not* mean that children must spend the majority of their time in teacher-directed learning. It does mean than classroom activities should be purposeful.
- Teachers may worry that too strong a focus on language and literacy detracts from instruction on other developmental domains. While intensity should relate to outcomes, programs will need to find the right balance of instructional emphases.
- Many teachers conduct almost all or their intentional instruction in whole-group formats. They may find it challenging to switch to small-group teaching.
- Teachers need support to better understand developmental processes and sequences and how to link instructional activities with specific learning goals.
- Most teachers have limited experience with differentiated instruction. This is a challenging area to master.

- Change takes time. Focus attention on priority areas and gradually move towards larger goals. One year is too short a time frame to bring about large or lasting change.

- Change can be threatening. Some teachers will be resistant. Even those who are eager to embrace new methods may be uncomfortable at first. For our teachers, the process of systematic data collection and self-reflection was new and somewhat unsettling. Most were very uncomfortable at first with being videotaped.

- The coaches' role is important. Our coaches were external to the program and did not have supervisory authority. The dynamics of the teacher-coach role may change depending on whether the coaches' role is more of a mentor or more of a supervisor.

- Trusting, supportive teacher-coach relationships are essential. Interpersonal skills are at least as important as content knowledge.

- Share data early and often. Seeing hard evidence of positive changes was motivating and rejuvenating for our teachers.

- Change is facilitated by specific plans and accountability. We saw more change when teachers created written action plans. These plans included: small, concrete steps towards larger goals, assigned responsibilities, and due dates.

- Not all teachers need the same kind of coaching and support. As professionals we believe in differentiated instruction for children; individualization is also important in professional development.

- Change should be empowering. Make the change process highly collaborative. And whenever possible, make it joyful.

Is it feasible for Head Start programs to emulate ERF? This is an important question, as most programs do not have the extensive professional development resources afforded by ERF. Identifying qualified coaches and trainers is a likely challenge for local programs. And implementing a coaching-based approach to professional development requires a strong commitment at the administrative level, including commitment of funds and personnel.

Most ERF projects deliver a luxurious level of support. It is possible that what is delivered is more than what is actually needed. There is very little systematic research on professional development. We simply do not know which particular professional development components are most effective for which teacher and child outcomes. Nor do we know what amount or duration of support is optimal. In the absence of clear evidence, we suggest that Head Start staff carefully compare professional development procedures and outcomes across a number of professional development projects, including ERF and ECEDP. Place most weight on projects that included a well-selected comparison group. This can provide evidence of what is possible to achieve. From this body of evidence, select those strategies that are most suitable and feasible for your own program.

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Table 1: LC Curriculum Domains and Learning Goals

Oral Language
- To use more diverse and sophisticated vocabulary
- To engage in conversations of increased length and complexity

Phonological and Phonemic awareness
- To segment and blend compound words and syllables
- To recognize and generate rhymes
- To segment and blend onsets and rimes
- To recognize and generate words with the same initial, final, and medial sounds
- To segment and blend phonemes in CVC words

Alphabet Knowledge and Print Awareness
- To recognize and identify letter symbols and letter names
- To identify letter-sound correspondences
- To track print from left to right and top to bottom
- To be aware of the functions of print
- To make use of environmental print
- To use print to convey meaning
- To read C-V-C words

Emergent Writing
- To use writing to convey meaning
- To strengthen fine motor skills and use tools in preparation for writing
- To use increasingly higher levels of emergent writing
- To use a left-to right and top-to-bottom orientation when writing
- To begin to spell simple words using letter-sound correspondence

Approaches to Learning
- To increase attention and persistence when doing LC activities
- To incorporate newly learned skills in free play

Numbers and Mathematical Operations
- To understand one-to-one correspondence
- To understand and associate numerals and quantities from 1-10
- To use alternative counting units
- To understand that adding/removing objects increases/decreases total number
- To use composite units and manipulatives to indirectly perform operations (add, subtract, multiply, divide)

Geometry and Spatial Sense
- To identify basic, advanced, and three-dimensional shapes
- To understand that new shapes can be made by combining two or more shapes
- To identify a given shape within a larger pattern or array
- To compare attributes of objects, e.g., shape, size, color, thickness, number of sides or angles
- To understand spatial relations, e.g., above, below, behind, next to, close, far

