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ABSTRACT

The Enriching a Child's Literacy Environment (ECLE) program was designed to establish a model for teaching parents, teachers, and other care providers how to develop the oral language, thinking abilities and motor skills of young children (ages six months to three years). ECLE trainers instruct the parents or other care providers by first modeling with children each activity in the program and, then, through discussion and lectures. The program's curriculum involves large muscle coordination, small muscle coordination, sensory stimulation/oral language development, print awareness, children's literature, number awareness, music and rhythm, and concept development. Pre- and post-treatment group measures were contrasted with those from an equivalent comparison group (1992-93) and with normative data. The tools selected to measure projected growth were the Mental and Motor subscales of the Bayley Scales of Infant Development. Subjects were five separate groups of students enrolled in the program from 1998 to 1993. Results indicated that, on average, for every month in the program, ECLE children showed two months of growth relative to the normative group. (Contains 7 tables of data.) (RS)

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ED 414 559

Enriching a Child's Literacy Environment (ECLE)

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E. Reid

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A Submission to

the

PROGRAM EFFECTIVENESS PANEL

November 1, 1993

Reid Foundation
3310 South 2700 East
Salt Lake City, Utah 84109

CS012552

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PROGRAM AREA:	Infant Development
I. TITLE:	Enriching A Child's Literacy Environment (ECLE)
II. LOCATION:	Reid Foundation 3310 South 2700 East Salt Lake City, Utah 84109
III. DEVELOPED BY:	The program was co-developed and tested by three distinguished educators.

Dr. Ethna R. Reid is founder and director of the Exemplary Center for Reading Instruction. Dr. Reid has been a secondary and elementary teacher, an elementary school principal, a general elementary supervisor, and a language arts supervisor. She has directed a state funded Reading Clinic and has been an adjunct or visiting professor at the University of Utah, and the University of California at Irvine, Santa Barbara, Davis, Santa Cruz, and Riverside. She is President of Reid Foundation.

Dr. Reid has been president and state chairperson, Utah Council of the International Reading Association (IRA); member of the Board of Directors of IRA, 1975-1979; President of the Salt Lake Council of IRA, 1992-1993; and is serving as State Coordinator at the present time.

Mrs. Shauna Tateoka, a co-developer of the program, has a Master of Education degree and has begun work toward her doctorate (including work at Harvard University) in the fields of children's language acquisition and children's literature. She has studied at universities in eight different European countries, at Hebrew University in Jerusalem, and in Japan. She is a former public school teacher, ballet dancer, and published poet and photographer. Mrs. Tateoka has been a member of the Reading/Language in Infancy Through Preschool Subcommittee of the International Reading Association, and she is presently serving on the Children's Literature and Literacy Commission Advisory Group for IRA.

Mrs. Kathleen Barlow, co-developer, has a Baccalaureate of Science degree in metallurgical engineering and a Juris Doctorate degree. She has worked as a teacher and a patent lawyer. She, too, has studied in many European countries as well as the Soviet Republic. She lived in Belgium and France for two years and is proficient in the French language. Mrs. Barlow majored in mathematics in her undergraduate work and is author of a mathematics series for young children and a teacher's guide for teaching mathematics. She has directed programs for youth in mathematics through the University of Utah.

IV. FUNDING:	Local Funds of $68,512 (1984-93) were supplemented by a FIRST grant of $96,000 (1989-90).
V. YEARS OF DEVELOPMENT:	Development 1984-87 Implementation 1987-93 Current Evaluation 1988-93

VI. BRIEF DESCRIPTION OF THE PROGRAM:

Goals

ECLE's goals are to develop **oral language, thinking abilities** and **motor skills** in infants through activities conducted in the classroom and activities conducted by parents/caregivers in the home.

Needs Addressed

There is a compelling need for parents to make learning the highest priority in their children's lives.[1] There is a need to reduce the number of at-risk children at age three and the number of children entering school needing remedial education or special education. There is an ever increasing need to help families develop practices and activities that promote literacy in their homes and build confidence and foster individual responsibility in their children.

Overview

ECLE was designed to establish a model for teaching parents, teachers and other care providers how to develop young children's oral language, thinking abilities and motor skills. This is accomplished as ECLE trainers instruct the parents or other care providers by first modeling with children each activity in the program and, then, through discussion and lectures. The parents or care providers replicate in class with their own children what was demonstrated. They practice in class what they will continue to do at home or in centers.

Background, Foundation and Theoretical Framework

The most critical years in child development are the early years. The kind of experiences provided for young children during the first three years of their lives affect the development of their intelligence. Every young child should be provided with appropriate experiences to stimulate their thinking, build confidence socially, develop oral language and motor skills, and help them interact in meaningful ways with adults. Bloom observed:

> Both types of data [Thorndike's correlation data and the absolute scale of intelligence] suggest that in terms of intelligence measured at age 17, about 50% of the development takes place between conception and age 4, about 30% between ages 4 and 8 and about 20% between ages 8 and 17. As much development takes place in the first 4 years of life as in the next 13 years.[2]

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[1]Tomlinson, T. *Hard Work and High Expectations: Motivating Students to Learn.* (Washington D.C.: U.S. Government Printing Office, April 1992), p. 17.

[2]Bloom, B.S. *Stability and Change in Human Characteristics.* (New York: John Wiley and Sons, Inc., 1966), p. 88.

Bloom declared that it is a basic proposition that, ". . . the environment is a determiner of the extent and kind of change taking place in a particular characteristic,"[3] and, "the greatest effect on a characteristic comes during the period of its most rapid development."[4]

The trend of conclusions found in early research information was that, ". . . children will, to an extent, become that which they are trained to become."[5] Studies reported that when young children in unstimulating environments were provided the stimulation they lacked, the children gained in language and mental test scores.

The Harvard Preschool Project, started in 1965 by Burton L. White, found that the ages from 12 to 15 months were the most critical for the development of social skills in children, and these skills seemed fundamental for success in school. According to White, a rich social life consisted of the child learning to seek the attention of an adult and trying to maintain it, cooperating with simple requests, and seeking the services of an adult. He found that the best parents excelled in three functions: (1) they were superb designers and organizers of their child's environment; (2) they were firm disciplinarians while simultaneously showing great affection for their children; and (3) they served as personal consultants to their children.

Preschool programs can compensate for deprivation found in low socio-economic disadvantaged homes. They can also compensate for those homes where parents fail to stimulate their children's oral language and neglect to introduce them to the wonders of books. Preschool programs can also provide an enriching supplement to homes where parents are knowledgeable about the importance of these early years. These parents usually search for programs that build on the children's natural spontaneity, creativeness, energy, and intellectual curiosity.

The stimulation provided by parents in the early months and years of a child's life, however, must also be extended in later years as well. It is important to teach parents to provide an enriched literacy environment while their children are young and to continue it as the children grow older.

In the Harvard study of *Families and Literacy: The Contributions of Out-of-School Experiences to Children's Acquisition of Literacy*,[6] it was found that children in grades 2 to 7 who reported that they liked to read, thought reading was important, read fast, had read some books recently "for fun," and went to the library frequently, had higher reading test scores. Also, children who reported learning to read early had higher reading test scores than those who learned to read later. Parents' interests in learning and love of reading carry over to their children.

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[3] *Ibid.*, p. 209.

[4] *Ibid.*, p. 214.

[5] Clasen, R.E., and others. "A Comparison of the Relative Effectiveness of Two Types of Preschool Compensatory Programming," *The Journal of Educational Research*, 62:9, May/June 1969, p. 405.

[6] Chall, J.S. and Snow, C., *Families and Literacy: The Contributions of Out-of-School Experiences to Children's Acquisition of Literacy*, Final Report submitted to the National Institute of Education, (Harvard University Graduate School of Education, December 1982).

The Harvard study found that either home or school can provide for the growth of reading, writing and word meanings among children. The best results seem to come, however, when the home *and* the schools both foster the development of reading, writing and language skills. Children from homes that foster literacy seem to make some progress even if the school contribution is not optimal. It is when neither the children's homes nor their schools provide the needed conditions for literacy development that the children do not progress as they should.

Professionals, then, generally agree that a focus on the early years of a child's life is critical. This is also an important time to assist parents in their approaches to caring for their children at home.

ECLE was developed to assist parents and teachers as they govern the encounters children have with the environment. ECLE's activities assist young children in developing more mature oral language and improved perceptual and intellectual functions. The activities provide children with experiences that will give them opportunities to practice what they ultimately will learn. Parents and teachers are shown how to help the children carry out the new behavior and, also, how to *talk* about their experiences. The earlier the investment in children's use and understanding of their language, the greater the return.