Measurement
- To seriate objects
- To distinguish dimensions of measurement, e.g., height, width, length, volume, area
- To use standard and nonstandard units of measurement
- To use measurement tools, e.g. balance, ruler
- To make and confirm predictions about objects that differ in terms of size, weight, volume, and area

Data Analysis
- To contribute data points to simple graphs
- To understand simple graphs

Mathematical Conversation
- To engage in increasingly complex mathematical conversations that incorporate prediction, problem-solving, and definitions
- To use spatial, number, geometry, and measurement terms in spontaneous conversation throughout the day

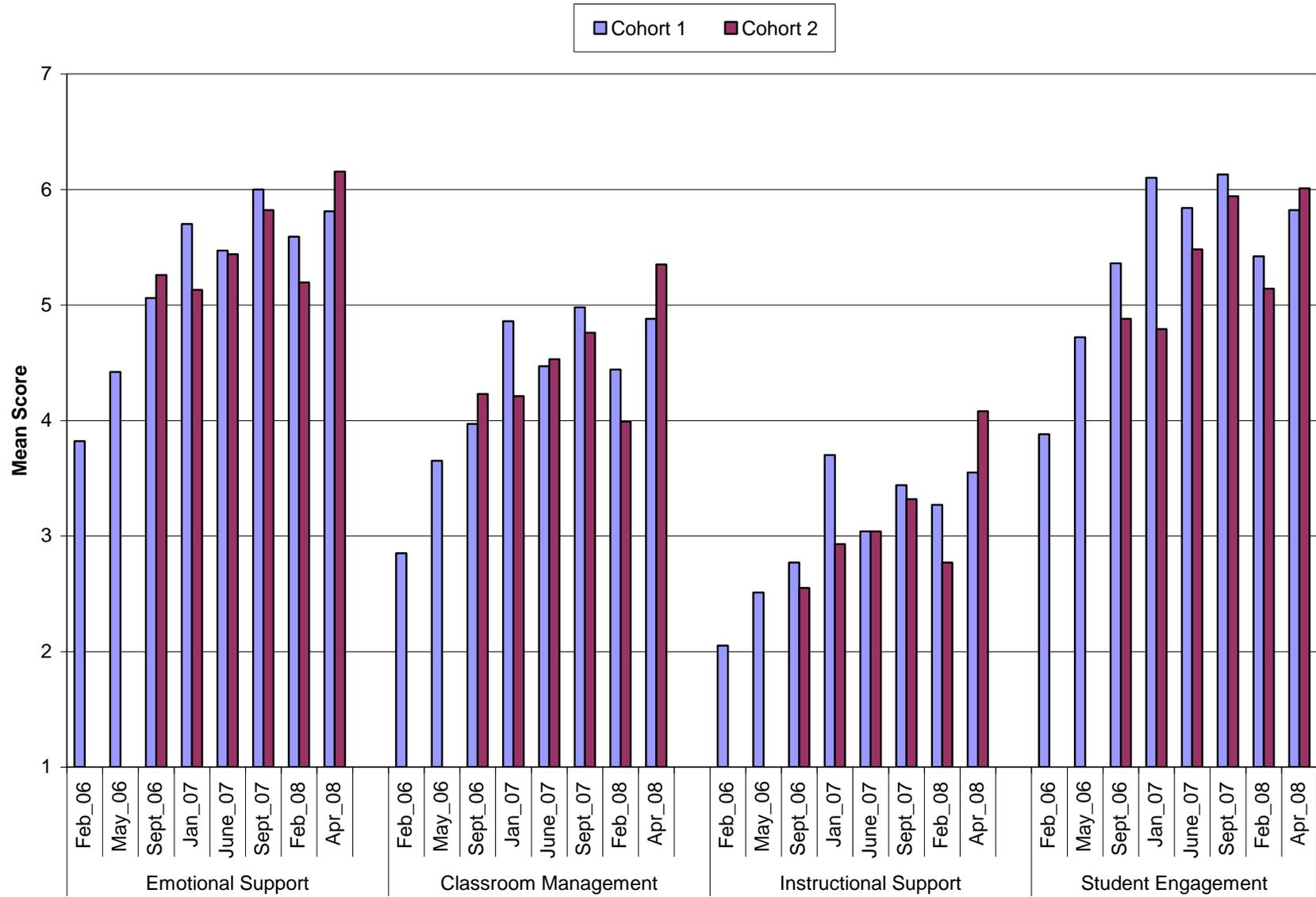Figure 1: CLASS scores over time by cohort