In *America 2000, An Education Strategy*, individual responsibility is designated as one of the key factors in success for our schools. "Increased attention will be focused on adult behavior, responsibility for children and family and community values essential for strong schools — including involving parents as teachers of their children and as school partners"[7]. . . . "Most of all, it will take America's parents — in their school, their communities, their homes — as helpers, as examples, as teachers as leaders . . . to make the America 2000 education strategy work."[8]

Although academic achievement differences have disappeared at the end of some special programs for young children, a 21-year study released in April of 1993 from the Frank Porter Graham Child Development Center at the University of North Carolina at Chapel Hill concludes that there is a significant advantage in providing a good early learning environment for poor children, and that it makes a significant and enduring difference to the child's future.

The study showed that the program of extra help:

- Raised test performances by 16.5 IQ points at age 3.
- Left a four-point IQ improvement at age 15, a decade after the help ended.
- Raised math and reading scores.
- Reduced the need for special education classes.
- Reduced the chances of flunking a grade.[9]

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[7]*America 2000, an Education Strategy* (Washington, D.C.: U.S. Department of Education, 1991) p. 32.
[8]*Ibid.*, page 34.
[9]Thompson, E. "Study Supports Value of Preschool." *Rapid City Journal*, April 22, 1993.

Intended Audience

ECLE has proven successful with young children (ages 6 months to 3 years) from varying socioeconomic levels and from different cultural groups. The program has been successful when delivered by fathers, mothers, grandparents, or babysitters in the ECLE class and in their homes.

Salient Features

PROCESS

The ECLE process combines class and home instruction. In the classroom setting, working collaboratively with ECLE professionals, parents (or other care providers) learn how to develop their children's oral language, thinking and motor skills. Here, instructional techniques are modeled for parents who then practice with their children under the guidance of ECLE teachers. Once the skills are mastered, parents replicate the activities in the home or day care setting. Parents and their children attend class twice a week for 75 minutes. One session averages 18 classes and usually spans a three-month time period. Babysitting service is provided for an hour after class in at least four of the sessions so that parents/care providers can participate in special classes without the children. Families can attend ECLE classes for as many as five sessions during a 12-month period. The program can be continued on from one year to the next during the infant's first three years.

CURRICULUM

The ECLE program emphasizes the development of a comprehensive set of psychomotor and cognitive skills. Infants practice and parents are taught how to develop the following:

Large Muscle Coordination — Over 40 large muscle coordination activities are presented. These are practiced each class period. The exercises each month always progress a little. They: (1) get a little harder, (2) last a little longer, and (3) take a little more effort.

The activities listed for each class are done by each child. The parent can direct his/her child through the activities in any sequence. Several activities can occur simultaneously. For example, while one parent is supervising a child crawl through the tunnel, another parent is helping his/her child with the "Wheelbarrow Walk."

Small Muscle Coordination — The small muscle activities are also practiced each class period. These activities also progress a little each month. The activities can be done in any sequence, so activities can be occurring simultaneously and children can take turns at each activity center. Small muscle coordination activities include: scissors grasp, radial-digital grasp, inferior and fine pincer grasp, turning of wrist, assembly skills, pre-writing skills, coordination and general skills.

Sensory Stimulation/Oral Language Development — Sensory stimulation provides a child with a wide range of auditory (hearing), tactile (feeling), visual (seeing), olfactory (smelling), and tasting experiences. As the child engages in these activities, the goal of the parent is to provide active verbal exchange with him/her. The main objective of sensory

stimulation time is to increase the oral language of the children, enabling them to describe themselves and their environment effectively. An example of this would be in describing a piece of spaghetti. The parents would point out that the spaghetti is hard, smooth, long, cylindrical and brittle as the children feel and break dry spaghetti. The activities are classified by the sense that is to be stimulated. Besides providing an explanation of the activity and list of materials needed, ECLE provides the vocabulary to be developed. Parents use these words (and as many others as they can add) as they and their children work at the sensory tables and talk about their experiences.

Print Awareness — "A child who does poorly in reading in the first year is likely to continue to do poorly . . . Early success with reading appears critical . . . Children who became poor readers entered first grade with little phonemic awareness."[10]

Because of the causal relationship between phonemic awareness and subsequent reading and spelling performance,[11 & 12] and because the alphabetic principle is the underlying rational principle that relates written English to spoken English,[13] ECLE provides children with an opportunity to talk about letters, feel them, and listen to sounds they represent.