Figure 2: ELLCO Literacy Environment Checklist (LEC) scores over time by cohort
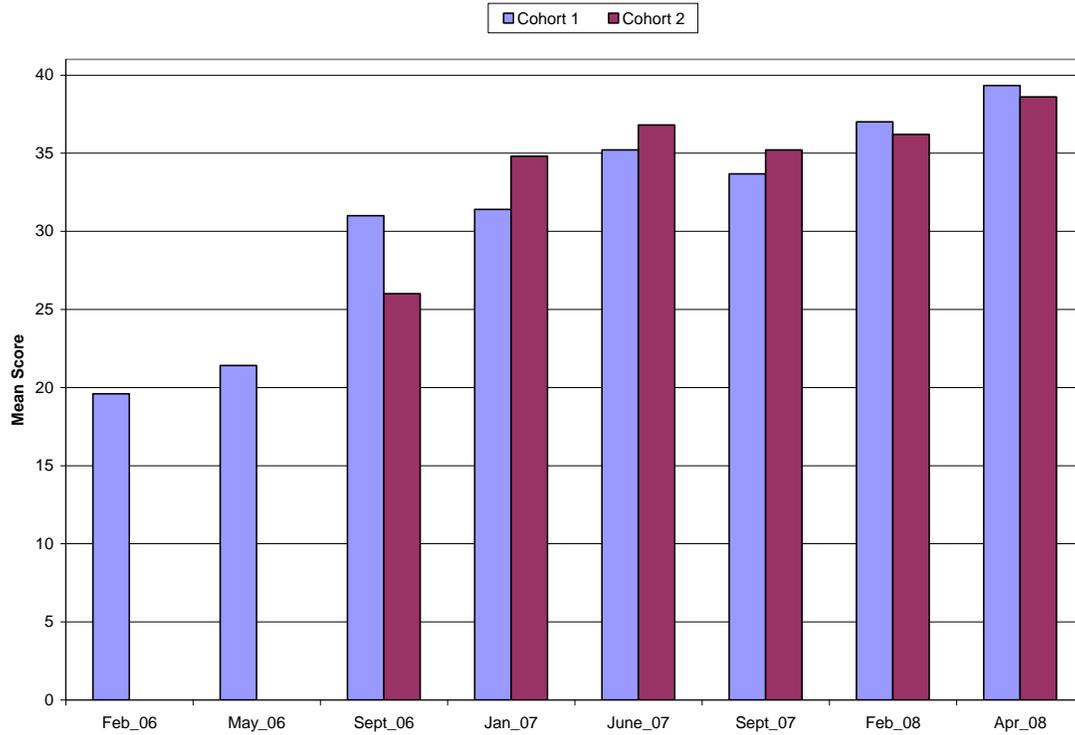