The ECLE program includes a model of lower-case velveteen alphabet letters that are mounted on 6" x 9" pieces of oak tag. Tracing the velveteen letters with their fingers provides the children with a tactile experience. The letters are also used to provide the children with visual and auditory experiences. Parents are taught to ask their children to respond orally and to praise continuously during the presentation of the letter names and sounds. Children are introduced in brief activities to the concepts that letters have names, that they represent sounds, and that sounds can be blended into words. The children are not necessarily learning to name all the letters or read sounds or words, although some children will. They are learning that these are important parts of our language heritage.

Children are also given opportunities to hear the rhythm and beauty of their language through poetry. Poetry is provided to the parents to be recited each day. They continue to recite a poem until the children can say it with them. A copy of the poem is placed on the back of an appropriate picture. The picture holds the children's attention. The parents are taught to recite the poem with expression — and with careful enunciation.

Children's Literature — It has been said that great music refines the ear; great art refines the eye; and great literature refines the mind. When children are read to by parents and teachers, they develop a sense of literary and artistic appreciation. They hear the beauty in language. They hear its changing sounds and feel its rhythm.

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[10]Juel, C. (1988). "Learning to read and write: A longitudinal study of 54 children from first through fourth grades." *Journal of Educational Psychology, 80*, pp. 437-447.

[11]Treiman, R. "Phonological awareness and its roles in learning to read and spell." In D. Sawyer & B. Fox (eds.), *Phonological awareness in reading: The evolution of current perspectives.* (New York: Springer-Verlag, 1991), pp. 159-189.

[12]Tunmer, W., & Rohl, M. "Phonological awareness and reading acquisition." In D. Sawyer & B. Fox (eds.), *Phonological awareness in reading: The evolution of current perspectives.* (New York: Springer-Verlag, 1991), pp. 1-30.

[13]MacGinitie, W. "Reading Instruction: Plus Ça Change . . ." *Educational Leadership, 48*:6, March 1991, p. 58.

Chomsky[14] has found a high correlation between language development and book exposure. Children who are read to are early readers and more advanced in syntax maturity. Robert Thorndike who studied excellent readers in 15 countries found they had two things in common: (1) books in their homes, (2) parents who read to their children. Charlotte Huck, an outstanding children's literature expert, suggests that parents should surround children with books. Children are more apt to read books they own.

The ECLE teacher provides the reading materials for the parents and children. The ECLE program describes 100 books and their accompanying activities that parents are to use as they introduce the books to their children. In addition, hard cover books, soft cover books, magazines, catalogs, and newspapers are placed in a special part of the classroom. Small chairs and tables or mats are placed in the "book area" so children can stay and browse through many books if they wish.

Parents/care providers are encouraged to read aloud to their children daily. Reading to children makes them curious, provides added experiences, and aids in the acquisition of early reading and oral language skills. Reading aloud is part of every class period.

Literature is presented to children in class using the following four steps, and parents are taught to use the same steps as they read to their children at home.

The first step is that of **preparation.** The parent presents words she/he feels would be unknown to the children. This means the parents first have to read the story before presenting it to their child. For instance, "Today I'm going to read you a story about a 'nymph.' A nymph is a magical being. She is less than a goddess, and she can live in mountains, forests, meadows and waters. Let's look at the cover of the book. What else do you think the story is about?" This pre-discussion develops interest in the story, aids with meaning and provides a common basis for analysis after the book has been read.

The second step is the **reading of the book or story.** Parents are encouraged to assume different voices for the different characters. The more dramatic the parent is, the more involved the child will become. Some children have longer attention spans than others. A parent begins by reading shorter books, and as the year progresses, longer books are read. Having the child listen for a specific item might aid in the quality of his/her listening. For example, "When you hear the word 'nymph,' raise your hand."

The third step is to **provide concrete or vicarious experiences with a book.** The parents/care providers use concrete objects to relate to the book as they present each book to children. These objects help each child to realize that "what I read about I can do." Examples of these include popping popcorn to accompany the reading of *The Popcorn Book*, holding a flaming red, shiny, smooth pebble while reading *Sylvester and the Magic Pebble*, or arranging a cheese "feast" and eating cheese while listening to *Whose Mouse Are You?* The objects and/or experiences prompt children to remember the story which can then be retold to siblings. Parents are taught how to provide experiences that will add meaning to the books they read to their children.

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[14]Chomsky, C. "Stages in Language Development and Reading Exposure." *Harvard Educational Review*, *42*, 1, February 1972.

The fourth step of reading good literature to children is the discussion. Children tell who they felt was their favorite character and why. They talk about who they thought was the funniest, scariest or silliest. The child retells his/her favorite part of a story, or children act out the story.

Previous books are compared or mentioned in the discussion. For example, "We have read three books about monsters, *Harry and the Terrible Whatzit, Where the Wild Things Are,* and *There's a Nightmare in My Cioset.* Which did you like best?" "Which did you think was the scariest?" "Why?" The discussion helps children develop the ability to talk about books and share experiences.

Number Awareness — The purposes of the mathematics activities are to familiarize the children with number concepts, directions, space and time relationships, and to develop an understanding of likenesses and differences by comparing objects. Each activity is designed to help the children build recognition and verbal ability in dealing with numerals, numbers and math concepts. Children learn to recognize likenesses and differences when dealing with mathematics and to use appropriate vocabulary such as: longer, shorter, bigger, smaller, more, less, heavier and lighter. (This will aid the children when formal mathematical training begins.)

The parents/care providers present the math materials such as those involving number and time concepts on cards using a quick pace. Daily review aids the children in retaining what has been presented. Children become comfortable and confident in answering orally.

Math activities that use hands-on experiences and help in the development of math vocabulary proceed at a slower pace appropriate for the child's level of development. Problem solving time follows a procedure and helps the child develop mathematical understandings.

To develop confidence in children, adults always refrain from testing them. They participate with the child in activities in a friendly, supportive manner. If a child answers incorrectly or uses manipulatives incorrectly, an adult reteaches or models the correct answer or procedure for the child. The adult is taught to listen carefully to the child.

Music and Rhythm — Children have an abundance of energy that is directed during movement time. Young children are uninhibited and are eager to try new things. They are curious, and they love to receive attention from adults. Movement incorporates many skills: physical, sensory-motor and emotional which build creative imagination and social skills. Social skills grow as the children enjoy activities together.

If a child doesn't join the group during movement, it could be because of a fear of new situations. Maybe a few times of watching will be enough to familiarize this child to the new activity. Perhaps the child isn't interested. In this case, the parents/care providers make movement time as motivating or entertaining as possible. They praise profusely the children who move at all. They encourage children to join in the fun, and they never criticize! All children love music, and they have been moving since birth — they are already experts. Parents learn to add some stimulation and direction. Children need repetition to learn and to feel comfortable with most situations. Hearing the same music again and again helps build the confidence of the shy or fearful child.

Concept Development — The term "know" is a very difficult concept for children to acquire. "Know," of course, has several meanings, but the one most commonly thought of in a school setting is the, "I *know* that is true." It is the recognition that something is a fact. It can be proved to be true. In teaching children what is true or a fact, it is important to recognize that they must find it out for themselves. A parent cannot tell them that something is true and have the children know it for themselves.

A "concept" is an idea formed in the brain. All ideas are properties of the brain. That is where they originate, and that is where they are retained. A concept cannot be handed from one person to another; but this is exactly what parents often try to do. If a parent tries to express his/her own concept of something by talking about it, he/she transmits only words. Those words may not give the children a clear picture at all. In fact, the words may confuse the children. Each person has to make his/her own concepts. The easiest way for children to obtain a concept of something is to have an experience with it — not through listening to someone else's words.

It is extremely important for parents/care providers to understand just how a child obtains his/her personal knowledge of the things in his/her world. Adults often resort to "talking to" or "telling" children, instead of literally "showing" them what they were talking about. For this reason, much of their teaching is relatively ineffective. This can be avoided by providing experiences for children in which they participate. They use one or more of their senses as they learn. They "do" and "say" as they experience.

All learning begins with some form of personal contact with actual objects, events, or circumstances in life. The contacts occur through our sensory organs. The process by which the senses transmit meaning to the brain is known as perception. From these constantly occurring acts of perception we formulate the concepts which give us our understanding of life.

The sensory stimulation activities during oral language development time that were discussed earlier assist children in recognizing the different sensory organs and learning how to use them to formulate ideas.

Through a light wave, a sound wave, some form of taste, touch, or smell, an impression is picked up and lodged in the mind. There is no literal picture in the mind, but there is an impression that begins to form a picture as continued experiences accumulate and meaning grows. A concept is a mental image of something the person has experienced.

Throughout the year, activities are provided for parents to help their children to obtain concepts in science, math, social studies, art and music. In addition, parents are instructed how to build their children's self esteem and to use techniques that focus on the positive aspects of the children's behavior.