Figure 3: ELLCO General Classroom Environment (GCE) and Language, Literacy, and Curriculum (LLC) scores over time by cohort
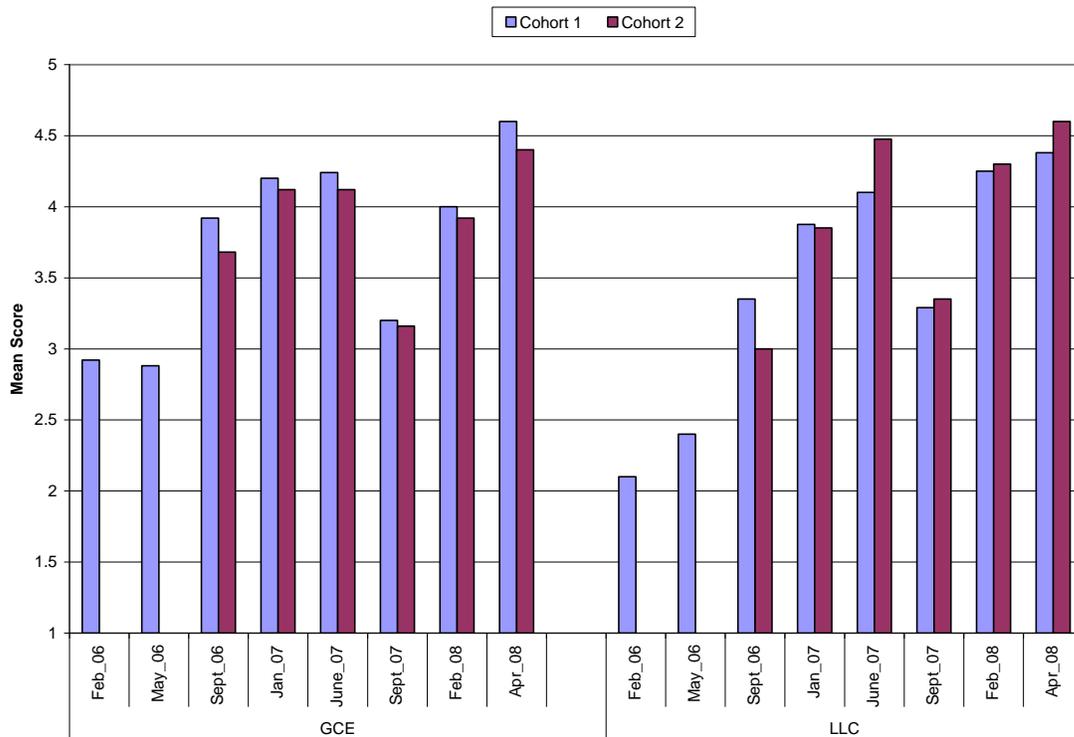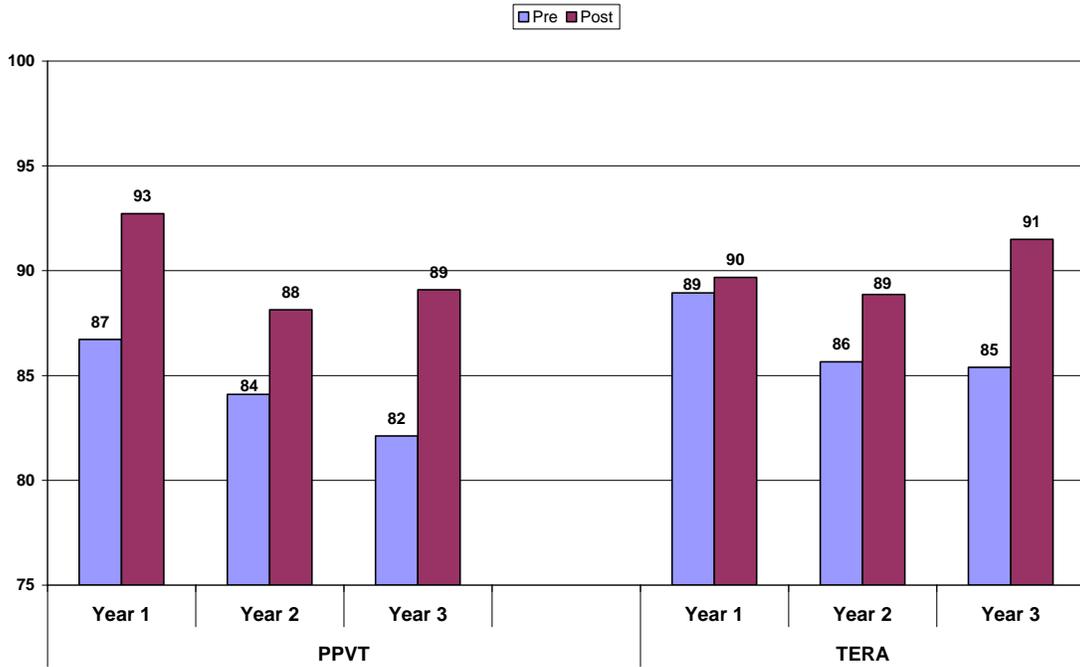
Figure 4: PPVT and TERA quotient scores over time