STAFF DEVELOPMENT

Educators learning to implement ECLE are required to attend a two-day seminar. During the seminar they learn to teach the aspects of the program, identify materials used, observe videotapes of the special lectures and learn how to find the parents and/or care providers for the classes. During the seminars, educators observe demonstrations of the techniques

used to motivate children to respond to instruction. A follow-up visit after the program has begun provides opportunities for the new teachers to observe demonstrations with parents and children in their classrooms by the experienced ECLE consultant.

INSTRUCTIONAL EQUIPMENT AND MATERIALS REQUIREMENTS

Educators who are trained in ECLE are required to purchase:

ECLE Manual

ECLE Videotapes: Modeling ECLE for Parents
Children's Literature
Building Children's Self-Esteem
Mathematics Readiness at Home
Focusing on the Positive

Educators implementing the program will need to purchase or locate equipment such as a balance beam, ramps, and a chinning bar, and household items such as salt shakers, tongs and cotton balls. Most of these items are readily available in settings that are likely to adopt ECLE.

COSTS

Education providers wishing to adopt ECLE are required to have their staff trained and to purchase ECLE implementation materials. The cost of such is as follows:

	Costs	
	Installation	Recurring
Training*	$475 honorarium/day x 2 days = $950.00	0
Follow-up*	1 day at $475	0
Program	$45/educator who will work with parents/ care providers	0
Videotapes	$35/tape for 5 tapes or $175 total (These can be rented.)	0

* Travel necessary if not part of a dissemination grant.

VI. EVIDENCE OF EFFECTIVENESS:

Claim of Effectiveness

Infants (ages 6 months to 3 years) will demonstrate significantly greater gains ($p<.01$) on the Mental Development (MDI) and the Psychomotor Development (PDI) subscales of the Bayley Scales of Infant Development than expectancies derived from a group of comparison students and from national normative data.

Evaluation Design

The evaluation employed a design in which pre and post treatment group measures were contrasted with those from an equivalent comparison group (1992-93) and with normative data provided by the test developers (1988-93).

Instrumentation

The tools selected to measure projected growth were the Mental and Motor subscales of the Bayley Scales of Infant Development (Psychological Corporation). The major criterion for selection of this tool was its high degree of validity for the ECLE intervention. According to the publisher,

> The **Mental Scale** is designed to assess sensory-perceptual acuities, discrimination, and the ability to respond to these; the early acquisition of "objective constancy" and memory, learning, and problem solving ability; vocalizations and the beginnings of verbal communications; and early evidence of the ability to form generalizations and classifications, which is the basis for abstract thinking.
>
> The **Motor Scale** is designed to provide a measure of the degree of control of the body, coordination of the large muscles and finer manipulatory skills of the hands and fingers. As the motor scale is specifically directed toward behaviors reflecting motor coordination and skills, it is not concerned with functions that are commonly thought of as "mental" or "intelligent" in nature.

Constructs measured by the Bayley include:

> *Oral Language* by observing and recording the child's (1) social responses to persons through vocalization; (2) use of words and sentences; (3) naming objects; (4) naming and pointing to pictures; (5) understanding prepositions; (6) following directions with the jointed doll; and (7) verbal comprehension.
>
> *Small Muscle Coordination* as measured by the following tests:
>
> (1) cube behaviors; (2) red ring coordinated manipulation; (3) spoons behavior; (4) manipulative behavior; (5) pellet use; (6) cup behavior; (7) ring and string behavior;

(8) pegboard use; (9) manipulations of boxes; (10) blue board use; (11) pink board use; (12) manipulative capacity; (13) hand bell use; (14) mending broken doll; and (15) using crayon and paper.

Large Muscle Coordination as children (1) sit alone; (2) walk up and down stairs; (3) balance; (4) walk on board; (5) jump from floor; (6) walk on line; and (7) jump from height.

Print Awareness as children (1) name objects; (2) name and point to pictures; (3) discriminate objects; (4) complete incomplete watch; (5) simulate words; and (6) use picture book.

Number Awareness as children (1) count cubes placed in a cup; (2) differentiate vertical and horizontal; (3) build towers of 2, 3, 6, 8 cubes and respond to concept of one; (4) differentiate shapes; and (5) respond to various numbers.

Music and Rhythm as children (1) cooperate in frolic play, games, and repeat performance; (2) manipulate bell; (3) walk sideways and backwards; (4) jump; and (5) hop.

Concept Development as children respond to visual and auditory stimuli.

Scale reliability was assessed by the publishers using a split-half technique. Spearman coefficients ranged from .81 to .93 for the Mental Scale and from .68 to .92 for the Motor Scale for 13 age groups.

The Bayley was standardized on a stratified sample of 1200 children with approximately even representations of male/female and urban/rural participants. Standard scores are expressed as the Mental Development Index (MDI) and the Psychomotor Development Index (PDI). Both indices have a mean of 100 and a standard deviation of 16.

Data Collection

The Bayley battery of tests was administered according to the publisher's guidelines immediately prior to and again on exit from the program. All the data reported were hand scored and coded by independent evaluators. Also, as a check on accuracy, the transformation of a sample of individual student scores was verified against publisher's manuals by an independent external evaluator.

Sample

The sample used for the current study included five separate groups of students enrolled in the ECLE program from 1988 to 1993. Not considering program validation in the early years, no students were measured for comparison with ECLE groups 1-4. A comparison group for ECLE group 5 was sought and found.

ECLE Groups 1, 2 and 4 included infants and their mothers/fathers, babysitters, or grandparents. They varied widely in primary occupation but were mostly middle class professionals.

The ECLE Group 3 was comprised of infants and their parents from low socioeconomic backgrounds who were funded through a U.S. Department of Education "FIRST" grant. Families from the Granite and Salt Lake School Districts' catchment areas were invited to attend at no cost. The group included many welfare recipients, single parents, and unmarried mothers.

Neither ECLE Group 5 parents nor its comparison group parents were charged tuition. The two groups were drawn from the same area and shared the same income range ($16,000 to $30,000 per year). The parents of both groups had applied for acceptance in the program. Treatment and comparison groups were assigned by random drawing. Comparison group parents were told that the program was full and that they would be accepted at no charge during the next year if they would agree to the testing of their infants. The data for all students enrolled were included in the analysis. There were no missing data. ECLE and comparison student demographics are presented in Table 1.

Table 1: Average Age and Age Range of the ECLE Sample at Pre-Test

Group	Year	Average Age (in months)	Age Range (in months)
1	1988-89	20.66	15-26
2	1989-90	22.75	13-27
3	1990-91	22.33	12-33
4	1991-92	20.37	6-30
5	1992-93	20.52	11-33

Results

The results of pre- and post-intervention testing with the 1992-1993 treatment (group 5) and comparison groups are presented in Tables 2 and 3.

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Table 2: Pre- and Post-test Means, Standard Deviations and Correlated t-Tests for ECLE and Comparison Group Students on the Mental Development Index

		Pre		Post				
Group	n	$\bar{x}$	sd	$\bar{x}$	sd	gain	t	p
Treatment	21	108.00	20.27	123.05	15.11	15.05	5.73	.0000
Comparison	20	100.45	23.38	94.45	19.95	-6.00	-2.77	.02

Table 3: Pre- and Post-test Means, Standard Deviations and Correlated t-Tests for ECLE and Comparison Group Students on the Psychomotor Development Index

		Pre		Post				
Group	n	$\bar{x}$	sd	$\bar{x}$	sd	gain	t	p
Treatment	21	114.38	19.06	126.09	14.95	11.71	6.65	.0000
Comparison	20	103.60	22.57	94.95	15.08	-8.65	-3.17	.005

As can be seen, for both the MDI (Table 2) and the PDI (Table 3), while significant gains ($p<.0000$) were made by infants in the ECLE group, significant losses ($p<.02$) were made by their comparison counterparts over the course of the treatment period. As one would expect, when these differential effects were examined by a two-way analysis of variance, the interaction terms were also significant. For the MDI, the F ratio was 34.51 ($p<.0000$). For the PDI, the F ratio was 40.22 ($p<.0000$).

Pre and post test data for five years of ECLE students are presented in Tables 4 and 5.

Table 4: Pre- and Post-test Means, Standard Deviations and Correlated t-Tests for Five Groups of ECLE Students on the Mental Development Index

		Pre		Post				
Group	n	$\bar{x}$	sd	$\bar{x}$	sd	gain	t	p
1 (88-89)	20	97.45	13.51	121.40	12.78	23.95	9.04	.0000
2 (89-90)	10	89.00	11.43	109.00	10.93	20.00	8.43	.0000
3 (90-91)	18	99.16	27.73	112.72	21.14	13.56	3.37	.0036
4 (91-92)	21	104.24	13.69	117.10	14.99	12.85	4.91	.0000
5 (92-93)	21	108.00	20.27	123.05	15.11	15.05	5.73	.0000
TOTAL	90	100.90	19.16	117.66	16.05	16.76	12.02	.0000