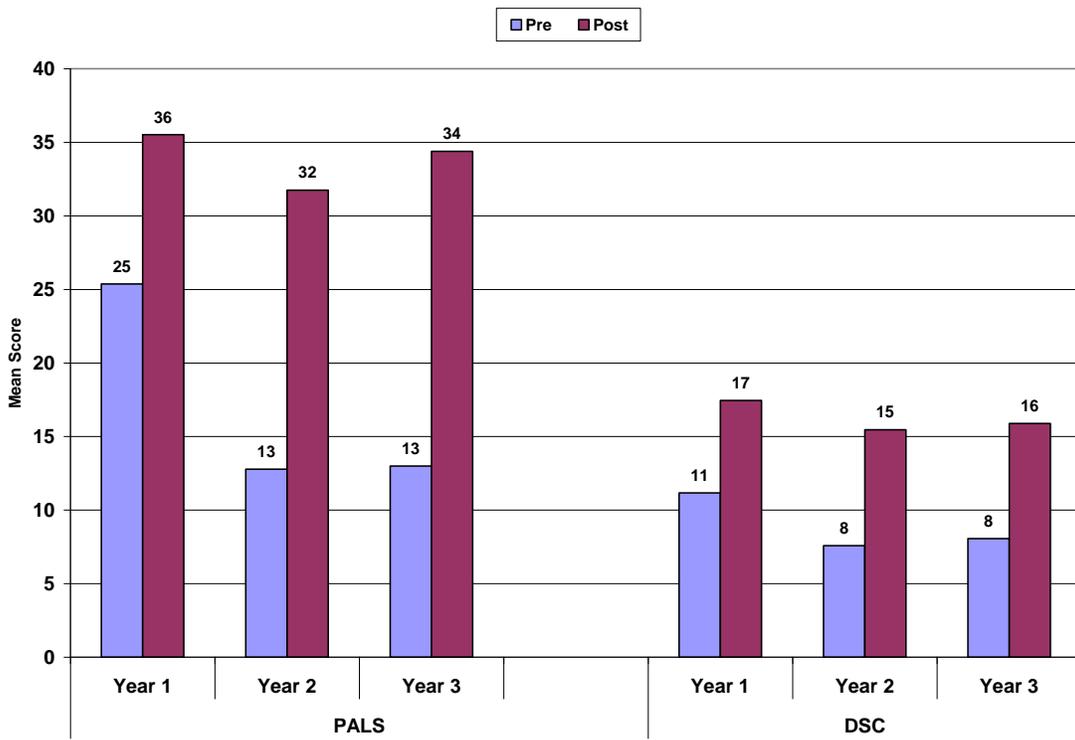Figure 5: PALS and DSC scores over time

Table 2
Results for multi-level analyses

Fixed Effect	PPVT			TERA			PALS			DSC		
	Coeff (*SD*)		*t*	Coeff (*SD*)		*t*	Coeff (*SD*)		*t*	Coeff (*SD*)		*t*
Intercept	.19	(.18)	1.09	.02	(.15)	0.14	-.02	(.16)	-0.13	.03	(.16)	0.18
Level 1												
Child age	-.02	(.01)	-1.35	-.07	(.01)	-5.82***	.02	(.01)	1.15	.02	(.01)	1.78*
Child NES	-.29	(.22)	-1.30	-.02	(.18)	-0.12	.04	(.21)	0.18	-.03	(.01)	-0.17
Level 2												
Mean age	-.26	(.13)	-2.07*	-.16	(.08)	-1.93	.00	(.08)	0.02	-.10	(.08)	-1.25
% NES	.33	(.47)	0.70	.60	(.44)	1.37	1.06	(.42)	2.54**	.27	(.43)	-0.63
CLASS	.26	(.25)	1.04	.17	(.23)	0.74	.67	(.20)	3.37**	.44	(.21)	2.06*
ELLCO	.05	(.13)	0.34	-.01	(.13)	-0.12	-.24	(.12)	-1.95	-.04	(.12)	-0.33
Variance Components												
Level 1	.96			.75			.90			.97		
Level 2	.02			.03			.00			.00		

Note.   NES = native English speaker
   *p < .10,   **p < .05,   ***p < .001