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Table 5: Pre- and Post-test Means, Standard Deviations and Correlated t-Tests for Five Groups of ECLE Students on the Psychomotor Development Index

		Pre		Post				
Group	n	x	sd	x	sd	gain	t	p
1 (88-89)	20	88.30	13.52	113.80	14.15	25.50	6.85	.0000
2 (89-90)	10	79.50	13.03	110.90	21.49	31.40	6.27	.0001
3 (90-91)	18	93.55	24.45	120.44	22.07	26.89	4.49	.0002
4 (91-92)	21	95.38	12.43	113.14	15.66	17.76	5.42	.0000
5 (92-93)	21	114.38	19.06	126.90	14.95	11.71	6.65	.0000
TOTAL	90	96.11	21.12	117.52	17.79	21.44	11.36	.0000

At pre-test, the total sample mean was statistically equivalent to that for the population (x=100; sd=16) for the MDI (t=0.53; p.59) and significantly less than that for the population and for the PDI (t=2.31; p.02). Following treatment, however, the picture was considerably different. Here, the total sample mean was significantly greater than the population mean for both the MDI (t=10.47; p<.0000) and the PDI (t=10.39; p<.0000). Statistically significant growth (p<.01) had occurred in both the mental (t=12.02; p<.0000) and psychomotor (t=11.36; p<.0000) domains on standard scores which include adjustments for maturation and on which no growth is expected.

Interpretation and Discussion of Results

RELATIONSHIP BETWEEN TREATMENT AND EFFECT

The pre/post comparison group design in conjunction with a norm-referenced approach effectively controls for maturation and testing effect, the two major threats to internal validity. The size of the means and the size and consistency of the effects across groups, provide an indication that neither statistical regression, nor the unique effect of the teacher were operative. Given this, and the fact that there was no group attrition, it can be concluded with a fair degree of certainty that it was the ECLE treatment that caused the observed effects.

SIGNIFICANCE OF RESULTS

The consistency and size of the gains across five separate groups strongly support the claim of program effectiveness. These data only include students who were 30 months or below at the time of post-testing, as the norms for the Bayley do not go beyond this age.

The average gain for the five groups combined was 16.76 for the MDI and 21.44 for the PDI. This represents an average effects size of in excess of one full standard deviation even after scores are adjusted for age. Keeping in mind that the expected standard score

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gain is zero, this growth is outstanding.

When individual group effects are examined, the program effect is consistent across all five subsets with gains ranging from one-half to two full standard deviations for the MDI and exceeding a full standard deviation for the PDI.

To provide a more interprepretable picture of this dramatic effect, individual student data are described in terms of expected versus actual growth in months (Tables 6 and 7).

Table 6: Estimated versus Actual Growth on the Mental Development Index for Individual Students in Five ECLE Groups

Group	n	x months MDI gain	x months in program	x months gain over expected
1	19	5.95	3.00	2.94
2	8	5.75	3.55	2.63
3	14	4.86	2.57	2.14
4	19	4.73	2.68	2.05
5	18	4.96	2.90	2.06
TOTAL	78	5.21	2.87	2.34

Table 7: Estimated versus Actual Growth on the Psychomotor Development Index for Individual Students in Five ECLE Groups

Group	n	x months PDI gain	x months in program	x months gain over expected
1	19	6.47	3.00	3.47
2	8	6.50	3.55	3.00
3	14	6.64	2.57	4.07
4	19	5.51	2.68	2.83
5	18	4.82	2.90	1.92
TOTAL	78	5.88	2.87	3.01

As can be seen, gains on both the MDI and PDI were approximately twice that expected. On average, for every one month in the program, ECLE children showed two months of growth relative to the normative group.

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Summary

The need for sound developmental programs has never been greater than it is today. Children are beginning school with much greater disadvantages than ever before. Many come from homes with single parents or from homes where the demands of work leave little time for their children. Whatever the reason, traditional parenting skills have declined leaving children without the skills and attributes that are so necessary for success in schools.

ECLE is a program that can help. It has been shown to enhance those developmental cornerstones upon which traditional K-12 skills are built. Evidence has been presented which testifies to the effectiveness of the ECLE intervention across five different groups of care-providers and students. The effects have been consistent, reliable, and of such magnitude to warrant the necessary investment of time and resources to adopt the program or one with a similar impact. For every month of ECLE, students average two months of developmental gain.